

SARA

A company committed to the FSC Principles and Criteria

SUMMARY OF FOREST MANAGEMENT PLAN FOR SARA, DANDELI, KARNATAKA INDIA.

INTRODUCTION:

The FMP contains a comprehensive list of instructions and plan of actions that will be used by SARA to develop and manage, on a sustainable basis, existing Eucalyptus, Casuarina Subabul plantation in parts of the Karnataka ,Andhra Pradesh and Maharashtra states of INDIA.

The objectives of this plantation project are: **(I)** to produce a sufficient and sustained supply of raw wood material for chip-wood production from thinning processes, and **(II)** to produce general utility timber at final crop spacing for sawn timber and furniture manufacturing on a 10-year felling cycle.

BACKGROUND:

SUMMARY OF SARA.

MISSION:

- ❖ The main mission of SARA in the project is to convert the whole of the existing first crop of *Acacia mangium* into a better, higher-yielding, well-managed and sustainable *industrial tree plantation* (ITS) through a private sector-driven initiative and recognized by local and international certifying bodies.
- ❖ To harvest, replant and manage the whole concession area over a period of 60 years based on 10-year harvesting cycles in line with sustainable forestry management practices with minimal impact on the environment.

STRATEGIC APPROACH:

Logging/Harvesting

The salvage logging operation on the existing first crop of *Acacia mangium*, which will be followed immediately by site preparation activities, will be carried out in stages in Logging Blocks (LB) of 400 hectares each and the plantation re-establishment activities will be conducted within Planting Blocks (PB) of 100 hectares. Not every part of the concession area will be cleared and subject to plantation re-establishment. Buffer zones, sensitive slopes and sites, permanent river embankments, protected areas (if any) such as genetic resource conservation area (GRA), areas containing pockets of high conservation value (HCV) species and protection forest, recreation and touristic areas and areas of special interests will be accordingly identified, delineated, marked on the ground, mapped and conserved for their non-timber values and services. Bottom of Form

The annual allowable coupe (AAC) for the concession area is 1,000 acres per year (approx. 400 hectares) for the 10-year cycle.

Plantation Re-establishment

Plantation re-establishment activities will be guided by the company's plantation programme that takes into consideration the following aspects:

- ❖ The conditions of the existing *Acacia mangium* forest plantation, general topography, soil types and suitability and physical environment.
- ❖ Benefit/ cost consideration.
- ❖ Availability, quantity and placement of functioning infrastructure, plantation tools and machinery, materials, forest nursery and technology.
- ❖ Availability of skilled and informed manpower.
- ❖ Protection of forest ecosystem and wildlife.

Salvage logging operation on the existing *Acacia mangium* stands and planting reestablishment will make full use of the existing old forest roads which will be upgraded to allow for use over an extended period of time.

Description of the Project Area:

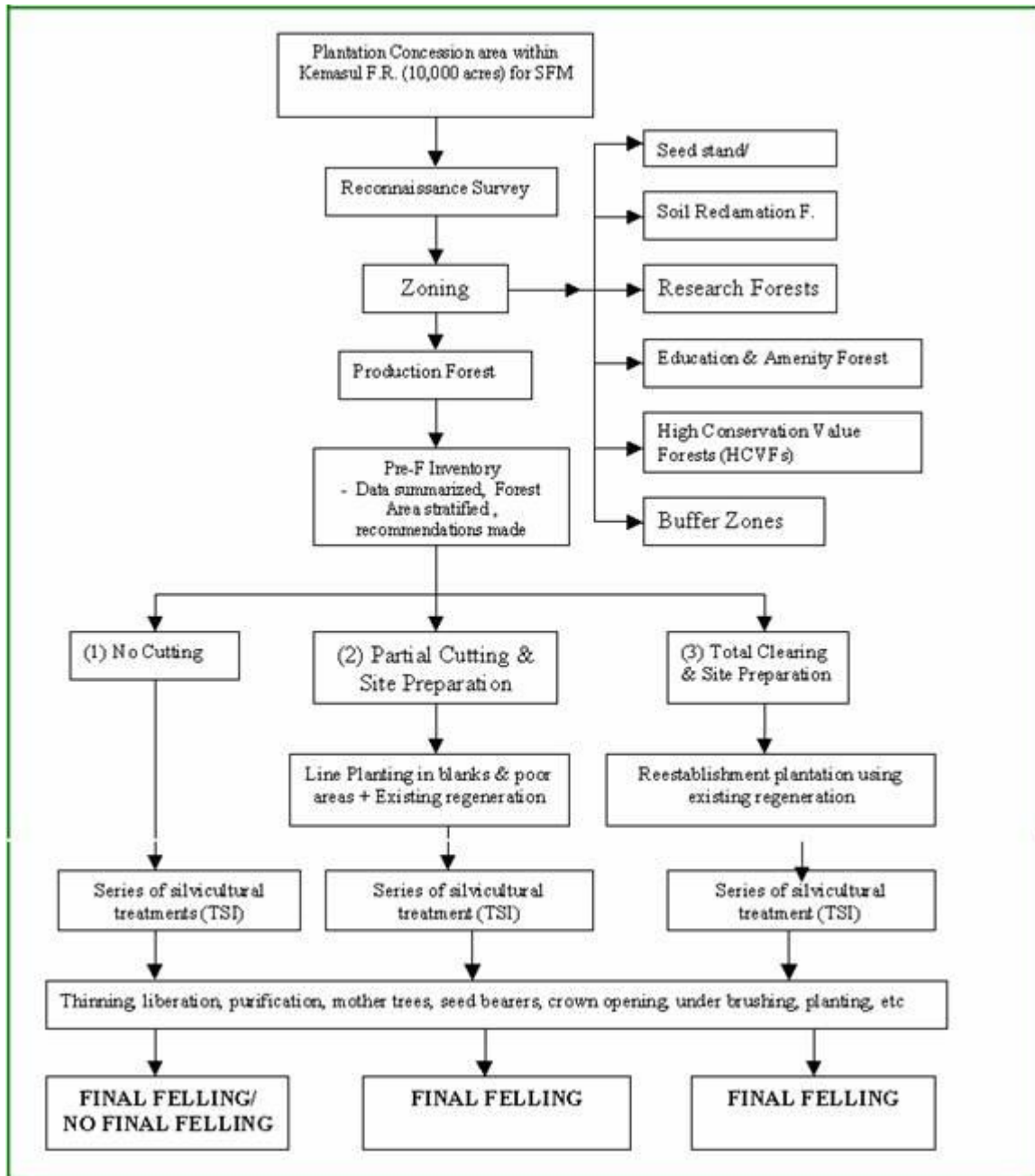
The concession area consist of four (4) major blocks with smaller sub-blocks coded and numbered based on the years they were alienated and planted by the Forestry Department. The 4 blocks are:

- ❖ Block 1, consisting of compartment 1/89 and parts of compartments C3/87, B1/87, B2/87 with total acreage of approx. 1,270 hectares (3,138 acres)
- ❖ Block 2, consisting of compartments B3/87 and 3/89 with total acreage of approx. 1,345 hectares (3,324 acres)
- ❖ Block 3, consisting of compartment A3/87 with total acreage of approx. 549 hectares (1,357 acres) and
- ❖ Block 4, consisting of compartment A/86 with total acreage of approx. 983 hectares (2,428 acres).
- ❖ Block 1 and part of Block 2 is currently under active logging to prepare for the re-establishment of the new plantation.

Foundation for Re-establishment of Plantation

The total area of approx. 4,046 hectares will be cleared in stages over a period of approximately 7 to 10 years from now. Inside each LB, **planting blocks (PB)** of 100 hectares each will be demarcated and will be replanted immediately upon completion of logging and site preparation works *i.e.* at about the same time the logging team moves to the next LB. *The designation of logging blocks into 100 hectares sizes are purely administrative as it is tied to the payment of premium and deposit to the State Forestry Department.* In other words, the Project Area will be harvested based on a total of 10 Logging Blocks of 400 hectares each that together contain a total of 40 Planting Blocks of 100 hectares each over a pre-scheduled period of between 7 to 10 years.

Conceptual Planning Approach:



Species Selection

The concession area had been planted with *Acacia mangium* only although other species such as Pine, Batai and Yemane were also planted on smaller scales in other parts of the Kemasul F.R., outside of ARCF's area. As of now, the plantation re-establishment will replant *Acacia mangium* as its species of choice as stipulated in the conditions for Regeneration by the Forestry Department.

(In the event that we decide to shift away from *Acacia mangium* in the future, there is a host of species to choose from. Some of the notable examples include: (a) Hevea tree (timber clones) (b) Meranti (*Shorea spp*), (c) Teak (*Tectona grandis*), (d) Mahogany (*Swietenia macrophylla*), (d)

Kedondong (species of *Santiria* and *Dacryodes*), (e) Jelutong (*Dyera costulata*), (f) Perah (*Elateriospermum tapos*), and (g) Kelempayan (*Anthocephalus cadamba*)

Site Preparation

It is the company's responsibility to ensure that the following points are met during site preparation, *i.e.* consistent with the principles of SFM and multiplicity of uses of the forestland:

- ❖ Site preparation will not be considered in isolation but as part of an inter-connected and inter-dependent network of activities in the plantation re-establishment process. As such it will be tied into higher-level plans and be coordinated with other site treatments
- ❖ The site preparation method (and its appropriate alternatives) will be clearly stated and followed in earnest.
- ❖ Site preparation will be ecologically based, suitable for the species and the site.
- ❖ Site preparation will not cause detrimental or excessive soil disturbance, but will be carried out in a timely fashion and under appropriate site and seasonal conditions, consistent with the specified soil/ forest floor disturbance limits.
- ❖ Site preparation prescriptions will consider integrated resource management issues such as enhancement of wildlife cover and browse species, biodiversity and other land use issues such as cultural heritage sites and unique recreational features. It will also be sensitive to other management issues such as the spread of noxious weeds and diseases.

Approaches to Site Preparation

Based on the data gathered from the Reconnaissance Survey of the area, the whole Project site of 4 Blocks will be zoned up into: **(I) Production Areas and (II) Non-Production Areas**. Production Areas are destined for timber production purposes whereas Non-Production Areas are those managed for non-timber producing purposes such as: **(i) River/stream Buffers (Annex 6A – D), (ii) Seed Orchards, including Plus Trees, (iii) High Conservation Value Forests (HCVF); (iv) Permanent Sample Plots and Research Areas; (v) Education and Amenity Forests.**

Forest stands identified as Production Areas will be further stratified into 3 categories: **(i) Very high stocking area; (ii) Moderately high stocking area; (iii) Very poor and degraded areas** with blanks patches.

For very high stocking areas, salvage logging and site preparation will be a straightforward affair as every single tree in the stand is cut and removed, *albeit* in an environmentally friendly and orderly manner. In very poor and degraded areas, virtually no timber output will be anticipated. Instead, planting using nursery-raised seedlings or those transplanted from the high-stocking areas will need to be undertaken in line with the company's objective of maximizing outturn through the utilization of all available land and turning these lands into highly productive use.

Road Construction

The construction of forest roads and infrastructure for forestry operation will be done based on the harvesting and requirements.

Primary Roads/ Permanent Access Roads:

These are the main access and primary roads into the forest plantation areas from the public road system. Road density will be kept at a **density of 40m/ ha with grades not exceeding 1:10.**

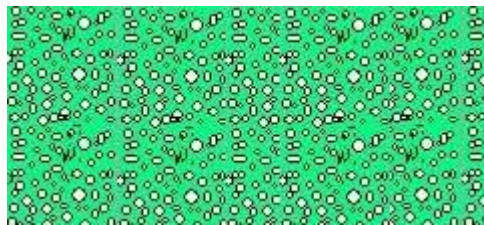
- **Secondary Roads:**
These provide the access from the primary roads into the compartments/ planting blocks (PB). Secondary roads will be constructed mainly along ridgelines or along PB boundaries. They will be well compacted but graveled only in wet places. Typically secondary roads will be constructed as land is cleared, and to serve as firebreaks.
- **Tertiary Roads:**
These provide access within the compartments/PB themselves for the purposes of salvage logging and plantation establishment and maintenance. These tracks will be formed by blade scraping only to the width of 2-2.5 meters.

Silvicultural Operation: Timber Stand Improvement (TSI)

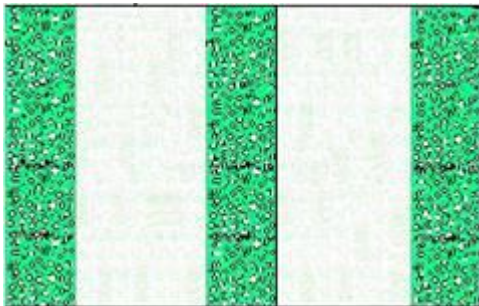
The main objective of the forest plantation project is for the production of both chip-grade timbers and sawlogs. In view of this, all of the subsequent silvicultural treatments and tending schedules will be planned and implemented with that objective in mind.

Silvicultural Treatments in Naturally Regenerated Area

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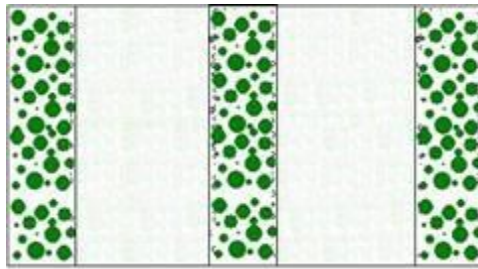


(a) <6 month after clearing: site full with naturally-regenerated seedlings of Mangium

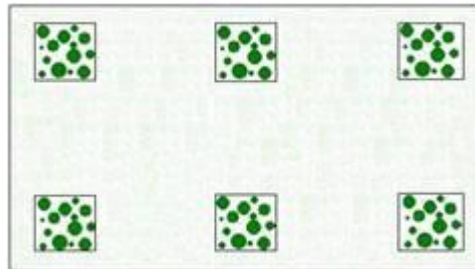


Vegetated strips 1-metre wide containing natural regeneration of Mangium

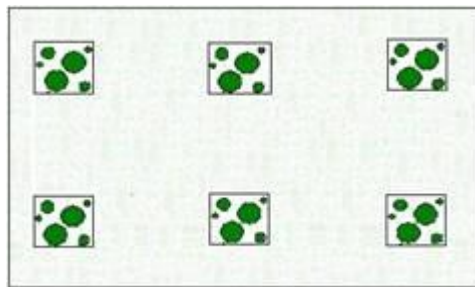
(b) at 6 months, strips of regenerated area 1-metre wide are kept alternately in between cleared strips of 2-metre wide. Target stocking: 3,400 trees per hectare.



(c) at Yr = 2, Singling treatment within 1-m vegetated strips to remove 50% of standing trees resulting in target stocking of 1,700 trees/ha.



(d) at Yr = 4.5, First thinning within 1-m strips removing about 50% of standing trees to leave 850 trees/ha



(e) at Yr = 7; Second and final thinning within 1-m rows removing 60% of standing trees to leave 340 trees/ha as final stocking.

General Silvicultural Schedule for Re-established Plantation Using Naturally-grown Seedlings

Treatment	Age	Activity	Remarks
Treatment 1	Y = 0.5	General slashing & form pruning	Clear 2-m wide strips and retain live seedlings within 1-m wide strips in alternate rows. Target stocking: 3,400 seedlings/ha
Treatment 2	Y = 2	Non commercial thinning and high pruning	Remove 50% of standing trees to result in a target stocking of 1700 trees/ha. Removed wood

			not to be used as chip-wood.
Treatment 3	Y = 4.5	Commercial Thinning 1	Removal of 50% of trees for chip-wood. Retain 850 trees/ha
Treatment 4	Y = 7	Commercial Thinning 2	Remove a 60% of trees for chip-wood. Retain 340 trees/ha as final crop.
Final Felling	Y = 10	Final Felling	Timber <15cm DBH for chip-wood. Timber >15 cm DBH for saw-log. Prepare site for re-establishment /new planting.

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General Silvicultural Schedule for New Plantation

Treatment	Age	Activity	Remarks
Treatment 1	4 months after planting	General slashing & form pruning	Spacing 3 x 3m =1,111 seedlings/ha. All climbers within 45cm radius around seedlings to be uprooted.
Treatment 2	6 months after planting 12 months after planting	General slashing First pruning	As in Treatment 1. Remove branches up to 50% of total height
Treatment 3	2 years after planting	General slashing. Thinning and high pruning	Removal of 30% of trees, retain 777 trees/ha. High pruning of remaining trees.
Treatment 4	4-5 years after planting	<u>Commercial Thinning 1</u>	Removal of another 30% of trees for chip-wood; retain 544 trees/ha
Treatment 5	7 years after planting	<u>Commercial Thinning 2</u>	Removal of next 37% for chip-wood; retain 340 trees/ha. As final crop
Final Felling	10 or 11 years after felling	Final felling	Timber <15cm for chip-wood Timber >15 cm for saw-log. Prepare site for re-establishment /new planting.

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Summary of Growth and Expected Timber Outturn (For New Plantation)

Operation	Initial Treatment*	Thinning 1 at YAP = 4.5	Thinning 2 at YAP = 7	Final Felling at YAP = 10
Year after planting (YAP)	2	4.5	7	10
Initial stocking, no. of trees/ha	3,400@	1,700	850	340
Standing Volume # (m3/tree)		0.047m3/tree	0.247m3/tree	0.76m3/tree
No. of trees to be removed in operation (trees/ha)	1,700(50%)	850(50%)	510(60%)	340
Volume to be removed/ ha		39.95m3/ha	126m3/ha	258m3/ha
Total volume Outturn based on 360ha (890ac) after deducting 10% of swamps etc.		15,120m3	45,360m3	92,880 m3

Proposed Plan of Actions: Harvesting and Planting Sequence

ACTIVITIES								
Re-Planting Block	Compt Numbers	Road works	Planting Block Surveyed	CFP Logging Starts	CFP Logging Ends	Site preparation starts	Planting Starts	Planting completed
R1	C3/87	Feb 03	Feb 03	Early Mar 03	Early May 03	Mid May 03	Early June 03	Mid July 03
R2	A/89	May 03	May 03	Early June 03	Early Aug 03	Mid Aug 03	Early Nov 03	Mid Dec 03
R3	A/89	Aug 03	Aug 03	Early Sep 03	Early Nov 03	Mid Nov 03	Early Dec 03	Mid Jan 04
R4	A/89	Nov 03	Nov 03	Early Dec 03	Early Feb 04	Mid Feb 04	Early Mar 04	Mid April 04
R5	A/89	Feb 04	Feb 04	Early Mar 04	Early May 04	Mid May 04	Early June 04	Mid July 04
R6	C3/87	May 04	May 04	Early June 04	Early Aug 04	Mid Aug 04	Early Sep 04	Mid Oct 04

R7	B3/87	Aug 04	Aug 04	Early Sep 04	Early Nov 04	Mid Nov 04	Early Dec 04	Mid Jan 05
R8	B3/87	Nov 04	Nov 04	Early Dec 04	Early Feb 05	Mid Feb 05	Early Mar 05	Mid April 05
R9	B3/87	Feb 05	Feb 05	Early Mar 05	Early May 05	Mid May 05	Early Jun 05	Mid July 05
R10	B3/87	May 05	May 05	Early June 05	Early Aug 05	Mid Aug 05	Early Sep 05	Mid Oct 05
R11	B3/87	Aug 05	Aug 05	Early Sep 05	Early Nov 05	Mid Nov 05	Early Dec 05	Mid Jan 06
R12	B3/87	Nov 05	Nov 05	Early Dec 05	Early Feb 06	Mid Feb 06	Early Mar 06	Mid April 06
R13	B3/87	Feb 06	Feb 06	Early Mar 06	Early May 06	Mid May 06	Early June 06	Mid July 06
R14	B3/87	May 06	May 06	Early June 06	Early Aug 06	Mid Aug 06	Early Sep 06	Mid Oct 06
R15	B3/87	Aug 06	Aug 06	Early Sep 06	Early Nov 06	Mid Nov 06	Early Dec 06	Mid Jan 07
R16	B3/87	Nov 06	Nov 06	Early Dec 06	Early Feb 07	Mid Feb 07	Early Mar 07	Mid April 07
R17	B3/87	Feb 07	Feb 07	Early Mar 07	Early May 07	Mid May 07	Early June 07	Mid July 07
R18	C3/87	May 07	May 07	Early June 07	Early Aug 07	Mid Aug 07	Early Sep 07	Mid Oct 07
R19	C3/87	Aug 07	Aug 07	Early Sep 07	Early Nov. 07	Mid Nov. 07	Early Dec 07	Mid Jan 08
R20	C3/87	Nov 07	Nov 07	Early Dec 07	Early Feb 08	Mid Feb 08	Early Mar 08	Mid April 08
R21	C3/87	Feb 08	Feb 08	Early Mar 08	Early May 08	Mid May 08	Early June 08	Mid July 08
R22	C3/87	May, 08	May 08	Early June 08	Early Aug 08	Mid Aug 08	Early Sep 08	Mid Oct 08
R23	3/89	Aug, 08	Aug 08	Early Sep 08	Early Nov. 08	Mid Nov. 08	Early Dec 08	Mid Jan 09
R24	3/89	Nov 08	Nov 08	Early Dec	Early Feb	Mid Feb 09	Early Mar	Mid April

				08	09		09	09
R25	3/89	Feb 09	Feb 09	Early Mar 09	Early May 09	Mid May 09	Early June 09	Mid July 09
R26	3/89	May 09	May 09	Early June 09	Early Aug 09	Mid Aug 09	Early Sep 09	Mid Oct 09
R27	A3/87	Aug 09	Aug 09	Early Sep 09	Early Nov. 09	Mid Nov. 09	Early Dec 09	Mid Jan 10
R28	A3/87	Nov 09	Nov 09	Early Dec 09	Early Feb 10	Mid Feb 10	Early Mar10	Mid April 10
R29	A3/87	Feb 10	Feb 10	Early Mar 10	Early May 10	Mid May 10	Early June 10	Mid July 10
R30	A3/87	May 10	May 10	Early June 10	Early Aug 10	Mid Aug 10	Early Sep 10	Mid Oct 10
R31	A3/87	Aug 10	Aug 10	Early Sep 10	Early Nov. 10	Mid Nov. 10	Early Dec 10	Mid Jan 11
R32	A3/87	Nov 10	Nov 10	Early Dec 10	Early Feb 11	Mid Feb 11	Early Mar 11	Mid April 11
R33	A/86	Feb 11	Feb 11	Early Mar 11	Early May 11	Mid May 11	Early June 11	Mid July 11
R34	A/86	May 11	May 11	Early June 11	Early Aug 11	Mid Aug 11	Early Sep 11	Mid Oct 11
R35	A/86	Aug 11	Aug 11	Early Sep 11	Early Nov. 11	Mid Nov. 11	Early Dec 11	Mid Jan 12
R36	A/86	Nov 11	Nov 11	Early Dec 11	Early Feb 12	Mid Feb 12	Early Mar 12	Mid April 12
R37	A/86	Feb 12	Feb 12	Early Mar 12	Early May 12	Mid May 12	Early June 12	Mid July 12
R38	A/86	May 12	May 12	Early June 12	Early Aug 12	Mid Aug 12	Early Sep 12	Mid Oct 12
R39	A/86	Aug 13	Aug 13	Early Sep 13	Early Nov. 13	Mid Nov 13	Early Dec 13	Mid Jan 13
R40	A/86	Nov 13	Nov 13	Early Dec 13	Early Feb 14	Mid Feb 14	Early Mar 14	Mid April 14

Activities and Monitoring Plan

ACTIVITIES	MONITORING PLAN & ACTIONS
<p>1. <u>Harvesting</u></p> <p>Tree felling and removal will be based on "Reduced Impact Logging (RIL)" guidelines with the long term objective of achieving sustainable forest management (SFM).</p>	<p>Harvesting operations will be monitored in accordance with the FMP/Annual Operation Plan and the approved harvesting licenses. Monthly progress report will be submitted by the supervisor to the Forest Manager. Quarterly report will be submitted to the Forestry Dept.</p>
<p>2. <u>Soil Erosion & Road Construction</u></p> <p>The tendency of soil erosion is proportional to the intensity of construction of forest road. This impact could be reduced by practicing proper engineering practices by installing culverts, side ditches, cross drains, diversion ditches, sediment basins, rip rap, silt traps or other facilities. Minimizing total length of roads and area of disturbance and proper maintenance.</p> <p>Forest roads and forest tracks to follow the specifications laid out by the Forestry Department.</p>	<p>Roads, culverts, drainage and soil condition shall be monitored and reports shall be submitted by the Operation Manager every month to the head office. Any serious damage shall be reported and addressed immediately. Use and movement of heavy machinery will be strictly controlled. All forest roads will be closed when not in active use.</p> <p>Soil and road monitoring report will be incorporated in the quarterly report to the Forestry Dept.</p>
<p>3. <u>Hydrology and Water Quality</u></p> <p>3.1. <u>Sediment load and turbidity</u> Efforts will be made to ensure that the total suspended solid (TSS) in surface water run-off from the project site is kept below 150 mg/l.</p> <p>3.2. <u>Drainage</u> Utilize natural drainage patterns to reduce sedimentation; maintain riparian vegetation. Facilitate water flow by clearing streams and culverts from rubbish, waste timbers and silt.</p> <p>No activity whatsoever will be conducted within river reserve and buffer strips</p>	<p>A regular monitoring (daily observations and samplings) of the quality of water released from silt traps and those in major rivers will be undertaken. This will involve parameters such as Total Suspended Solid (TSS), and Oil & Grease (O&G). Data on water quality of rivers and streams will be incorporated in the quarterly report to the Forestry Department.</p> <p>Regular monitoring on river flow and stream flow will be carried out by the forest supervisor and monthly report submitted to the Forest Manager. Obstructions to river and stream flow will be cleared wherever possible. This report will be incorporated into the quarterly report to the Forestry Dept.</p>

<p><u>4. Planting& Silviculture Treatments</u></p> <p>Planting will be done in accordance to guidelines in Chapter 5 of this FMP.</p> <p>Site clearing operation will proceed systematically within the planting block (PB) to allow ample opportunity for animals to react and adjust and accordingly migrate to safer areas.</p>	<p>Monitoring on progress of planting and silvicultural treatment to be done regularly and quarterly report submitted to Forestry Department. Important elements to be incorporated into this report are the acreage planted, area planted, species planted, silviculture treatments, growth rates, mortality rates, pest and diseases, fire, and recommendations, if any.</p>
<p><u>5. Habitats, Species and Population</u></p> <p>A comprehensive survey will be conducted with the collaboration of the document the fauna in the plantation area including those animal species which are thought be threatened, rare and endemic to the site.</p>	<p>Regular monitoring of the wildlife and habitats will be conducted. Protocol of the biodiversity monitoring and enhancement is elaborated in the high conservation value forest (HCVF) protocol. This element will be incorporated in the quarterly report to the Forestry Dept.</p>