DOC004

Samling Reforestation (Bintulu) Sdn Bhd
A member of Samling Group of Companies

PUBLIC SUMMARY

Forest Plantation Management Plan

For MARUDI Industrial Tree Plantation LPF/0008

1st February 2018 to 31st January 2028

James Ho Yam Kuan
Chief Operating Officer

1. Related Documents and Systems

There are numerous the related documents and systems used in the management of the Marudi LPF. These are listed in the Document Register held in the Marudi LPF office.

2. The Company

Marudi Licensed Planted Forest (MARUDI) is an industrial tree plantation (ITP) operating under a Sarawak government licence (LPF/0008) issued to Samling Reforestation (Bintulu) Sdn Bhd (SRB) – a subsidiary of Syarikat Samling Timber Sdn Bhd (SST) – in 1998. It is valid for 60 years.

Samling is head-quartered in Miri, the largest city in the north of the State of Sarawak, Malaysia.
The use of Samling here and throughout this FPMP refers to the timber and wood products division of the Samling Group.

Samling aims to produce an economically sustainable supply of logs from the MARUDI ITP which when combined with logs from their other ITP areas and from their natural forest licence areas will support its downstream wood processing activities – plywood, sawn timber, fibre board and furniture components.

Samling is an equal opportunity employer that operates an active safety and health management system.

Additionally, Samling also recognises the value of and the importance of its environmental and social responsibilities.

3. Malaysian Timber Certification Scheme (MTCS)

3.1. Our Commitment

Samling is committed to develop and conform to the principle of sustainability on all forested land and potentially forested land held under LPF/0008 and, in so doing, to comply with the Malaysian Criteria & Indicators of the Malaysian Timber Certification Scheme (MTCS) - the MC&I ST 1002:2021 (SFM) of the Malaysian Timber Certification Council (MTCC). It is intended that the ethos of MTCS compliance should be embedded in MARUDI's management culture.

Certification of forest plantation management - and therefore of the plantation logs produced for in-house processing – is very important to the future of Samling. It creates potential marketing and economic advantages for its wood-based products and, more importantly, it will help ensure that the management of its resources is carried out under MTCS principles thereby helping to ensure sustainability.

3.2. Certification Requirements

The MTCS requires:

1. Practicing the guidelines and requirements set out by the nine principles of the MTCS.

2. Developing a sound policy base derived from the nine principles and ensuring they are communicated and followed in the workplace.

3. Developing open lines of communication involving employees and stakeholders in the development of economically sustainable forest plantation management practices.

4. Using best practice guidelines in its management regimes. This includes the implementation and continued use of sound, proven and economically viable forest plantation management, environmental, financial and social practices that protect the sustainability of the resources.

3.3. Certification Status

The intention was to certify those areas which were eligible under the MTCS and to claim PEFC Controlled Source status for areas of ITP that were not eligible under the MTCS because of the cut-off.

SIRIM conducted the MTCS Stage 1 audit on 24th and 25thJanuary 2018 followed by the Stage 2 audit conducted from 17th to 20thJuly 2018. A verification audit, precipitated by a spurious complaint made to SIRIM, was conducted by SIRIM on 24 October 2018.

SIRIM's certificate FMC -FP 00117 was issued on 15 January 2019.

4. Forest Plantation Management

4.1. Statutory Framework

In the main the most recent legislation that effects ITP and environmental management is contained within the Forest (Planted Forests) Rules, 1997 and the Natural Resources and Environment Ordinance, 1993 (Cap. 84).

The outcomes should always adhere to the principle of sustainable ITP management and are controlled in companies such as Samling by the use of these documents as resource consents. These two pieces of legislation therefore act as a method of controlling adverse management effects.

Numerous other Acts and Regulations form the basis of forest plantation management practices at Marudi LPF. These are listed in the Document Register held in the Marudi LPF office.

SST's legal department will advise MARUDI of relevant changes in existing legislation and of new legislation as appropriate.

MARUDI keeps "hard" copies of legislation key to its business and management practices on site in the MARUDI office and at the Miri HQ. In some cases the legislation is held in PDF format where hard copies are not available. However, amendments to legislation are relatively frequent and there is access to up-to-date acts of parliament through the internet. (Full copies of these acts of parliament may be found at www.agc.gov.my and www.federalgazette.agc.gov.my.)

4.2. Forest Plantation Management Objectives

The forest management objective is the **economic production of logs for supply to Samling downstream**. This supply is primarily for solid use, i.e., peeler logs and saw logs. However, in achieving this primary objective there are several important supplementary objectives. These are listed below, not in any order of priority:

- maintain the ecological productivity of the ITP – thereby assist to maintain the value of the forest services;
- ensure a sustainable level of log production at the group level;
- conduct forestry operations in a manner that does not impact negatively on the wellbeing of those people living within and nearby the LPF;
- safeguard the environment of the LPF - thereby assisting to maintain the value of the forest services;
- ensure that natural forest areas are protected from human interference in the Conservation Area SMZs; and maximise harvesting recovery.

4.3. Forest Plantation Management Strategy

SRB uses the MTCS principles and criteria to formulate the management strategy in order for MARUDI to achieve the objectives set out above.

As the history of the LPF described in Chapter 5 indicates, and as is noted in the EIA, the area has a long history of repeated harvesting by third parties unrelated to Samling. The ITP is established in clearly defined areas of this degraded residual forest.

Special Management Zones (SMZ) have been, and continue to be, identified (see Section 4.4). The SMZs invariably contain residual forest which, as it is protected within the SMZ, has a protective function and contributes to conservation values including the enhancement of bio-diversity (see 4.4.3). The area under SMZs represents 32% of the total area of the MTCS area (Table 5.2).

SRB also recognises the importance and significance of international agreements in its management. It will give governing authorities as much cooperation as possible to enforce the regulations of such agreements.

The text of these agreements and conventions can also be accessed through some excellent websites dedicated specifically to them or through association with Sarawak government departments such as that of the Natural Resources and Environment Board (NREB).

4.4. Special Management Zones (SMZs)

4.4.1. Zone types occurring in MARUDI MTCS Area

SMZs are generally, but not necessarily, those areas of harvested and now degraded residual forest which do not form a part of the ITP planted area for reasons other than being designated as SA (shifting agriculture) or under land claim. The R&D areas, although under special management, are within the ITP planted area. Within Sarawak there are a number of possible zone types but only those listed in Table 4.1 below have been identified as occurring within MARUDI to date.

Table 4.1: Special Management Zones (SMZs) occurring within MARUDI MTCS Area

Zone Types
River buffer (RBZ) - mandatory; to EIA prescribed widths determined by the water course width
International Buffer Zone – mandatory. 1,000m
Swampy (mineral soil)
Rocky (skeletal soils)
Steep areas $\geq 35^{o}$ – mandatory; Terrain Class IV; upper slopes (i.e. outside riparian buffers)
Gulley - steep riverside areas outside the mandatory buffer zone
Conservation – including areas which might be voluntarily designated as such and which would otherwise have been planted

A zone type may be mandatory, e.g. a river buffer zone which must be established along permanent water courses or it might be a steep already classed as Terrain Class IV - see Table 4.2. Elective zone types are those where, for example, at the manager's discretion a wildlife corridor has been demarcated on otherwise plantable land. This would be classed as a conservation area. And there are 'Hobson's choice' zone types where the physical characteristics of the site preclude the option of planting, e.g. marshland, skeletal soils and steep and/or rocky areas. In reality all the SMZs are effectively conservation areas in which NTFPs may be collected but where encroachment is prohibited. Where encroachment cannot be satisfactorily resolved by management in discussion with those involved then a report must be made to the relevant authority.

The types are not mutually exclusive: e.g., a river buffer may contain marshland and steep areas. By virtue of being demarcated on the ground, GPSd and mapped and then protected from most human activity, SMZs, of whatever type, play a significant role in the conservation of MARUDI's bio-diversity.

Table 4.2: Recommended Widths for River Buffer Zones

Width of Water Course (m)	Width of River Buffer Zone (m)
40	50
20 - 40	40
10 - 20	20
5 - 10	10
<5	5

Source: Table 4. MARUDI EIA 2003, Ecosol Consultancy Sdn Bhd

4.4.2. Management of SMZs

The guiding management principles are common to all SMZs that are currently identified in MARUDI regardless of whether or not they fall within the MTCS area.

The zones are first identified and then demarcated on the ground using blue paint as appropriate. Although they must still be demarcated, the boundaries of steep areas, skeletal soils and marshland are more or less self-defining whilst the boundaries of riparian buffers (RBZ) must be carefully located to ensure compliance. Once clearly demarcated on the ground all SMZs are protected and, apart from the removal of any planted merchantable exotic trees and access by local people for traditional purposes (and such use is negligible). There should be no invasive human activity within them. However, incursion can and does take place but most in cases management does not have the authority to take any action other than to make an official report to the relevant government agency.

Where mangium (or any other exotic ITP species) was originally planted in the RBZ (in the years prior to certification) the intention is to remove it when harvesting the adjacent block. Harvesting will be undertaken with minimum damage leaving the residual vegetation to recover and to continue to develop over the ensuing years. The removal of the exotics can be considered as assisting the natural process of recovery and reversion. The use of machinery, other than chain saws, in an RBZ is prohibited. A contractor who transgresses may be fined up to RM5,000.00 should he allow machinery to enter any SMZ (other than chain saws in zones where exotics are to be removed) and RM100.00 for any non-exotic tree deemed to have been avoidably damaged within the zone.

Following demarcation and the removal of any merchantable exotic trees, no further invasive action in these SMZs is allowed. This protection will allow the SMZs to develop in structure and bio-diversity.

Table 5.2 shows the distribution of SMZ types. The major SMZ type is that of the conservation areas - in the MTCS area these were formerly called green belts (and in the balance of the LPF still are) which cover 4,9740ha; this is just over 76% of the totally protected forested area. SMZs cover 31% of the gross MTCS area.

4.4.3. Natural Forest Areas

More than 24% of the MTCS is natural forest. This is kerangas and MDF in the international buffer zone abutting Brunei, the limited area of green belt that occur along the western edge of the MTCS area, particularly Coupes 2A(I) and 4A and in the water catchments. All these natural forest areas have been harvested at varying intensities and without doubt the forest structure of this residual forest has been changed, in varying degrees, as result. Whilst it is known that many of the larger, merchantable trees have been removed (harvested) the change in frequency and abundance of particular species will never be known as base lines were never established. However, from empirical evidence, both casual and documented, it is known with certainty that the forest structure will recover - given time; a *Shorea bracteolata* sapling requires an unknown number of, but it is certainly many, decades to reach a not unusual size of, say, 130cm DBH. For these residual areas to recover to a state resembling primary forest in terms of structure requires only time. Time is assured by protection and not by intervention.

Designation as an SMZ will ensure protection for the validity of the LPF licence. Areas within SMZs that might be considered to be degraded will also be left to recover without human intervention – such areas add pools of bio-diversity for the LPF's flora and fauna as their structure and species composition (of both flora and fauna) change over the time of the undoubtedly lengthy recovery process.

5. Resource Description

5.1. History

This history refers only to the area now known as Marudi LPF the location of which within northern Sarawak is shown in Map 5.1. (Right click here to access Map 5.1)

5.1.1. Land Status

The current land status of the area proposed for MTCS and of the LPF area immediately adjoining is shown in Map 5.2 (Right click here to access Map 5.2) which is based on EIA Figure 3. From the FDS Locality Map enclosed with WPO/P/98/(Marudi)(III)-66 date 3 December 2012 it appears that there might have been a significant (6,400?ha) extension southwards of the Marudi F.R. and a proposed significant northward extension of the Batu Belah P.F.. However, the boundaries of these extensions are not clear on the map provided and clarification is being sought from FDS. FDS state in the above referenced letter that areas of NCR have been excluded from the LPF. If this is correct then any land claims over the area shown as shifting agriculture in Map 5.2 will be spurious.

5.1.2. Expired Forest Timber Licences

Apart from the international buffer zone much of the forested area of what is now LPF/0008 has been heavily harvested under various forest timber licences (FTLs). The FTL areas on mineral soils, with the exception of T/9041 (Sy. Sekaloh Sdn. Bhd.) had been completely harvested and the licences had either expired or been surrendered before planting started in 2009. Sy. Sekaloh Sdn. Bhd. completed their last re-entry sometime in 2013 following which their licence expired (or was surrendered). The peat swamp forest in the very north of the LPF, against the international border zone, was harvested under T/0371 (Enka Trading Sdn Bhd). The peat swamp forest east of and adjacent to the Btg Baram near Kuala Tinjar together with an area of peat swamp forest lying between the Btg Tinjar and the Btg Baram was licenced to Baram Sawmill Sdn. Bhd. (T/0040) – a company related to the Samling group - with effect from January 1966. The FTL was renewed annually until it expired in November 2014. The information on the licencing history is not complete. It is likely that some of the later FTLs were re-issues of much older FTLs. This was certainly the case for T/9041 which was previously licenced as T/0049 (Nam Hua Sdn. Bhd.).

It should be noted that the area proposed for certification under MTCS does not included any areas of peat swamp.

5.1.3. Past Harvesting

The terms and conditions attached to the FTLs issued for the forest areas on mineral soils are not known to Samling. However, the 50% of the mineral forest area that is under forest reserve should have had general timber licence conditions imposed with respect to diameter cutting limits. This would have meant that non-dipterocarp obligatory species of 45+cm DBH OB and dipterocarps of 60+cm DBH OB that would yield one or more merchantable logs must be harvested with a penalty be paid for failure to do so. Trees below these cutting limits should not have been felled. For the forest on state land outside of the forest reserves the imposition of a cutting limit meant that trees above the cutting limit must be taken but trees of less than the cutting limit could be taken at the licensee's discretion.

Anything from 25 to 100 m3/ha of merchantable logs might have been removed from these licence areas. This would inevitably result in a significant degree of damage to the remaining trees and saplings with the actual degree being more or less proportional to the volume removed. Thus the structure of the post-harvest forest would rarely if ever approximate that of the undisturbed 'natural forest' or the 'native ecosystem' or to use the more common term, the 'primary forest'. If an area has been subject to more than one cycle of harvesting in the past few decades then its structure and diversity would have

been further compromised. The older FTLs would have been in force for at least 40 years prior to the LPF operation starting. This means that some, if not all, forest areas would have been cut-over several times.

On an area designated for conversion to LPF the FTL holder, after completion of harvesting, surrenders the completed coupe to the LPF holder. The LPF holder then applies to SFC under the Permit to Enter Coupe system (PEC), first for Operations 1 to 4 which covers boundary demarcation of the blocks, road alignment etc., all of which will be in existence from the FTL operation. Following inspection by SFC, Operation 5 is then applied for. This allows the LPF holder to clear the area in preparation for planting. Any residual merchantable trees will then be harvested (an operation known as 'salvage'). If the area has been subject to more than one cutting cycle, the residual merchantable volume will be very low or even non-existent. (In the LPF licence, page 11, it states that *"…The existing Mixed Dipterocarp Forest within the project areas have (sic) been logged and most of the forests have lost their form and structure…"*

5.1.4. Conversion of Primary Forest

As has been noted in the preceding section, areas of natural forest within the LPF have been subjected to repeated harvesting for forty, and possibly fifty, years or more. Consequently, no undisturbed primary forest was known to remain at the time the LPF licence was issued in December 1998. **This means that no primary forest has been converted to ITP within the LPF area in the currency of the LPF licence period. Furthermore, no primary forest remains for conversion.**

5.2. Determination of the Area Eligible for Certification under MTCS

5.2.1. Marudi LPF is not eligible in its entirety

The gross area of the LPF is 55,822ha[1]. Table 5.1 shows the breakdown of the whole LPF by coupe, location west or east of the Baram River, and basic soil type. This table also shows how the gross area of the four coupes that contribute to the MTCS area is reduced, step by step, from gross coupe area to planted area. This table also shows the small discrepancy between the GIS area of 55,663ha and the FDS licence area of 55,822ha. The 159ha discrepancy is primarily the result of FDS and Samling working from different digitisations of the original LPF licence map. FDS has yet to provide the shape file that would resolve this.

Consequent of the changes required by PEFC's endorsement of the MC&I SFM, under which the MTCS operates, Marudi LPF is not eligible for certification in its entirety. This has led to an unsatisfactory situation whereby Samling must ensure that it secures the largest possible area for certification but in doing so this has inevitably meant that the MTCS area is geographically somewhat fragmented (see Map 5.4). Table 5.1 shows the areas and basic soil type of the coupes that comprise the whole LPF and it should be noted that areas eligible for MTCS only occur in Coupes 1 to 4.

5.2.2. The eligible MTCS area

The eligible area for MTCS was determined through the application of the FDS's operational control system known as Permit to Enter Coupe (PEC). An area of just under 15,000 ha of notionally operable area was endorsed for clearing. The actual ITP area is less than the PEC approved area because the former is the actual planted area based on GPS survey of the individual blocks and the latter is an estimate of 'operable area' available to be cleared. Within the 'operable area' there are areas which, for various reasons, are unplantable, e.g., steep areas, river buffer zones, etc.

5.3. Geology and Soils

Reference should be made to the EIA which gives a very concise overview of the geology of the LPF. It also gives a summary of the soils although these have only been documented at reconnaissance level. Unfortunately, it does not identify – and makes little mention of - the very low nutrient status white

[1] This is the revised licence area figure from FDS Locality Map date 16 0ctober 2012.

podzolic soils (kerangas) that is of significant occurrence, particularly in Coupe 4. These soils frequently have a hard pan not far below the surface. Unless 'ripped', this pan impedes drainage and is consequently detrimental to plantation tree growth. The LPF licence has a soil map (D2) at 1:50,000 which is less detailed than that in the EIA and which to some extent is in disagreement with the EIA map. It provides no additional information on the occurrence of white podzolic soil. The undated vegetation map (C2) that is attached to the licence is more useful in identifying these problem soils. The occurrence of kerangas forest in the vegetation map, provided it was correctly identified on the aerial photographs, should be a good indicator of an underlying white podzolic soil.

Table 5.1: LPF/0008 coupe areas, location, soil type and MTCS area (hectares)|14 February 2018

Coupe	Gross area	Location	Soil Type	In MTCS area
1	3,090	East of Baram	Mineral	yes
2	8,223	East of Baram	Mineral	part only
3	5,369	East of Baram	Mineral	part only
4	6,867	East of Baram	Mineral	yes
5	3,515	West of Baram	Peat & some mineral	no
6	4,664	West of Baram	Peat & some mineral	no
7	3,017	West of Baram	Peat & some mineral	no
8	3,964	West of Baram	Peat & some mineral	no
9	3,490	West of Baram	Peat & some mineral	no
10	2,504	West of Baram	Peat & some mineral	no
11	3,273	West of Baram	Peat & some mineral	no
12	2,828	East of Baram	Peat	no
1-12	50,803			

Source: Samling GIS in Marudi FPMP Tabs 5.1 etc.

Item	Coupe 1 - 4	Description
1	23,548	gross area; of which
2	19,941	is in the MTCS area; of which
3	15,146	is gross PEC area approved for Op.5 before cut off; of which
4	12,707	is MTCS production area; of which
5	5,805	was planted at July 2017

Source: Samling GIS in Marudi FPMP Tabs 5.1 etc.

5.4. Land Use

LPF/0008 became effective on 8th December 1998 for a period of 60 years.

The LPF is located in the Marudi District of the Miri Division. (See Map 5.1).

A statement of land types and land use for the MTCS area is given in Table 5.2. The total MTCS area of 19,941ha represents about one third of the gross LPF area (55,822ha – FDS revision, Oct 2012).

Table 5.2: Area Statement for MTCS Area within MARUDI LPF/0008 at 31st July 2023 (hectares)

Land Type	Gross Area ha %	Non-Productive[5] Area											ITP Productive Area				
		Non-Forested Areas					Protected Forested Area										
		SA	Water	Road line	Others[1]	Total Non-Forested Area	Conser-vation [6]	Buffer Zone	Gully	Steep	Total Protected Area	Total	Planted [2]	Plantable [3]	TUP[7]	Potential [4]	Total
Mineral	19,941	0	114	236	2,200	2,551	6,993	1,709	65	604	9,371	11,922	6,945	517	557	0	8,019
Total	***19,941***	***0***	***114***	***236***	***2,200***	***2,551***	***6,993***	***1,709***	***65***	***604***	***9,371***	***11,922***	***6,945***	***517***	***557***	***0***	***8,019***
% Distribution - Certification Area		0%	1%	1%	11%	13%	35%	9%	0%	3%	47%	60%	35%	3%	3%	0%	40%
% Distribution - Non-productive [5] & Productive Area		0%	1%	2%	18%	21%	59%	14%	1%	5%	79%	100%	87%	6%	7%	0%	100%

Sources: LPF Licence, Block Master

Block Update As of: 03/08/2023

Layer used : Z:\Mapping\Temp\2023\08_August\L08\MTCS\Shp\l08_block_update_p_20230731_clip_mtcs.shp

[1] *Rocky Area, Swampy Area, Proposed Nursery, Temuda Claim Area, Sandy Area & Others*

[2] *Includes area of Kerangas soil which will not be planted after harvesting.*

[3] *Cleared under PEC Opt5 on or before 31st December 2010; assessed as plantable but still not recorded as planted at map record date*

[4] *Cleared under PEC Opt5 on or before 31st December 2010; but status & capability not yet confirmed by ground survey*

[5] *Non-productive as in not producing industrial timber*

[6] *International Buffer Zone, Kerangas Forest, Green Belt & Water Catchment*

[7] *Temporary Unplanted Area*

5.5. Industrial Tree Plantation (ITP) Resource in the MTCS

5.5.1. Resource utilisation

Harvesting started in October 2017 and stopped temporarily in August 2021 when the planned harvesting of the eligible blocks was completed. The harvested area is recorded as 1,733 ha.

5.5.2. Species distribution

Table 5.3 shows the distribution of the major species and years of planting **(**YOP) for the MTCS ITP resource at 31st July 2023 as extracted from the Block Master at that date.

Two species, mangium and pellita, comprise almost 87.2% of the planted area and *Acacia* hybrid contributes a further 8.5%. Falcata is included in Table 5.3 in order that the area planted might be compared with that planted in Samling's other LPFs where it is an important component.

Table 5.3: Species by Year of Planting for Marudi MTCS area at 31st July 2023

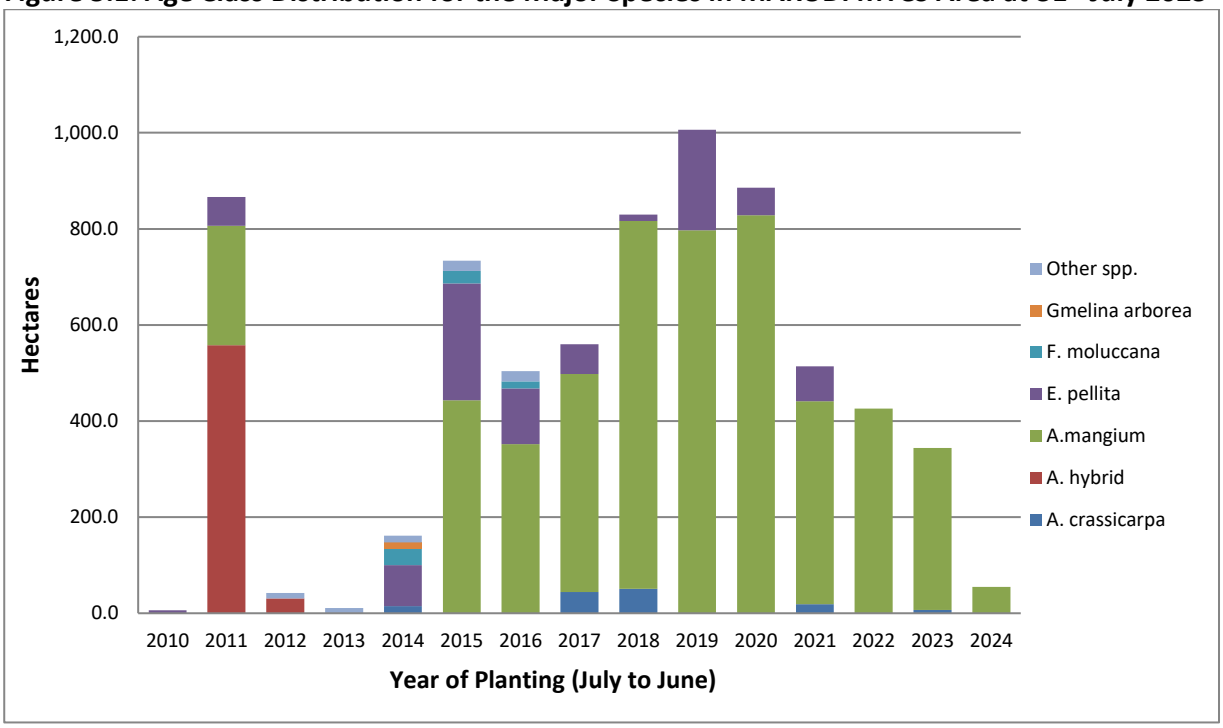
	Year of Planting (YOP)															Grand Total	%
Species	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**		
A. crassicarpa	-	-	-	-	14.9	-	-	44.4	50.9	-	-	19.1	-	6.6	-	135.8	2.0
A. hybrid	-	558.0	31.0	-	-	-	-	-	-	-	-	-	-	-	-	589.0	8.5
A.mangium	-	248.2	-	-	-	443.2	352.3	453.6	765.3	797.1	828.7	422.5	426.2	337.7	54.8	5,129.6	73.9
E. pellita	5.9	60.3	-	-	85.4	243.5	115.6	61.6	13.6	209.5	57.4	72.2	-	-	-	924.9	13.3
F. moluccana	-	-	-	-	34.7	25.6	14.8	-	-	-	-	-	-	-	-	75.1	1.1
Gmelina arborea	-	-	-	-	12.7	-	-	-	-	-	-	-	-	-	-	12.7	0.2
Other spp.	-	-	11.2	10.6	13.6	21.3	21.0	-	-	-	-	-	-	-	-	77.7	1.1
Grand Total	**5.9**	**866.5**	**42.2**	**10.6**	**161.3**	**733.7**	**503.7**	**559.6**	**829.9**	**1,006.6**	**886.0**	**513.8**	**426.2**	**344.3**	**54.8**	**6,944.9**	**100**

Layer used : Z:\Mapping\Temp\2023\08_August\L08\MTCS\Shp\l08_block_update_p_20230731_clip_mtcs.shp

NB The areas in Table 5.3 are those which have passed post-plant QC. Table 5.3 also includes a few small areas which were planted but are considered to have failed following establishment and which might be re-planted before rotation age.

The age class distribution of the ITP resource on the MTCS area, for six named species and all other species combined, is shown graphically in Figure 5.1.

Figure 5.1: Age Class Distribution for the Major Species in MARUDI MTCS Area at 31st July 2023



Source: MARUDI Block master. Excel file: MARUDI FPMP Tabs 5.1, 5.2 & 5.3.

Figure 5.1 clearly shows the highly skewed distribution of the age classes. The harvesting plan will take this into account when determining the annual cut; it will also consider the fact that the MAI of mangium peaks around four years old and that the standing volume can go into severe decline at about twelve years old as a result of root rot (*Ganoderma* spp.). The harvest plan will, as far as is practicable, start to smooth the annual cut (AC) produced from the MTCS area but, given the highly skewed age class distribution, the AC will inevitably and unavoidably fluctuate significantly. The total planted area of the LPF will continue to increase for some time and there will be a corresponding increase in the AC.

5.5.3. Sustainability of production

When considering sustainability of production, it should be kept in mind that Samling's downstream is also supported by log production from Samling's other ITPs. In order to ensure a more or less regular log flow to the mills it is, therefore, Samling's *total log flow* that must be sustainable and not necessarily that of any individual LPF. Furthermore, as noted in the previous paragraph, the area that might be harvested on an annual basis is far too small for economic annual production.

5.5.4. Risks faced by the resource

Disease

A *Ceratocystis* sp. has been present in MARUDI LPF for some time and has resulted in the death of a number of *A. mangium*. Management must always be aware of the possibility that the incidence of damage and death will reach the epidemic proportions already experienced in Sumatra and, to a lesser extent, in Sabah and of the impact that this will have on the AAC – and on future species selection.

Fire

All forest plantations are at serious risk to fire at some stage in their development. It is the responsibility of management to reduce the risk where possible and be prepared to deal with any incidence of fire that might be within its area of responsibility and to assist in dealing with fire in nearby neighbouring areas.

Flood

There are no parts of the MTCS that are subject to serious, prolonged flooding.

Wind blow

Experience on the peat at Segan has shown that wind blow can be quite severe. Mangium and its hybrid might be more prone: a stark example of this was observed with two adjacent blocks, one of pellita and the other of mangium: the latter was flattened but the former remained standing. Elsewhere pellita is seen to suffer but, perhaps surprisingly, not from uprooting but from both stem break and the stems bending - something from which they did not recover. However, if the water table is too high then blow may occur.

However, on the mineral soils of Marudi, wind damage, whilst it might be severe very locally, has not yet been wide spread. When wind blow does occur, it gives the impression that the trees have been struck by a strong wind on a very a narrow front – a line squall. But, of course, the damage is accumulative over the rotation period and could have a significant effect on yield.

5.6. Forest Carbon Stocks and High Carbon Stock Areas (HCS)

The previous edition of the MTCS' MC&I (MC&I Forest Plantation.v2) did not stipulate any requirements regarding forest carbon stock. The revised version, the MC&I SFM which came into force 1st January 2021, does mention forest carbon stock under Indicator 6.1.2 in terms of the EIA. Under Indicator 6.12 it mentions high carbon stock but this last is not applicable as it specifically refers to afforestation of *non-forest lands*.

6. Environmental Considerations

6.1. Environmental Limitations

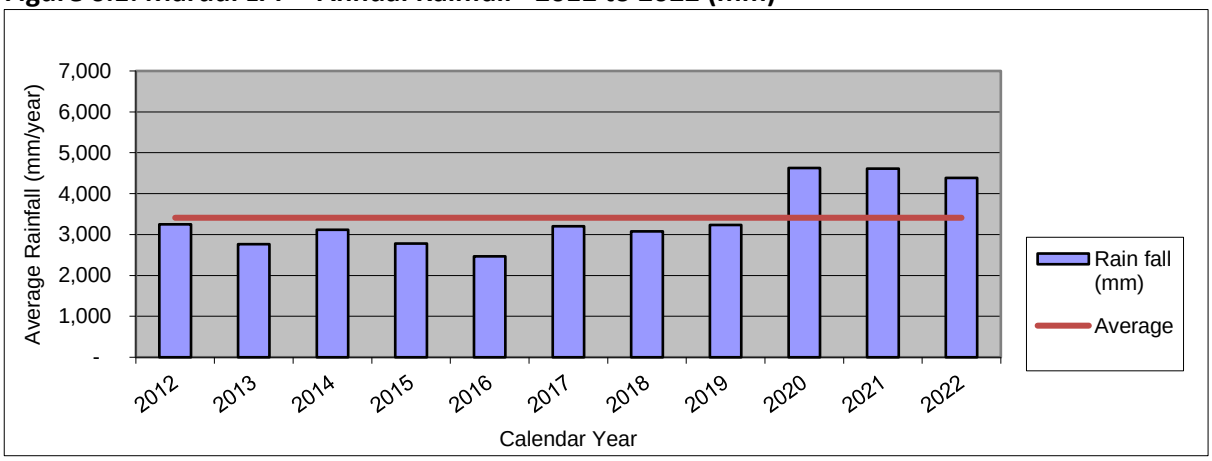
6.1.1. Introduction

There are few environmental limitations for ITP in the LPF area. Similarly, for the MTCS area where the main limitation is the broken terrain with short, steep slopes on relatively fragile soils leading to a potential for increased erosion. A further limitation is that the combination of high rainfall and broken terrain gives rise to intricate networks of small streams. There are thus numerous water courses that must be buffered with protective strips of residual natural forest or unplanted land of widths determined by the prescription set out in the EIA and shown in Table 4.2.

6.1.2. Rainfall

The annual rainfall recorded over 2012 to 2022 at MARUDI nursery is shown in Figure 6.1. The average for 11 years is 3,411mm and has ranged from 2,469mm (2016) to 4,625mm (2020). On average there are 14 rain days a month and 162 rain days a year.

Figure 6.1: Marudi LPF – Annual Rainfall - 2012 to 2022 (mm)



Source: Rainfall All LPFs Master (Excel)

The driest and wettest months recorded to date are March 2015 - 45mm - and October 2022 - 807 mm. Any month in a given year might be either the driest or the wettest in that year; but, as can be seen in Table 6.1, October, November, and December may be thought of as the wetter season accounting for about 34% of the average annual rainfall. Although both the amount of rainfall and its frequency are

lower than for Samling's other LPFs they are still relatively high. With no truly distinct season this impacts heavily on the efficient use of both labour and equipment and thus on operational costs.

Table 6.1: Marudi: Average monthly rainfall and rain days 2012 to 2022 (inclusive)

Item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Aver.	Annual Aver.
mm	327	213	232	255	241	190	201	191	183	355	334	343	255	3,411
days	15	10	11	11	12	10	10	10	10	16	16	17	12	162

Source: Rainfall All LPFs Master (Excel)

6.1.3. Access

The relatively high level and frequency of the rainfall and steep terrain also make access to some areas difficult and even impossible at times, especially during the wetter season (November to January inclusive) when ungravelled roads can quickly become slippery and temporarily unusable. Because of this it is not realistic to plan for reliable harvesting and transportation on a year round basis. To ensure a regular log supply log stocks will have to be built up at an all-weather depot, or at the mills, before the onset of the wetter season.

6.1.4. Harvesting

Harvesting is predominantly by shovel yarder with shovel extraction close to the roads. This combination makes for reasonably efficient extraction in the broken terrain whilst minimising the environmental impact, especially soil disturbance that can lead both to compaction and to increased erosion. Ground skidding will be used in the few areas where the access and topography restrict the efficient use of shovel yarding and shovel extraction. However, it must be kept to the absolute minimum to avoid serious site damage that will compromise the growth of the next crop.

6.2. The Environmental Management Plan (EMP)

The EMP (DOC015) is a stand-alone document to which reference should be made for details. Elements of the EMP are referred to in various sections of this FPMP. Some of the essential points regarding environmental impact mitigation measures are restated in Section 6.3.

6.3. Environmental Impact Mitigation

6.3.1. Soil erosion

Mechanised operations in areas of steep slopes and high rainfall inevitably give rise to increased soil erosion. This is kept to a minimum firstly by using the most appropriate harvesting systems. Secondly, where new roads must be constructed, by ensuring a reasonable road alignment and by construction that conforms to the FDS standards – which is necessary in order to obtain a PHC (Permit to Harvest Coupe). Thirdly, by ensuring that any extensions of spur roads and clearing (for new landings to facilitate extraction and loading) are kept to the minimum necessary for efficient operation (see 6.1.4 above).

6.3.2. Water quality

The target set by the State Government is for river water quality to be maintained at least to Class IIB1[2] of the National Water Quality Standards of Malaysia (NWQSM). Maintenance of water quality is in part achieved by minimising soil erosion (6.3.1) and by keeping fertiliser leaching and herbicide run off to the minimum. Fertiliser use is exceptionally low - less than 70kg/ha. The herbicide load is also low with 4 to 5 litres/ha applied each round. The active ingredient of the main herbicide used is glyphosate which is generally considered to be toxicologically and environmentally more benign than most of the other herbicides currently available.

To date MARUDI has not used insecticides in the field. However, experience in other ITPs indicates that there might be the occasional need for very restricted use of a termaticide. It would only be used in response to attack and not pre-emptively.

[2] Meaning that the river water is safe for recreational use with body contact

Sewage disposal in the camp is by means of cess pits and in the plantation by long drop latrines. All used oil from in-field oil changes is brought back to the workshop as scheduled waste for controlled recycling.

Water quality is monitored by means of water sampling whereby samples are taken quarterly from sampling points identified by the EIA. (The locations of the sampling points are shown on the LPF map in the Marudi office.) These samples are analysed by an external laboratory with the results submitted to NREB and presented within the external consultant's quarterly Environmental Monitoring Report (EMR). Reference to these reports will confirm that, to date, the results have almost always been within NREB acceptable parameters or in other ways compliant with the standards set in the EIA. (The most recent monitoring results appear in the Samling website.)

6.3.3. River buffer zones (also known as riparian buffer zones) – RBZ

River buffer zones are established in accordance with the EIA recommendation (See the EMP and Table 4.2). The objective is to establish a well-defined strip of land - a buffer - that will help to protect the river bank and the river bank eco-system at least for the currency of the LPF. This will reduce soil erosion and thereby reduce the amount of sediment moving into the water courses. Establishing and then protecting river buffer zones also maintains, and over the longer term enhances, the biodiversity of the area. There are currently 1,110 ha of RBZ within, and representing more than 6% of the gross MTCS area. From the experience gained in Segan, it is expected that this area will increase following re-demarcation of RBZs prior to harvesting the first rotation areas that were established prior to implementing the standards required by the MTCS.

6.3.4. Zero burning

There is a 'zero burn policy' for the preparation of second rotation sites after harvesting. This practice has the multiple benefits of reducing air pollution, increasing the organic carbon content of the top soil and improving the overall nutrient status and condition of the soil. (Where the first crop was Acacia, burning for second rotation site preparation usually results in very dense natural regeneration of acacia seedlings. This gives rise to very heavy competition for the planted seedlings.)

'Zero burn' also removes the ever-present danger of a controlled burn getting out of hand. However, there are negative factors arising from a 'zero burn' policy: even on the second rotation, planting is more difficult than would be the case on a clean burnt area. This is especially so where a very thick fern layer has built up. Furthermore, in dry periods the presence of large amounts of flammable debris presents a serious fire hazard that remains for some time after planting.

6.3.5. Use of chemicals

Apart from the insecticides and fungicides used, unavoidably, in the nursery only herbicides and fertiliser are used in the plantation. As stated in 6.4.2, below, both are used at low, or very low, rates of application.

6.4. Environmental Safeguards

6.4.1. Environmental Monitoring Report (EMR)

Ecosol Consultancy Sdn Bhd is contracted to monitor and review MARUDI's compliance with the recommendations set out in the EIA. The results of their findings are presented in Environmental Monitoring Reports (EMR) which are produced four times a year: January to March, April to June, July to September and October to December.

The EMR is scheduled to be phased out during the first 2-3 years of this FPMP. It will be replaced by the Environmental Compliance Assessment (ECA) which, it is proposed, will be conducted twice a year by NREB trained Samling in-house audit teams with an annual verification audit undertaken by external auditors appointed by NREB.

6.4.2. Use of chemicals and implementation plan for reduction in their use

i Background

As stated in 6.3.5 chemicals are used in both in the nursery and in the blocks (only herbicides) but at very low rates of application.

MARUDI acknowledges that under current best practice, applications of herbicides are necessary to ensure an acceptable survival rate as well as prevent loss of increment through the competitive effects of weeds. The ERP (Enterprise Resource Planning) system records the type and quantity of chemicals used in forest operations and the rate of application is recorded on a block by block basis with the results reported monthly in the Block Consumption Report.

However, MARUDI will always actively seek management practices that reduce the amount of chemical entering the environment of its LPF. This is of benefit not only to the environment but also to SRB as chemicals are expensive - both to procure and to apply. Reducing these activities would have a substantial financial as well as environmental benefit to Marudi LPF.

Training also provides best practice guidelines and protocols for the proper use of chemicals in terms of human and environmental safety and economic application and for the safe disposal of the containers in which chemicals were supplied.

ii implementation plan for reduction in their [chemical pesticides] use

The current implementation plan for the reduction in chemical pesticide usage is as follows:

- Planting spacing has been reduced to 2m x 3m. This ensures earlier canopy closure for acacias and led to the reduction of one round of chemical spray;
- Trials are under way to test pressure-controlled knapsack sprayers. In combination with lower volume nozzles this will reduce the rate of chemical used per hectare; and
- Nursery improvements to ensure healthier plants through better hygiene thus reducing the need for chemical interventions.

6.4.3. Water course quality

As mentioned in 6.3.2 under the LPF licence conditions MARUDI is required to monitor water quality of the LPF's water courses. This is done four times a year with analysis undertaken by an independent laboratory and the results reported in the EMR.

6.4.4. Invasion by, and monitoring of, exotic plant species introductions

MARUDI's management is aware of the potential problems that might arise from the introduction of exotic species. However, no exotic species grown by SRB has been identified as an invasive plant pest by any Sarawak government agency. Furthermore, only three exotic species, of two genera (*Acacia* and *Eucalyptus*), are currently planted commercially (as opposed to trialled) in MARUDI LPF. All three species are known to regenerate naturally, to a greater or lesser degree, under MARUDI's conditions but this is not necessarily an adverse environmental impact.

To date neither an *Acacia* nor a *Eucalyptus* species originating in the LPF is known to have invaded areas outside the LPF. Mangium is a pioneering, short lived light demander and generally only regenerates in open, and relatively open, areas, e.g. burnt over SA. In areas of SA under a hill padi cropping cycle, the regeneration of mangium might be considered as beneficial because it both protects and, as a nitrogen fixer, improves the soil.

In the event that *E. pellita* seeds do germinate as wildings outside of designated planting areas, the seedlings will find it very difficult to compete with strong weed competition. (Of the two other species planted operationally by Samling in other LPFs it might be noted that Gmelina, whilst it does regenerate naturally in Sarawak, is not known anywhere to be invasive. Falcata (batai), although a pioneer light demander, has not been known to be invasive under Sarawak's conditions.)

Unfortunately, other than those of the four genera listed above, not one of the almost 90 exotic and indigenous species that have undergone trials by Samling to date has, as yet, proven successful enough to regenerate naturally and thus none poses any degree of environmental risk.

As yet no exotic plant species is known to present a significant risk of invasion of the MTCS area.

Monitoring of exotic plant invasion (inward and outward) is by observation during the course of regular security patrols and by *ad hoc* comment from management staff made in the course of their duties.

6.5. Fire Prevention and Control

The Marudi FMU has a detailed fire plan covering fire prevention and control. Sections 3 & 4 cover the description of the FMU, rainfall records and trends and vegetation and boundaries and neighbours. Sections 5 and 6 cover the prescription for firebreaks and the potential fire risk areas and the fire danger rating system. Sections 8 and 9 cover vehicles and equipment. Sections 12, 13 and 14 cover the management of the situation should a fire occur with 11 and 15 covering post fire activities.

6.6. Conservation of Bio-diversity

This has been briefly referred to in Section 4.4. Whilst acknowledging the findings and comments of the HCV (2018) assessment it should be noted that conservation of the bio-diversity as represented by the gene pools of MARUDI's flora and fauna, and of the ecosystems in which they are found, is very much dependent on the residual natural forest in the river buffer zones and the conservation areas which together represent more than 30% of the gross area of the MTCS area. There will be, as yet unidentified, contributions to bio-diversity from the *planted* forest areas. Indeed, even shifting agriculture (SA) in its various stages has a part to play in contributing to the overall bio-diversity of the area – although it should be noted that whilst SA does occur within the LPF there is none in the MTCS area.
It is recorded in Chapters 4 and 5 of the EIA report that the harvesting of the natural forest has been very wide spread and intense. Para 4.1.2 of the EIA states:

"… the Project Area has already been greatly disturbed by past logging activities; the remnant vegetation does not have high conservation value and the logged-over forests now harbour very little wildlife. More over none of the remaining biological species that will be affected are endemic or endangered; they can be found in similar habitats elsewhere in the State…"

Undertaken more than ten years after the EIA, the HCV (2018) assessment has shown that there are in fact endangered species within the Marudi LPF. However the statement that these species can also be found in the [widespread] similar habitats elsewhere in the State remains true.

Map 5.2 shows that timber licences have at some time covered the whole LPF. This harvesting has occurred at varying degrees of intensity over several decades. No natural forest type has been identified within MARUDI LPF that is not also widely represented elsewhere within Sarawak. As already mentioned, the residual or remnant forest falls into several mapping units which together are termed Special Management Zones (SMZ) - see Table 4.1 - all of which are protected to the extent that Samling's LPF management has the authority to do so.

Prior to harvesting starting[3] the process of re-demarcating SMZ areas on the ground and their subsequent GPS tracking will be carried out with far greater diligence than was the case in the early years of clearing and establishing planted areas. This in part due to the wide spread availability of GPS devices – some of the original blocks were established using chain and compass – and in part the awareness of operating under the MTCS. As harvesting proceeds through the MTCS area the re-survey of the coupes and blocks should result in a small increase in the area of RBZs and possibly of other SMZ types.

[3] January 2018

As stated in Section 4.2.2, the SMZs are protected areas. This protection should ensure that the current level of bio-diversity does not diminish; indeed, over time the diversity of the flora should increase with the arboreal component developing in terms of DBH and height (i.e. structure) with the species composition becoming, albeit very slowly, more diverse (see 6.6 Residual Forest). The MARUDI plantation maps show that the SMZs are widely distributed throughout both the LPF and the MTCS area. Currently they represent more than 31% of the MTCS area - (Table 5.2). It is expected that this percentage will increase a little over time as the pre- and post-harvest GPS surveys better define the land categories.

6.7. Residual Natural Forest

The history of the LPF in Section 5.1 clearly shows that the original MDF was subjected to very heavy harvesting in the past. This means that the residual, or remnant, MDF forest is very much secondary in physical structure. However, in terms of genetic diversity its flora is, in all probability, little changed as harvesting was selectively based on DBH. But, as no study was undertaken prior to harvesting the natural forest in order to establish baselines, the original diversity levels of both the flora and the fauna of the no longer extant primary forest type(s) remain unknown. It is now a question of protecting those areas of residual forest that have been designated as SMZs. Continued protection of the SMZs should, over many decades, allow the forest to recover in terms of structure: i.e. only time will allow the full genetic expression of those species that are capable of growing to a large size. Similarly, over time, the genetic diversity may change, but not necessarily increase, as pioneer species in the gaps created by harvesting are slowly replaced by longer living species. The slowly – as species that might have disappeared are recruited back into the SMZs by various means of seed dispersal.

6.8. Adjacent Land

As can be seen from Map 5.4 a significant length of the MTCS area's eastern boundary is formed by the international border with Brunei Darussalam along which there is a 1km wide buffer zone that comprises mostly disturbed MDF. Much of the reminder of the boundary adjoins either shifting cultivation or planned ITP areas which were approved for PEC Op. 5 after the December 2010 cut-off date. In the south-east, very close to the international buffer zone, is the start of the MTCS area's common boundary with Formasi Abadi Sdn. Bhd, an oil palm plantation company. Initially the common boundary[4] is formed by a cut line until it meets and then follows Sg. Besali to the kuala with Sg Temasok which it then follows for several kilometres until Kuala Temasok on Sg Tutoh where it ceases. The LPF boundary then follows Sg Tutoh downstream to the Sg Apoh which it then follows to Kuala Linei and then follows Sg Linei upstream for several kilometres after which it goes more or less due north first along a small river then along a steep narrow ridge up to Sg Ridan. Across river from the Apoh & Tutoh is the LPF/0011. Across from the Linei and the also adjoining north heading boundary is a mix of SA and degraded to much degraded land.

The common boundary with Formasi Abadi Sdn. Bhd. was established by a joint survey team comprising staff from both companies and from SFC. The planted area of MTCS area and that of the balance of the LPF were established primarily on residual forest land. Apart from the international buffer zone most of the land adjacent to these areas has a similar history of harvesting.

In summary: the adjacent lands of the MTCS comprise the Labi F.R. of Brunei Darussalam, oil palm. a mix of SA and the non- MTCS planted areas of Marudi LPF, and degraded land adjoining the MTCS but outside of the LPF.

There are no neighbouring or nearby suburban or residential developments which require the consideration of either environmental and aesthetic values or additional safety considerations during forest operations. Marudi Town, the nearest township, lies on the Btg Baram, some14 km west of nearest part of the MTCS area.

[4] The common boundary was established by a joint survey conducted in December 2017

7. Socio-Economic Context

7.1. Contribution by Current and Future Forest Operations

The ITP productive area within the MTCS area is just over 12,500ha. This is negligible when viewed against the State's planting target of one million hectares or even against the area currently planted state wide. However, small as this area might appear the MARUDI resource is important to Samling and to the Miri region's economy. All the log production will go to Samling's own downstream operations: peeler logs for Samling's plywood mills and saw logs to Samling Housing Products Sdn Bhd. Mangium chip logs will go to Samling's TreeOne Mega Pellet at Bintulu. Thus, the entire log production from MARUDI ITP will be processed locally, i.e., within the Miri-Bintulu Region.

7.2. Employment and Provision of Services

Table 7.1 shows the breakdown of the in-house workforce by origin and by sex: at 31 December 2022[5], 22.1 % were local, 44.2% were Malaysian and 13.2% were female. Most (74%) of the workers are Indonesians on two year contracts. MARUDI is an equal opportunity employer but only just over 13% of the workforce is female. This low rate of female participation reflects the nature of the work rather than any form of discrimination.

The competition for local workers from offshore oil and gas and the perceived unattractiveness of work in the ITP industry are in great part the cause of low participation rates of locals and other Malaysians as workers. For those with some education and skills and able to work in the grade of supervisor or higher the local and Malaysian participation rates are much higher – over 50% and over 90% respectively.

The contractors provide further employment but, as with in-house workers, their workers are almost exclusively Indonesian.

The establishment, maintenance and harvesting work in MARUDI is done using in-house workers and contractors. The whilst some the engineering, spares and supply support, is from Marudi Town most is sourced from Miri.

7.3. The Value of Forest Services

The EIA of the whole LPF was undertaken in 2007. At that time the survey found that 53% of the potentially active working population (males and females aged 18 to 60) had already out-migrated. It was noted that "… *a significant number of residents, especially the younger and more able bodied people, have left the settlements and are now working elsewhere…"* The core occupation of the area's communities is farming and is therefore not related to the forested areas of the LPF. The SIA (2018) made similar comment but did not include supporting data.

The following extracts from the 2007 EIA indicate that even ten years ago there was no longer any real dependence on the residual forest and the natural resources that might be found either in the LPF in general or in the MTCS area in particular:

Fishing: "…fishing in the Btg Baram… Sg Tutoh and their tributaries are not commercial in nature being carried out by the locals mainly to supplement their diets. Only excess catch, which is becoming rare nowadays, is sold for cash…"

*Hunting; "…*is no longer important for the Iban, Kenyah and Berawan communities surveyed...there a dearth of large animals in the region….The wild game, such as wild boar and deer, are mostly found in the more forested areas. Game meat, if any is mainly for the hunters' own consumption…*"*

[5] Harvesting had yet to start in December and hence the harvesting staff and workers are not included here

Jungle Produce: "…logging and shifting cultivation had (*sic*) depleted the forest resources. The introduction of modern household utensils had also reduced the dependence of (*sic*) the forest products… still collecting the forest produce…for the people's own use and not for commercial purposes."

The SIA (2018) notes (3.2.1) that many villagers say that wild game, fish and NTFP are almost gone *"… which indirectly affects the livelihood of the local people…".* The HCV (2018) in section 3.5 states: "…*The assessment reveals that the dependency on jungle produce are minimal as they are adapting into the modern lifestyle by getting their supplies from Marudi town apart from the facts that natural resource are depleting*…". It then goes on to say that: *Forest dependency rates area varying kampong communities within the MTCS…".* Here the draft report[6] was in error in that there <u>are no communities within the MTCS</u> – only within the LPF.

As an ever-increasing percentage of the various communities becomes wage earners and entrepreneurs (either locally, or more probably after migrating to urban centres) demand for these forest services will continue to fall.

However, the villages on Sg Linei use the stream water for domestic purposes and Kpg Long Panai and Kpg Batu Belah source water from a catchment from within the MTCS area. Villagers in Ulu Sg Ridan use both stream water and water from a catchment within the MTCS. This provision of water for domestic purposes is important function that is supplemented by the capture of rain water.

The three water catchments in question are demarcated on the ground, mapped and protected to help ensure they fulfil their purpose. The HCVA identified nine water catchments but some of these catchments are included within the three larger catchments, others are primarily in areas of SA and hence outside the jurisdiction of the LPF management.

The SIA drew the conclusion (5.2) that there were two potentially significant [negative] social impacts: (a) the local community water supply and (b) the declining [NTFP] resources and two positive impacts: (c) the opportunity for employment and (d) the increased accessibility [afforded by the plantation roads].

[6] At the time of writing the FPMP only the drafts of the HCV assessment and SIA were available. It is expected that such errors will be corrected in the final editions.

Table 7.1: Marudi LPF – Social and economic monitoring – employment

Category	Year	2017		2018		2019		2020		2021		2022	
		n	%	n	%	n	%	n	%	n	%	n	%
Staff													
Sarawakian *local	m	13		13		15		14		2		3	
	f	2		2		4		4		1		1	
	m+f	15	18.5	15	20.3	19	22.1	18	19.4	3	4.4	4	5.6
Sarawakian - other	m	4		4		4		5		10		10	
	f	2		2		2		3		2		2	
	m+f	6	7.4	6	8.1	6	7.0	8	8.6	12	17.6	12	16.9
Malaysian - other	m	1		1		1		1		3		2	
	f											0	
	m+f	1	1.2	1	1.4	1	1.2	1	1.1	3	4.4	2	2.8
Foreign	m	5		5		3		1		3		0	
	f											0	
	m+f	5	6.2	5	6.2	3	3.5	1	1.1	3	4.4	0	0.0
Staff total Malaysian & foreign		27	33.3	27	36.5	29	33.7	28	30.1	21	30.9	18	25.4
Worker													
Sarawakian - *local	m					8		11		8		13	
	f	3		3		5		5		5		3	
	m+f	3	3.7	3	4.1	13	15.1	16	17.2	13	19.1	16	22.5
Malaysian - other	m												
	f												
	m+f	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Foreign	m	44		37		40		46		33		34	
	f	7		7		4		3		1		3	
	m+f	51	63.0	44	59.5	44	51.2	49	52.7	34	50.0	37	52.1
Worker total Malaysian & foreign		54	66.67	47	63.5	57	66.3	65	69.9	47	69.1	53	74.6
All employees	m	67	82.7	60	81.1	71	82.6	78	83.9	59	86.8	62	87.3
	f	14	17.3	14	18.9	15	17.4	15	16.1	9	13.2	9	12.7
	m+f	**81**	100.0	**74**	100.0	**86**	100.0	**93**	100.0	**68**	73.1	**71**	76.3
All employees	*local	18	22.22	18	24.32	32	37.21	34	36.56	16	23.53	20	28.17
	other Mal	7	8.6	7	9.5	7	8.1	9	9.7	15	22.1	14	19.7
	foreign	56	69.1	49	66.2	47	54.7	50	53.8	37	54.4	37	52.1
	All	**81**	100.0	**74**	100.0	**86**	100.0	**93**	100.0	**68**	100.0	**71**	100.0

Source: payrolls
* 'local' - within district

7.4. Socio-economic Survey

7.4.1. Communities

There are seven communities within the LPF (see Map 5.4) (Right click here to access Map 5.4) - but none is within the MTCS area. Without exception all are within SA. This means that the ITP operations have little or no direct physical impact on any communities either within or close to the LPF. The MTCS area is generally more remote with respect to the five mentioned communities and there is, therefore, even less probability of any impact by ITP operations. It follows from this, as stated in 7.4.1, that, other than the provision of employment, the MARUDI ITP operation has little or no social, or environmental, impact - either direct or indirect - on the various nearby communities.

7.4.2. No significant impacts

From Section 7.4.1 and the results of the Socio-economic Profiling Study it is abundantly clear that, apart from employment and road access, the socio-economic impact of the Marudi MTCS area on the community has not been, and is unlikely ever to be, very significant. Furthermore, as the existing population ages what impact there has been - whether negative or positive - will lessen to the extent that an ever-larger proportion of the community will work away from the area, and some will move right away - perhaps eventually breaking all ties to the land.

Opportunities for employment of local males and females have been created by the ITP activities (Table 7.1). Downstream activities that process the logs from MARUDI ITP have been created in the Miri-Bintulu Region but this is not very relevant to the rural population associated with Marudi MTCS area.

7.5. Description of Stakeholder Consultation

7.5.1. Introduction

Stakeholder consultation, perhaps better termed '*engagement*', should:

- assist in the development of constructive, productive and more trusting relationships over the long term;
- result in a relationship with mutual benefits;
- help to identify trends and emerging challenges which are currently, or which may in the future, impact the management of the LPF in some way;
- establish transparent and accountable forest management operations; and
- provide a platform for proper conflict resolution.

7.5.2. Communities

Consultation, or engagement, is usually in the form meetings to ensure the FMU's compliance with the various requirements of the MC&I SFM. E.g., awareness of the FMU's operations that might affect the community and dissemination of the relevant results of social and wildlife monitoring.

Engagement is sometimes in the form of a joint survey and the negotiations that precede clearing either old or new temuda for new planting.

Community engagement also takes place when:

(a) a grievance arises and a *Borang Keluhan* is completed and submitted to the FMU manager for further action - which should include community consultation and discussion as an aid to resolution; or

(b) a community wants to request some form of assistance that would trigger a CSR response. For this a *Borang Memohon Bantuan* should be completed and submitted to the FMU manager or put in the box provided outside the office.

7.5.3. Government departments and agencies

Engagement and consultations with FDS, SFC and other government departments and agencies take place on an *ad hoc* basis - as and when required by either party.

7.5.4. Non-government organisations

Samling, through the AGM Refor, engages regularly with the STA's Plantation Committee.

Samling Refor, as a member, also engages fully and actively with the Borneo Forestry Cooperative (BFC).

Other NGOs are engaged from time to time as they or Samling might deem appropriate; e.g. WWF, Mighty Earth, Aidenvironment.

7.6. Social Impact Monitoring (SIM)

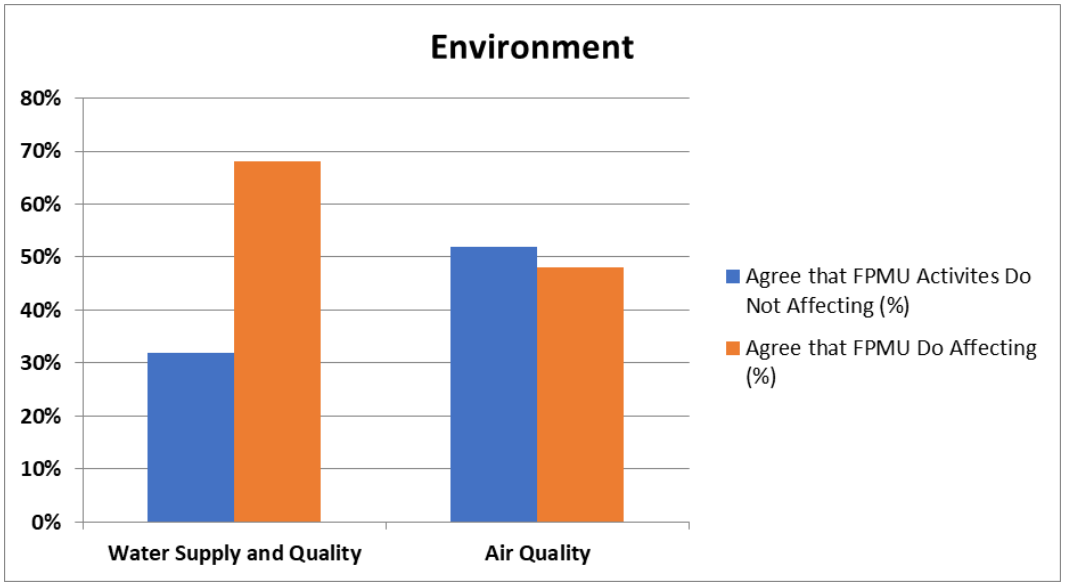
7.6.1. Introduction

Social Impact Monitoring is undertaken once a year. The main findings of SIM January (2022) are set out below.

7.6.2. Water Supply and Quality and Air Quality

As can be seen in Figure 7.1, the majority of the local communities disagree that their water supply and quality are not much affected by LPF's activities with 68% of the assessed local communities disagreeing with the statement that the '*LPF activity does not negatively affect river water quality*'.
As for air quality, the 52% of the assessed local communities agree that '*the air quality is not affected by the LPF's activities'.*

Figure 7.1: Water Supply and Quality

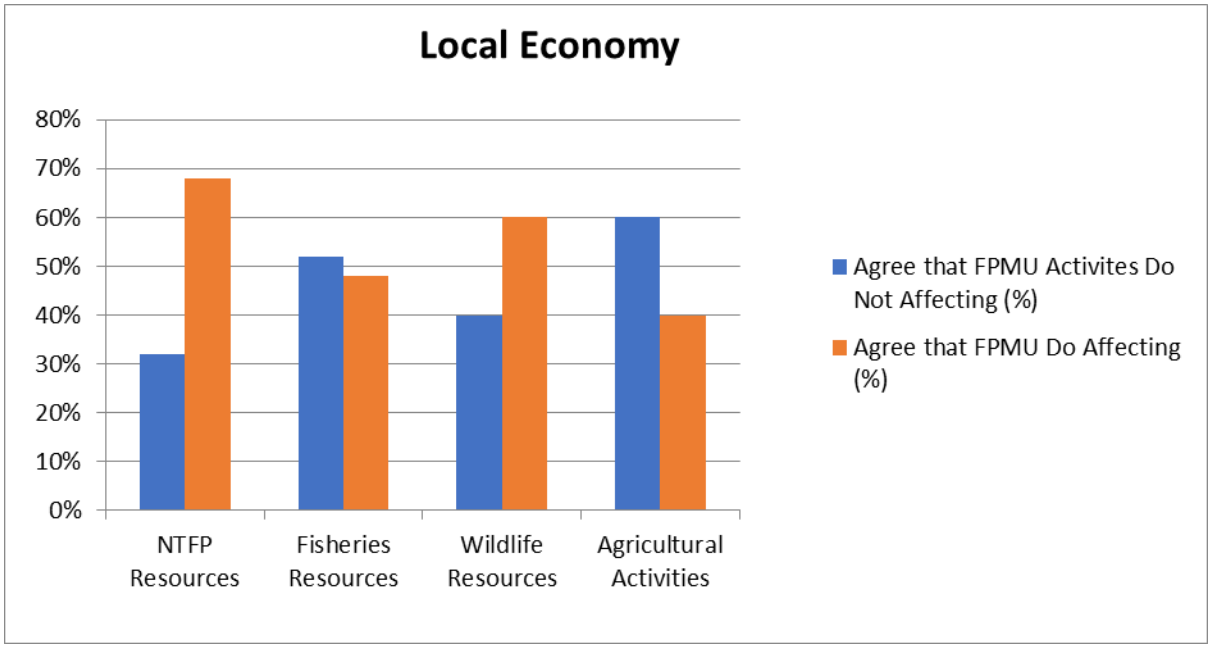


7.6.3. Local Economy

The SIM (January 2022) result revealed that 68% of local communities disagree that '*the LPF's activities have no negative impact on the availability of NTFPs'.*

The SIM (January 2022) results also showed that the local communities who agree with the statement that the Segan LPF's activities do not affect the fisheries resources, wildlife resources, and agricultural activities are 52%, 40%, 60% respectively [shown in Figure 7.2].

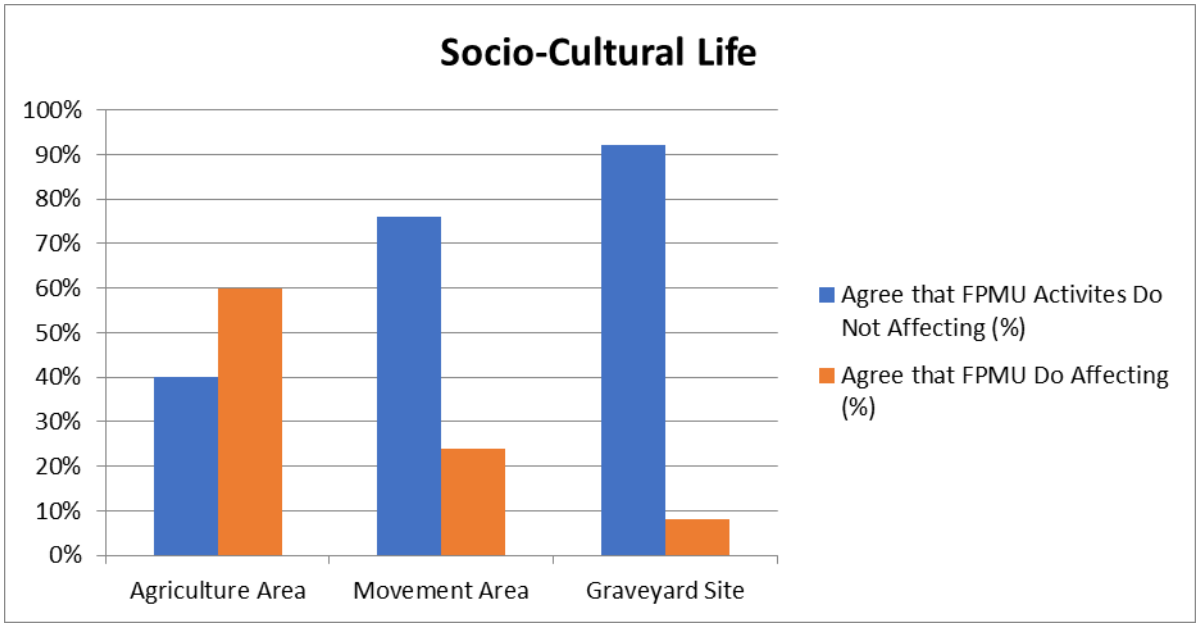
Figure 7.2: Local Economy



7.6.4. Socio-Cultural Life

From socio-cultural life aspect of the local communities, results of the social monitoring shows that there are higher percentage on the respondents who agree that FPMU activities does not affected them negatively, except for their agricultural area. 60% of the respondents mentioned that their agricultural area is limited as they only able to cultivate within their gazetted area. The local community's graveyard site and their movement area are less affected, which gives the percentage of 92% and 75% respectively.

Figure 7.3: Socio-cultural life



8. Establishment and Silvicultural Regimes

8.1. Introduction

8.1.1. Background

Planting started in MARUDI LPF in 2006/2007, mainly with mangium. The establishment regime for mangium is well known but the most appropriate silvicultural regime required for solid wood products, as opposed to chip logs, has yet to be proven. There is little information available in terms of the methodologies and economics of such practice from either the private sector or government agencies[7].

Samling's Segan LPF is a leader in developing the management practices required to satisfy the objective of producing logs for solid wood use. (The SPF objective is to produce chip wood - for a pulp mill near Samarakan, Bintulu that has yet to be built.)

8.2. Choice of Species

8.2.1. Background

When Samling started planting in Segan in 2000 the management objective was to produce only chip wood. This objective was revised 3-4 years later to the current Samling objective. At that time mangium was the species of choice throughout Malaysia. The perceived wisdom then was that mangium would '*grow well - anywhere'*. Time has clearly shown that this is not correct. In Marudi mangium growth on the red-yellow podzolic soils has to date satisfactory but on the grey-white podzols it, along with all other species planted operationally to date, mangium does not perform well. (See 9.3).

Mangium suffers from high early mortality. This is in great part due to a high susceptibility to root rot (*Ganoderma* spp.) which experience elsewhere indicates increases in severity with each succeeding

[7] "The Establishment & Management of *Acacia mangium* for solid wood products." by Boden, D. and Molony, K. (August 2015) was commissioned by SFC. It contains little factual information that is applicable to Sarawak regarding growing mangium for solid wood use. The authors conclude that growing mangium for this use cannot be recommended at present!

rotation. Given its record in parts of Indonesia and Sabah, *Ceratocystis* is also, undoubtedly, a very serious potential problem for the ITP industry in Sarawak. However, although present in MARUDI, it cannot yet be considered to be serious.

The early promise of *Acacia* hybrid has not yet been realised. Whilst the form and branching habit is quite good, growth and survival (susceptibility to pink disease) are generally not. The MAI of Year Class 5 was 6.8 m3/ha. The PAI was higher 10.6 m3/ha but even if this was to be maintained until the end of the rotation it would not lift the MAI to an acceptable level. Clones 1 to 14, of the 28 Acacia hybrid clones brought in as tissue culture material from Sabah in 2012, were planted in Lana LPF. Not one of the fourteen clones grew well and the form was generally very poor. (Similarly, not one of the Sabah clones (Numbers 15 to 28) planted in Segan grew well and the form was also poor.)

The initial dependence on a single species is recognised by Samling - and by much of the ITP industry in Sarawak - as a flawed policy and R & D's search for alternative species continues with a recently increased momentum. R&D's aim is to achieve a degree of species diversity that will help mitigate the risk from pest and disease attack whilst still meeting the objective of economically producing peeler logs of acceptable size and quality.

However, other than *Acacia mangium*, *Eucalyptus pellita, Falcataria moluccana, Gmelina arborea* and perhaps *A. crassicarpa*, not one of the more than 90 or so species trialled (both native and exotic, see Appendix 1) by Samling in various LPFs to date has shown any promise for use in solid wood ITP. In MARUDI the situation with regard to species is even more restricted in that acceptable levels of growth have only been shown by mangium to date.

R & D species trials have been recently been established in MARUDI in part in an attempt to reduce the single species dependence but also to try to identify a species that will give an acceptable return on investment when planted on the extensive areas of grey-white podzols on which degraded kerangas forest occurs.

8.2.2. Site-species matching

There will no doubt be subtleties provided by differing chemical characteristics of the various soil series and compound associations of the mineral soils but Samling's ability to recognise any such subtleties, and the ability to make use of them, is some way off. Neither the EIA nor any other source is particularly revealing in terms of the soils. The two main soil mapping units (series) identified in the MTCS area are predominantly red-yellow podzols: the Bekenu Series and the Kapit Series. In the EIA grey-white podzols are mentioned as the Saratok Series under the section Minor Soils but they are certainly not minor given that Map C2 in the LPF licence identifies well over 4,000ha as kerangas forest – almost all of which falls within the Batu Belah P.F.

8.2.3. Planting of native species

The Sarawak Forest Department has long extolled kelampayan **(***Neolamarckia cadamba*) as an ITP species. Without doubt the form, growth rate and peeling qualities are all positive attributes of this species. However, in Sarawak to date there is insufficient knowledge of seed sources and related genetics and of nursery practice through to ITP silviculture, for this species. There has been at least one relatively large scale failure of kelampayan in Sarawak and success at an operational ITP level seems to be unknown - to Samling at least. Samling has planted kelampayan in other LPFs with little success. It is not planted in MARUDI as there are no suitable sites of any extent on which to base a trial.

In Chapter 9, Plantations, in '*A Review of Dipterocarps'*[8], Weinland restates a conclusion drawn by Kollert *et al* (1994) "…The establishment and management of [dipterocarp] plantations are uneconomical on financial terms alone.'' This conclusion was drawn more than 20 years go. With the changes that have

[8] Eds. Appanah, S & Turnbull, J. M. 1998 CIFOR

occurred since, particularly in wood processing technology, the possibility that one or more of the dipterocarps, e.g. *S. parvifolia,* might prove to be an economic plantation species is recognised by Samling. There is however more than 100 years of literature on the subject of dipterocarps as plantation species and a review is required before addressing the problem of sourcing seed and then moving to trials can be considered.

Samling (and FDS) has spent much time and money on trials of native species. However, at the present time neither Samling nor - so it would appear – FDS or any other company in Sarawak has obtained sufficient and reliable information on the use of Sarawak native species in ITP to implement any other choice of species scenario than that described here.

8.2.4. Utilisation of species selected – end uses

Table 8.1 shows the end uses for the species that are or will be harvested by Samling over the next five years but not necessarily in MARUDI. Also shown are the possible end uses for the two species which have recently become operational species. Gmelina has already been subject to downstream peeling trials and was satisfactory. It is known to be a versatile species for processing and is a medium quality sawn timber. Falcata is well known in Java as a peeler species but downstream will need to run tests to confirm acceptability for sawing and use in high density fibreboard.

Table 8.1: End uses of Samling's operationally planted species

	Plywood	Sawn timber	HDF/door skins
Long Established			
Mangium	Yes	Yes	Yes
Acacia hybrid	Yes	Yes	Yes
Pellita	Yes	Yes	Yes
Recently Established			
Gmelina	Yes	Yes	Yes
Falcata	Yes	Yes?	BD (kg/m3) - 270 cf mangium 460 Possibly too light?

8.2.5. BORNEOTEAK®

Acacia mangium is listed as 'Mangium' in Table 8.1. Samling has successfully registered mangium with the Registry of Malaysian Trade Marks under Classes 19 and 31 as BORNEOTEAK®. It is sold under this name to Samling's downstream.

8.3. Current Establishment and Silvicultural Regimes

8.3.1. *Acacia mangium* and *A. crassicarpa*

As may be noted in Table 8.1 the intention is to produce logs that will be suitable for peeling and for sawing. The determinant of suitability is primarily small-end diameter – currently >15cm sed - with grading for roundness, straightness and internal defect (centre rot and hollow) undertaken after felling. Logs that are unsuitable for solid wood use will be sent to Daiken Miri Sdn Bhd (formerly Samling Fibreboard Sdn Bhd) for the manufacture of MDF.

Good quality stock

As a matter of course MARUDI will only plant selected stock with good genetic characteristics with preference given to seedlings from in-house collections of Superbulk seed from plus trees or from Samling's clonal seed orchard which comprises only clones of elite Superbulk trees. (Superbulk is the name given to some of the mangium seed produced by Borneo Tree Seeds Sdn Bhd in which Samling has a holding.)

Site preparation and establishment

Before planting takes place some site preparation is necessary – see Table 8.2. This usually involves a herbicide application to kill any emergent weeds, particularly natural regeneration of mangium, thereby reducing competition to newly planted seedlings. Labour shortage often results in the time elapsed between completion of harvest and the commencement of site preparation being overly long. This means that prior to spraying the site must be slashed and time allowed for new growth to flush so that spraying can be more effective.

Table 8.2: Typical Establishment and Silviculture Regime for *A. mangium* and *A. crassicarpa*

Operation	Approx. Year in Rotation	Operation Requires
Site Preparation	-1	Prepare for planting in order to create conditions for good survival
Planting & fertilise	0	Stock the site 1,667 SPH; fertiliser to SOP
Weed	0 -1	Manual weed & herbicide to keep newly planted stock weed free
Access prune & single	0.5	Remove multiple stems, forks, rogue & dead branches
Prune 1	1 to 1.5	Prune to 3m
Harvest	5-6	Clear fell

Maintenance

Conditions are very conducive to vigorous weed growth. Circle weeding, slashing and herbicide spray are all used at a frequency that is determined by the rate of weed growth relative to that of the trees.

Silviculture

The intensive silviculture regime with four pruning lifts is intended to produce trees with a significant volume of "clear wood" in the pruned length. Live knots would be restricted to a small DOS core along the pruned length. This should reduce the amount of veneer repair required, allow a proportion of face and back veneer to be produced and also improve sawn timber recovery.

The rationale behind pruning 80% of stems to a height of 6.0m is to produce a butt log with a minimum small end diameter (sed) of >15cm that will yield two peeler logs each of 8ft (2.5m) with an allowance for end splitting. Pruning above 4.5m might prove to be uneconomic but until PSP data on older trees in unthinned blocks are available and more information is produced by downstream both as to their intentions regarding equipment and the likely recovery rate at various log diameters it is difficult to evaluate the economics of pruning.

8.3.2. Eucalyptus species

As originally planned the value of the unthinned eucalyptus resource would be maximised by:

> *aiming to produce a crop that has a stocking of 600 to 700[9] SPH of good form and which have at least 80% of these stems pruned to 6.0m.*

The regime designed to achieve this is summarised in Table 8.3. It is essentially the same as that for mangium except that the rotation length might be 12 years. (Where performance is particularly poor the rotation might shortened and the block replanted with mangium or, possibly, with crassicarpa.) Only when a sufficiently large number of PSPs have been established in blocks of ten or more years old and when there is veneer grade recovery information from downstream will it be possible to determine the economic rotation age.

[9] This is considerably higher than the conventional stocking for solid wood ITP – a direct result of the 'no thin' policy.

Table 8.3: Typical Establishment and Silviculture Regime for Eucalyptus

Operation	Approx. Year in Rotation	Operation Requires
Site Preparation	-1	Prepare for planting in order to create conditions for good survival
Planting& fertilise	0	Stock the site at 1,110 SPH. Fertilise as per current SOP.
Weed	0 -1	Manual weed & by herbicide to keep newly planted stock weed free
Prune (Access)	0.7	Access prune to allow safer spraying. To approx. 1/3 tree height.
Prune 1	1	One third of live crown
Prune 2	1.5-2	Prune to 4.5m but not to exceed half tree height
Prune 3	2-3	Prune to 6m (80% of SPH)
Harvest	10-12	Clear fell

Good quality stock

As a matter of course MARUDI will only plant improved genetic material. Seed is currently from Samling's own plus tree selection. The extensive pellita breeding programme on three sites is now two years old. The first recommendations for improved seed have been made and it is hoped that SPA seed will be available from these areas in 2019/20.

Site preparation and establishment

Before planting takes place some site preparation is necessary. This usually involves a herbicide application to kill any emergent weeds, particularly natural regeneration, therefore reducing competition to newly planted seedlings. Labour shortage often results in the time elapsed between completion of harvest and the commencement of site preparation being overly long. This means that prior to spraying the site must be slashed and weed growth allowed to time to flush with new growth before spraying.

MARUDI plants 1,110 stems per hectare at 3m x 3m and considers a block established with a survival rate of 95% assessed 30 days after passing planting QC.

Maintenance

Conditions for weed growth are excellent. Circle weeding, slashing and herbicide spray are all used at a frequency that is determined by the rate of weed growth relative to that of the trees.

Silviculture

The objective is to produce primarily peeler logs. Samling downstream has undertaken peeling trials of Segan pellita logs at 5.6yrs old. The results were satisfactory. There was negative comment only on the small diameter and the existence of dead knots; both of which can be influenced by silviculture. The results of both the sawing and KD trials were also strongly positive.

The intensive silvicultural regime with four pruning lifts was designed to produce trees with a significant volume of "clear wood" in the lower stem. Logs from the lower stem would have primarily green knots restricted to a small DOS core along the pruned length and should yield a significant proportion of face and back veneer.

As with mangium the rationale behind producing stands with 80% of stems pruned to 6.0m is to allow pruned butt-logs with a minimum small end diameter (sed) of >15cm to yield two peeler logs each of 8 ft (2.5m) with an allowance for end splitting.

With a 'no-thin' regime a residual stocking of around 600 to 700 stems per hectare is expected to remain after natural mortality has taken its toll through to Year 12. This high stocking will restrict branch size in

the logs above the pruning limit; but it will also restrict "clear wood" production over DOS in the pruned stem length and it will significantly reduce the average tree volume and, hence, the average piece size.

Pruning above 4.5m might prove to be uneconomic but until PSP data on older trees is available and more information is produced by downstream both as to their intentions regarding re-equipping and the likely recovery rates at various log diameters it is difficult to evaluate the economics of pruning.

8.3.3. Other species

Acacia hybrid was planted operationally but planting stopped when it's generally poor growth and susceptibility to pink disease (*Erythricium salmonicolor syn. Corticium salmonicolor*) became obvious. Batai (*Falcataria moluccana* syn. *Paraserianthes falcataria*) and to a lesser extent *Gmelina arborea* have been planted operationally but have generally failed. The regime for gmelina followed that of mangium – see Table 8.2. The provisional regime for falcata is given in Table 8.4 for reference.

Table 8.4: Provisional Establishment and Silviculture Regime for *F. moluccana*

Operation	Approx. Year in Rotation	Operation Requires
Site Preparation	-1	Prepare for planting in order to create conditions for good survival
Planting	0	Stock the site at 1,600 SPH
Weed	0 -1	Weed by hand & by herbicide to keep newly planted stock weed free
Single	0.5	Removal of all branches to tip
Prune 2*	1	Prune to 3m when >50% of trees suitable
Prune 3	1.5-2	Prune to 4.5m when >80% trees suitable
Harvest	7 to 8	Clear fell

* Singling and Prune 1 completed as one operation

8.4. Scheduling of Silvicultural Operations

Apart from the need to ensure that early competition from weeds is kept to minimum the key driver behind the silvicultural schedules of those species to be pruned is the timing (but see below). As MARUDI is aiming to produce clear wood material in order to maximize veneer recovery and quality, the minimisation of the knotty core (determined by diameter over stub, or DOS, at time of pruning) is essential.

In order to have an easily measured criterion that reduce the dangers of both over-pruning (which can impact significantly on increment, particularly on eucalyptus) and under-pruning (which results in an increased DOS and loss of log quality) the 5cm gauge standard was introduced in 2010 and applied to Prune 1 and 2 scheduling. Scheduling for Prune 3 and 4 is by manager's visual assessment pending development of a standard criterion.

9. Monitoring Plantation Forest Dynamics

9.1. Permanent Sample Plots

MARUDI is active in the use of permanent sample plots (PSPs) to monitor the growth and to develop growth models. The LPF licence conditions require that one plot be established for every 20 hectares planted. From the start of PSP measurement this was reduced to one plot per 5 hectares and this has been maintained in order to build up a strong data base in reasonable time. Initially, PSPs were established when trees are 24 months old. This was later changed to 12 months. The PSP data are used to construct yield tables, to model the growth in order to update estimates of the allowable annual cut (AAC), to determine which blocks should be harvested in any one year to achieve the AAC and for long term production forecasts. P&D information is also collected at the time of PSP assessment.

MARUDI has established, maintains and regularly measures an intensive allocation of PSPs to monitor forest growth and dynamics. More than 750 plots have been established over the LPF. A very high proportion of these are in the MTCS area.

Following initial establishment of the PSP, subsequent re-measurement should be done on the anniversary of the first measurement over the length of the whole rotation. As the data base strengthens the need to continue the current, very high, level of sampling intensity will be reviewed for each species.

Before field work commences, the GIS section in HQ randomly (with some restriction) allocates the required number of plots within the area of the block that the GIS shows as planted. In the field, regardless of where it falls, the plot centre is established at the predetermined GPS point. The only exception allowed being to ensure that no part of a plot encroaches on to a road-line or any non-productive area that has been GPSd and excluded from the productive planted area statement.

9.2. Taper Functions and Volume Equations

A taper function has been developed for *Acacia mangium* (mangium) based on SEGAN volume sample trees and an interim volume equation has been developed for *Eucalyptus pellita* (pellita).

A taper function is currently under development for Samling's pellita. Taper functions for other species will be developed when there is a sufficient number of representative trees old enough to provide the required full DBH range of sample trees.

9.3. Monitoring Plantation Tree Growth and Site Productivity

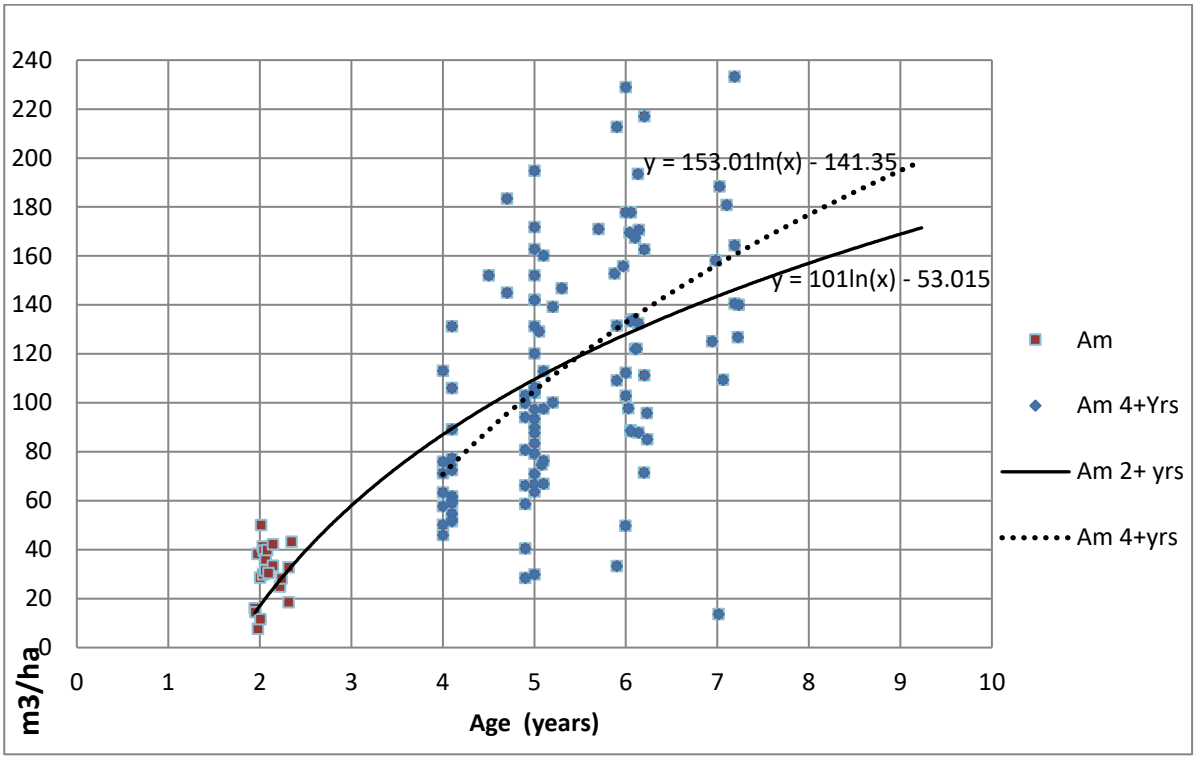
9.3.1. Introduction

As mentioned in Section 9.1, a strong system of PSPs is in place to monitor the tree growth of the whole of MARUDI LPF. Consequently, as the MTCS area forms a large part of the monitored area, the growth models and yield tables developed are applicable to the MTCS area.

9.3.2. Mangium

The results of sequential measurements on more than 260 plots have been used to develop a growth model and yield table. The yield table is quite strong almost to rotation age. Further measurements will allow the development of the yield table to rotation age. The yield table is under continuous revision as PSP data continue to be captured. The productivity - as expressed by m3/ha - is highly variable as can be seen in Figure 9.1.

Figure 9.1: A. mangium – provisional growth model (m3/ha)



9.3.3. Pellita

Sequential measurements have been taken on more than 100 plots. The growth of pellita is also highly variable with large differences between the PSP results for plots of the same age. The increment between sequential measurements of the same plot can also vary widely from one year to the next.

9.4. Monitoring of Pests and Disease

9.4.1. Regular monitoring

Regular monitoring is undertaken by the PSP crew at the time of establishing or re-measuring the PSP plot. Only the occurrence of what are considered to be the more import P&D factors is recorded.

10. Allowable Annual Cut, Annual Harvesting Plan, Harvesting Systems, Financial Sustainability

10.1. Allowable Annual Cut (AAC)

10.1.1. Introduction

The final AAC for MARUDI LPF cannot be determined as new areas are still being planted. This increase in planted area together with the requirement of the LPF licence conditions to replant harvested areas and the expected continual genetic improvement of the planting stock, should mean that the AAC will increase from that originally estimated. The MTCS area will be a significant contributor to the final AAC but the volumes produced from this area will fluctuate quite widely from year to year as a result of the skewed area distribution of annual planting (Fig. 5.1).

Table 10.1: Harvest AAC by Financial Year – Planted 2017 to 2028 and Actual 2017 to 2023 (m3)

Harvest	Financial Years July to June (m3)											Upto & including 2022-23	
	[1]2017-18	2018-19	2019-20	2020-21	[2]2021-22	[3]2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	Totals	Annual Average Harvest
Actual	14,541	47,034	38,612	38,628	8,369	36,922						184,106	30,684
AAC (planned)	21,000	84,000	84,000	84,000	84,000	41,001	*84,325*	*135,082*	*136,082*	*137,196*	*139,241*	398,001	66,334
Actual-AAC	-6,459	-36,966	-45,388	-45,372	-75,631	-4,079						-207,436	-35,649

Source: Marudi FPMP Tabs 5.1 etc

10.1.2. Determination of the AAC

With a long-term objective of sustainability, determination of the AAC cut should consider:

- ensuring that the areas of mangium in the MTCS area do not become over-aged; and, a little way in the future,
- the need to consider the normalisation process for the whole LPF.

Given the much-skewed age class distribution already referred to, production will vary from year to year but it will trend upwards for the reasons already given. With production from the MTCS area combined with that from the LPF it should be possible to aim for a more normal plantation structure thus ensuring greater stability of production and of employment opportunities.

To help achieve the long-term AAC objective for the whole LPF, the AAC should be reviewed regularly.

10.1.3. Log Production

Maintaining a sustainable flow of logs suitable for Samling's solid wood downstream requirements is a key management objective. The MTCS area and the balance of the LPF (PEFC Controlled Source) must both play their parts in achieving this.

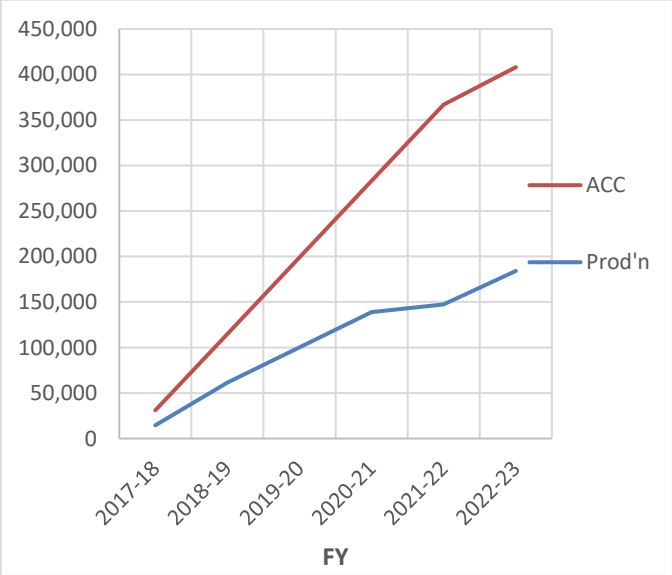
Harvesting started in January 2018 and was temporary suspended for several months in each of 2021 and 2022. The log production from start-up is shown in Table 10.2 on the following page.

Table 10.2: Marudi – log production from start-up

Fin Year	Trucked (t)	AAC (t)
2017-18	14,541	31,000
2018-19	47,034	84,000
2019-20	38,612	84,000
2020-21	38,628	84,000
2021-22	8,369	84,000
2022-23	36,922	41,001
Total	184,106	408,001

Fig. 10.1: Marudi – cumulative log production from start-up

(tonnes)



Source: Marudi Trucked Yarded

10.2. Annual Harvesting Plan

The high level and frequency of the rainfall combined with the steep terrain makes access to some areas difficult, and even impossible at times, especially during the wetter season (November to March inclusive) when ungravelled roads can quickly become slippery and temporarily unusable. This means that it is not realistic to plan for reliable harvesting and transporting on a year-round basis. To ensure a regular log supply for processing log stocks will have to be built up at an all-weather depot, or at the mills, before the onset of the wetter season.

A management objective for MARUDI LPF is to eventually achieve a normal forest age class structure as the basis for a sustainable yield. This might mean that some blocks would be harvested when

considerably older than their planned rotation age. In acacia this may result in negative increment. Therefore, despite the long-term objective of creating a normal plantation age class structure, the acacia harvesting rate might have to be increased in some years in order to avoid any significant financial losses that would result from negative increment.

10.3. Harvesting Systems

As mentioned in 6.1.4 when discussing environmental considerations, shovel yarding is the primary harvesting system to be used at MARUDI. As well as being economically more efficient in areas of steep and broken terrain the use of this system also helps to protect the fragile soils and in particular reduce erosion and compaction. (Avoidance of the latter effect is of particular importance given the expectation that the Samling eucalyptus breeding programme will shortly result in an increased annual planting target for pellita – although not in MARUDI.)

Extraction of trees felled near the roadsides will be ground based and site damage will be limited by the use of shovel mounted grapples.

MARUDI is now harvesting the first rotation of ITP. This was planted on residual and degraded MTH areas and full use is made of the existing logging roads and skid trails. Little new roading is required other than the extension of access spur roads. These will only be constructed following approval by FDS and prior to obtaining approval to harvest - (Operation 5 in the current PHC system).

10.4. Financial Sustainability

The MARUDI MTCS area is a small part of the MARUDI LPF and an even smaller fraction of the total ITP area operated by the Samling Group. The Group has clearly been financially supportive of MARUDI from start up in 2009 and of its other ITPs since their start-ups. It is reasonable to assume that this will continue to be the case for the foreseeable future. However, now that harvesting has started the net revenue from internal log sales should cover replanting and overhead costs for the remainder of the 60 year licence period and this support should no long be required.

11. Spatial Information and Management Systems

11.1. Spatial Information

LiDAR commissioned by Samling covers part of MARUDI LPF. ArcGIS is used to process the detailed spatial information. Data are captured by the QS team using Garmin 76CSx. GPS tracks are downloaded using OziExplorer. Tracks are then cleaned and processed using OziExplorer. GIS data are then held by ArcGIS for further processing and mapping. The GIS allows Samling to produce a variety of maps displaying an array of information including coupe, block and protected areas boundaries, and HCV locations. The distributions of the species planted and of the years of planting are also held, as is land-use and related spatial information, such as contours and transportation features. Harvest planning is done on maps generated from the GIS and - where available - with LiDAR providing contours at 10m intervals.

GPS tracks are backed up at MARUDI. After arrival at Miri HQ the tracks are checked and cleaned and then saved on both Refor hard drives and Samling's local server.

11.2. Management Systems

Samling uses an ERP system for financial control and the ATLAS GeoMaster suite to manage block records.

12. Conservation, Conservation Areas and High Conservation Value Areas and Social Impacts

12.1. Conservation and Conservation Areas

Given the past long history of widespread, heavy harvesting with multiple re-entries it is not surprising that undisturbed primary forest has not been identified within the MARUDI LPF.

This history and the relatively small size of the MARUDI MTCS area lessen, but do not necessarily preclude, the prospects for MTCS area having much relevance to conservation in general. In particular it is unlikely that any medium and larger sized rare, threatened and endangered species (RTE) exist within the LPF and certainly to date none has been located. Indeed, there is a paucity of all larger animals in the LPF. But, however limited the potential might be, MARUDI recognises that it has an obligation and commitment to incorporate into its management practices a system that takes into account the need for conservation awareness and for the identification and protection of RTE species. It also recognises the importance of indigenous biodiversity and the need to protect some areas of indigenous vegetation which might have the potential to recover, albeit over a long time, in both structure and biodiversity, to something approximating that which existed prior to the start of natural forest harvesting.

The whole length the international buffer zone within the MTCS area abuts on to Brunei Darussalam's Labi F. R. which comprises mainly mixed dipterocarp forest (MDF). The Brunei Forest Department has designated it to be sustainable production forest except for a small area classified as '*protected area'* in the north-west. The western boundary of this '*protected area*' adjoins part of the international buffer zone creating a small unit of trans-boundary '*protected area'*.

As mentioned earlier no areas of undisturbed primary forest have been identified in MARUDI. Those areas of remnant forest that have been designated as conservation areas, as opposed to river buffer zones or RBZs - the establishment of which is a mandatory - are also protected as SMZs. Full protection of the conservation areas and other SMZs will allow them to continue to develop their structure and maintain their biological diversity. These areas will also provide wildlife refuges. They can also provide internal wildlife corridors between other parts (non-MTCS) of the LPF and with the adjoining area of Brunei Darussalam's Labi F.R…

As a forestry company, and with its Sarawak ITPs increasing in significance in terms of log production, Samling views its forest plantations as a contributor to reducing pressure on the harvesting of MTH in Sarawak and Malaysia (and therefore globally).

The EIA and HCVA identified some of the protected and totally protected flora and fauna that occurs within the LPF. Section 12.4 below contains more information but these reports should be referred to for the full detail.

As mentioned earlier, the MTCS area is, in terms of NTFPs, clearly not *fundamental* to meeting the basic needs of the local communities.

12.2. High Conservation Value

The main HCV headings are given below are from the WWF guidelines and are those used by the HCVA report. They are reproduced here to help reinforce management's awareness of the breadth of the HCVA. (For details the HCVA report should be consulted.)

HCV 1 Biodiversity Values *Forest area contains globally, regionally or nationally significant biodiversity values (e.g. endemism, endangered species, and sites of critical temporal use)*

- HCV 1.1 Protected Areas
- HCV 1.2 Threatened and Endangered Species
- HCV 1.3 Endemism
- HCV 1.4 Critical Temporal Use

HCV 2 Landscape-level Forest *Forest area contains globally, regionally or nationally significant large landscape level forest where significant populations of most if not all naturally occurring wildlife species exist in natural patterns and abundance.*

HCV 3 Ecosystems *Forest area contains or is part of a threatened or endangered ecosystem.*

HCV 4 Services of Nature *Forest area provides basic services of nature in critical situations.*
HCV 4.1 Watershed Protection
HCV 4.2 Erosion Control
HCV 4.3 Barriers to Destructive Fire

HCV 5 Basic Needs of Local Communities *Forest area is fundamental to meeting basic need of local communities.*

HCV 6 Cultural Identity of Local Communities *Forest area is critical to local communities' traditional cultural identity.*

12.3. High Conservation Value Assessment

SFC undertook an HCVA in March 2018 and produced a Report entitled *'High Conservation Value Assessment Report MTCS area within MARUDI Reforestation LPF/0008, Sarawak' (July 2018)*. The HCVA followed the WWF Toolkit for Malaysia and gives a detailed summary of the HCV status in MARUDI LPF and the MTCS area that lies within[10].

Numerous HCV attributes were identified as present in the course of the assessment but when considering HCV attributes then scale and proportion must always be kept in mind. The gross area of the MTCS area is 19,941ha; of this more than 31% (6,170ha) is already in protected areas (SMZs). At July 2017 5,805ha had been planted. A further 6,902ha is classed as plantable but, following detailed survey and the establishment of RBZs and identification of other SMZs, the final area planted will be considerably less.

12.4. Analysis of the High Conservation Value Assessment

12.4.1. Background

In analysing the HCVA it should be noted that:

- the area has generally been very heavily disturbed by timber harvesting prior to the issue of the LPF licence;
- further salvage harvest took place prior to the release of coupes for PEC Op.5 (clearing & site preparation);
- the LPF has been in continuous operation for almost nine years;
- a high percentage - 31% (6,170ha) - of the gross MTCS area is designated as SMZ. This means there is already a relatively very large forested area under protection; and
- hunting by Samling employees and contractors is prohibited and, furthermore, as the populations' age and decline there should be reduced pressure on the collection of NTFPs and from hunting and fishing from within the MTCS area.

The first three points above are, without doubt, 'conservation negatives' but it is quite clear from the EIA(2007) and the HCV(2018) reports that, despite these negatives, an interesting degree of biological diversity has been maintained.

The fourth point - that such a high proportion (31%) of the area has SMZ status and is therefore already protected from invasive and damaging human activity – together with the fifth point will surely lead to the existing diversity, already quite considerable, being quantitatively and qualitatively further enhanced over time.

[10] SFC was contracted to conduct an HCVA of the MTCS area but the greater part of the LPF that lies to the east of the Baram River was actually included. This has led to some confusion as is not always clear to which areas some comments in the HCVA are referring to.

12.4.2. Analysis

In summary the HCVA shows that:

HCV 1 and 2: the MARUDI MTCS area does have some HCV attributes. However, the RTE fauna species that have been identified are well served by the protected areas (SMZs). In addition, all the RTE mammal species, with perhaps the exception of Mueller's gibbon, are known to make full use of the areas planted under ITP. Thirteen RTE species of flora (all trees) were identified in the SMZ areas - meaning that these species are in areas that have been demarcated on the ground, surveyed and mapped and are already protected.

Endemic species were identified by the HCVA but they are all acknowledged to be endemic to the island of Borneo. It follows that, on the current level of knowledge, that neither the LPF nor the MTCS area can be considered to be an HCV contributor of any importance with regard to endemic species.

At the time of the HCVA a small cave in the planted area of Block 56C (Coupe 2) was alleged by residents of Rh Lajang to be inhabited by bats. This was recorded in the HCVA report. However, initially at the time of the Stage 2 SIRIM audit and subsequently by further field inspection, it was found not to exist. (It transpired that the HCVA record was based on a verbal report from Rh. Lajang that had not been field checked.) Two salt licks were identified in SA and are consequently outside the MTCS (there is no SA within the MTCS) but the GPS locations are known and are shown on management maps of the LPF.

As mentioned earlier, the international buffer zone in the MTCS area abuts Brunei's Labi F.R.. Apart from this trans-boundary connection with Brunei, the MTCS and the LPF[11] areas are more or less isolated (by oil palm, ITP, SA and large rivers) from all other areas of natural forest and hence they contribute little in the way of connectivity to any areas that have HCV significance.

When the qualitative and quantitative aspects of these HCV attributes are viewed in the context of relevance, either to the needs of Borneo or Sarawak state or to those of the MARUDI LPF itself, there is no justification for elevating any of MARUDI MTCS conservation areas from their current protected status and according them HCV status under either HCV 1 or HCV2. This point is reinforced by the fact that SMZs already provide an equal level of protection for free ranging mammals and birds as would be provided by an area being declared and established as having HCV attributes.

HCV3: there is no peat swamp forest in the MTCS but kerangas forest does occur there. Sites with soils classed as intermediary between grey white podzolic soil supporting kerangas forest and red yellow podzolic (RYP) generally supporting MDF might still be cleared for ITP.

HCV4: Water catchments have been identified, marked on the ground, GPSd and mapped. These are for community use. The water catchments are of significant importance and concerns regarding water supply were frequently expressed during the course of the SIA. RBZs are a significant mitigating factor in maintaining water quality. These are already established within the MTCS and every attempt is made to ensure continued protection from human interference. Prior to harvesting of the first rotation RBZs are established or re-established to NREB specification[12].

It is important to note that thirteen of the twenty communities that the SIA considers to be associated with the LPF lie fully outside the drainages of the LPF and consequently the LPF's catchments should not be of concern to them (see MTCS Area map at 1:50,000).

HCV 5: both the SFC reports (HCVA and SIA) reinforce the findings of the much earlier EIA: that there is now no true dependence on any NTFPs that might be provided by the MTCS area or indeed on those

[11] In the north of the LPF, Coupe 12 abuts the PSF of Brunei's Ulu Mendaram F.R.

[12] In recent years, after the decision to implement the MTCS, RBZs were established with increased diligence. Consequently, over time, the area under RBZs will increase.

provided by the whole LPF. Most timber and timber products are bought in Marudi town rather than self-collected. It is clear that for most communities what negative socio-economic impacts the ITP in the MARUDI MTCS area might have had, they have been greatly mitigated by various forms of economic development, e.g. through government assistance, improved road and river access and increased availability of salaried and waged employment. In December 2017, 53 Sarawakians, almost 60% of whom are local, were directly employed in MARUDI ITP (employment has much increased now that harvesting has started).

HCV 6: several burial grounds and grave sites have been identified; all are in SA over which the LPF management has no jurisdiction. However their locations have been GPSd and are shown on LPF management maps. No other sites of cultural or historical significance have been identified.

12.5. Social Impacts

12.5.1. Assessment

SFC undertook a Social Impact Assessment (SIA) in March 2018. A report on the assessment entitled *'Social Impact Assessment for the MCTS (sic) area within Marudi Plantation Management Unit under LPF /0008 at Marudi, Miri Division, Sarawak'*, is currently in draft form (June 2018). The assessment was guided by the *'Guidelines and Procedures for Social Impact Assessment and Monitoring of Forest management Operations (Peninsular Malaysia).* UPM 2012.

12.5.2. SIA Report and Analysis

The SIA states the objectives of the assessment[13] as:

- To identify and enumerate the baseline data of local communities' conditions within the planted forest management operations area;
- To identify the key social impacts of affected (sic) by the FPMU's operations;
- To recommend management action needed to mitigate and monitor the social impacts of forest management operations in Marudi FPMU; and
- To establish friendly relationship between Licensee and the affected communities.

The assessment identified and addressed three main points of impact arising from the forest plantation activities within the LPF:

i. Water supply and quality

a) Community water supply and quality
b) River water and transportation

Ensuring adequate supplies of clean water throughout the year is a major concern for most villagers. This is addressed in part by designating water catchment areas which must then be protected from encroachment and destructive human extractive activity.

ii. Local economy and livelihood

a) Forest resources
b) Traditional land tenure
c) Income and job opportunities
d) Traditional economic activities

[13] Whilst in the Introduction to the SIA report it is implied that the assessment would be confined to MTCS area it is by no means clear that that is the case. If the assessment did over step the TOR in that the assessment and cover whole LPF this is no bad thing as Samling intends to apply, as far as is practicable, the principles of the MTCS to the whole LPF as opposed to only the area actually certified.
Rather confusing it was also decided to refer to the MTCS area in the report as the Marudi FPMU.

In Marudi LPF most of the residual forest areas are now protected as SMZs. This means that extractive activity is restricted to more or less non-damaging events, e.g. collecting honey, fruit, rattan etc. The felling of any tree within an SMZ is prohibited (unless it is an exotic). This means that the availability of trees from which to produce timber for construction is perceived to be restricted – which it is. But what is not known is the true demand side for such trees. Given the assumed to be diminishing and aging nature of the populations together with the trend for using cement in house repair and construction, then both the demand for timber and the number of men available and capable of harvesting trees, must be trending down.

The low participation rate of locals in the workforce reflects the twin perceptions by these locals, and the reality, of contract work in the forest plantations being physically arduous and that the work is not overly well paid. These perceptions, together with the need for regular and consistent working hours and with the work place being somewhat remote from home comforts, has resulted in this low participation rate. But low worker participation rates are not confined to MARUDI LPF; this is the case for the ITP industry throughout Sarawak and, to a slightly lesser degree, for Sarawak's oil palm industry.

iii. Socio-cultural life

a) Health and safety
b) Traditional knowledge and skills of local communities
c) New knowledge and skills

The SIA has little of substance to say about health and safety apart from noting a concern that the dust from the plantation roads gives rise to reduced air quality.
Linked in part to the reduced area of the forest resource is the dwindling traditional knowledge and shrinking traditional skill base of the communities. But the reduced availability of traditional material is not the only cause of diminishing handicraft practices. As the population ages so the number of skilled and practicing artisans decreases; infirmity renders the collection of the raw material from the forest a less attractive activity; and then death takes its toll and further reduces the number of participating artisans. For many, perhaps most, of the younger villagers the time taken to collect raw material from the forest and then process it prior to starting handicraft production – even if the material is available in the forest in adequate quantity – is not a very attractive proposition. When viewed against a wage-earning occupation and the lure of the 'digital world' it becomes even less so.

The report acknowledges a positive impact in that the improved access by way of the, albeit dusty, plantation roads allows villagers to attend training courses in Marudi town and similarly for government trainers to run courses on location in the villages.

In the Conclusion the SIA report states that "…*Potentially, the MARUDI FPMU has certain positive impacts on the affected communities in terms of opportunity for employment in the plantation industry...".*

12.6. Wildlife Monitoring

12.6.1. Fauna

The presence, or absence, of fauna within the plantation is monitored by means of sightings (or lack thereof). Table 12.1 on the next page shows the annual summaries of the patrol report sightings for the various animals whose presence in the plantation had in some way been noted.

Table 12.1: Marudi LPF: Wildlife monitoring – Summary of sightings 2017- 2022

Annual summary of sightings								
Common/Local Name	Scientific Name	Year						Total
		2017	2018	2019	2020	2021	2022	
Mammalia								
Bearded Pig (Babi Berjanggut)	*Sus barbatus*	4	9	31	14	12	0	70
Borneon gibbon (Empeliau)	*Hylobates muelleri*	0	0	0	0	0	0	0
Civet (Musang)	Family Viverridae	0	0	0	0	0	7	7
Flat-headed Cat (Kucing Hutan)	*Felis planiceps*	0	0	0	0	0	0	0
Long-tailed Macaque (Kera)	*Macaca fascicularis*	0	6	2	0	3	0	11
Malayan Porcupine/Common Porcupine (Landak)	*Hystrix brachyura*	0	0	0	0	0	0	0
Mousedeer/(Pelanduk)	*Tragulus napu*	0	0	0	0	0	0	0
Muntjac/Barking Deer (Kijang)	*Muntiacus* sp.	0	2	9	0	1	1	13
Pig Tailed Macaque (Beruk/Nyumboh)	*Macaca nemestrina*	1	0	1	0	0	0	2
Plantain Squirrel (Tupai Pinang)	*Callosciurus notatus*	3	17	25	15	31	30	121
Prevost's Squirrel (Tupai Gading)	*Callosciurus prevostii*	0	0	0	0	0	0	0
Sambar Deer (Rusa/Payau)	*Cervus unicolor*	3	1	10	3	8	0	25
Slow Loris (Kongkang)	*Nycticebus coucang*	0	0	0	0	0	0	0
Sun Bear (Beruang Madu)	*Helarctos malayanus*	0	0	2	1	0	0	3
The silvery lutung (Jelu Puan)	*Trachypithecus cristatus*	0	0	0	0	0	0	0
Reptilia								
Monitor Lizard (Biawak)	*Varanus salvator*	0	0	1	0	1	0	2
Monocled cobra (Ular Tedung Senduk)	*Naja kaouthia*	0	0	0	0	0	3	3
Python (Ular Sawa)	*Python* sp.	0	0	1	0	0	0	1
Aves								
Ashy tailorbird	*Orthotomus sp.*	0	0	0	0	0	0	0
Asian Black Hornbill (Kekalau / Rengak)	*Anthracoceros malayanus*	0	23	2	59	56	46	186
Black-and-yellow broadbill (Burung Tukau Hitam Kuning)	*Eurylaimus ochromalus*	0	0	0	0	0	0	0
Bornean peacock-pheasant (Burung Merak Borneo)	*Polyplectron schleiermacheri*	0	0	0	0	0	0	0
Bulwer's Pheasant (Sempidan)	*Lophura bulweri*	0	0	0	0	0	0	0
Bushy-crested Hornbill (Enggang Buluh)	*Anorrhinus galeritus*	0	0	0	0	0	0	0
Common hill myna (Burung Tiong)	*Gracula religiosa*	3	0	15	15	13	15	61
Crow	Family Corvidae	0	0	0	0	0	14	14
Dusky munia	*Lonchura sp.*	0	0	0	0	0	0	0
Eagle	Family Acciptriformes	8	18	69	50	96	48	289
Egret (Burung Bangau)	*Egretta garzetta*	0	0	0	0	0	0	0
Emerald dove (Burung Punai)	*Chalcophaps indica*	0	0	0	0	0	0	0
Greater coucal (Burung But-but Carik Anak)	*Centropus sinensis*	0	0	0	0	0	2	2
Helmeted Hornbill (Tajai)	*Buceros vigil*	0	0	0	0	0	0	0
Munia (Burung pipit)	*Lonchura fuscans*	0	0	3	0	0	0	3
Oriental magpie-robin	*Copsychus sp.*	0	0	2	1	0	0	3
Plaintive cuckoo	*Cacomantis merulinus*	0	0	0	0	0	0	0
Rhinoceros Hornbill (Kenyalang)	*Rhinoceros buceros*	5	0	63	0	0	0	68
Rufous-tailed tailord (Burung Perenjak Rimba)	*Orthotomus sericeus*	0	0	0	0	0	0	0
Swifts (Burung Layang-layang)	Family Apodidae	12	0	0	0	0	0	12
Wrinkled Hornbill (Burung Enggang Kedut)	*Aceros corrugatus*	0	0	0	0	0	0	0
Yellow-bellied Prinia (Burung Perenjak Padi)	*Prinia flaviventris*	0	0	0	0	0	0	0
Yellow-vented Bulbul	*Pycnonotus sp.*	0	0	1	0	0	0	1
Insecta								
Rajah Brooke's birdwing	*Trogonoptera brookiana*	0	0	0	0	0	0	0
Source: Patrol reports & ad hoc notifications								

13. Multiple-Use

13.1. By Local Population

13.1.1. Hunting

Hunting is prohibited within the LPF other than by members of the local communities and then only when for personal consumption. Members of a local community who are also Samling employees are prohibited from hunting whilst working in the LPF and whilst resident in Samling's quarters within the LPF.

13.1.2. Fishing

Apart from Sg Linei and its two main tributaries (Sg Linei Merah and Sg Ulu Merah) there are no rivers of any appreciable size within the MTCS area and so the opportunities for fishing are extremely limited. Where Sg Tutoh forms the licence boundary to the south and south-west it is a large river but, as the river bank is the boundary, the river itself is outside the LPF and hence it is outside the MTCS area. Furthermore, where a river is sizable there is invariably shifting cultivation for some distance from the riverbank – in which case, even though the river might lie within the LPF, it will, as it is SA, be excluded from the MTCS area.

13.1.3. Other Non-timber Forest Products (NTFP)

There is no one actually living within the MTCS area. Most communities within the SA of the LPF, and all outside it, other than those in Ulu Ridan, are separated from the nearest conservation areas (the main sources of NTFPs) by a very steep scarp that makes access to any NTFPs difficult. The main conservation area is the International Buffer Zone which is a minimum of 5km straight line distance away from the nearest communities - those of Sg Linei. This means that, as a source of NTFPs, e.g bamboo, rattan, rubber (natural), honey and honey comb, fruit, vegetables, mushrooms, the MTCS is of very limited utility to the communities. It would appear that collection of NTFPs is very much opportunistic: perhaps, when having driven to a location for hunting, other NTFPs might be collected as they are encountered?

The results of the HCVA tend to confirm what the GIS information has indicated above: in Section 3.5 (pge 61) of the draft *"…The assessment reveals that the dependency on jungle produces are minimal as they are adapting to the modern lifestyle*…". But the report, rather confusingly, does go on to say that the "…*Forest dependency rates are varying (sic) among communities..".*

Whilst not a use of the *forested* area, the use of SA areas established within the LPF (which were excluded from the plantable area statement in the LPF licence) still continues by subsistence farmers - both for growing crops and as a source of what might be called NTFPs. However, it may be recalled that there is no SA inside the MTCS.

13.2. By Others

13.2.1. NTFPs

There is no commercial collection of NTFPs by Samling and there is not known to be any collection by non-local persons.

13.2.2. Other non-NTFP uses

MARUDI LPF is an active participant in Samling's R&D programme but as yet is not involved in the Planted Forest Research Programme (PFRP)[14]. Although the PFRP sites are not located in MARUDI LPF some of the information and results obtained may well be applicable in time to come and benefit the MTCS area in the way of improved genetic material.

[14] A long term R&D co-operative agreement which Samling has with the Sarawak Forestry Corporation.

14. Cultural and Historical Values

14.1. Cultural Values

In the course of the HCVA fieldwork several burial grounds and grave sites were identified; all are in SA over which the LPF management has no jurisdiction. However, their locations have been GPSd and are shown on LPF management maps.

No other sites of cultural significance have been identified to date.

14.2. Historic Values

No sites of historical significance have been identified to date.

15. Occupational Health and Safety and Environment

15.1. Introduction

Occupational Safety and Health in FPMU is governed by the requirements and compliance to the Occupational Safety and Health (Amendment) Act 2022 and its principal Act, Occupational Safety and Health Act 1994, the relevant regulations, industry code of practices and guidelines as may be applicable to the Forestry/Timber Industry in Malaysia. Environment aspect in this chapter is applicable to the management of wastes in particular the compliance to Environment Quality (Schedule Waste) Regulations 2005. At the time of updating this chapter, the OSH (Amendment) Act 2022 has not yet been enforced and so the principal Act and the Factories and Machineries Act 1967 provision shall still be referenced.

Forest Management is responsible to take, as far as practicable, such measures as necessary to ensure the safety and health of all persons when at work in the FPMU to achieve the OSH objective of zero injuries at work so that everyone go home safely.

15.2. Health, Safety and Environment (HSE) Policy Statement

Forest management is committed to the following principles:

- To conduct risk assessment and implement risk control at the place of work, and in line with such risk controls (HIRARC), the provision of systems of work, work environment, plant, equipment and the maintenance of the same, in so far as practicable, that are safe and without risk to health and adverse impact to the environment;
- Provision of adequate welfare, religious and recreational facilities for all employees without adverse impact to the environment;
- Provision of a safe means of access, egress to and from work places, emergency response (ERT) for rescue, control of environmental spill and natural disaster in so far as practicable;
- Provision of information, work instruction, training and supervision for all staff to enhance work competencies, skills and awareness in HSE, and the implementation of Best Management Practices (BMPs) in the industry;
- Review the HSE standards and practices periodically to ensure continued relevance and appropriate to the organisation.

15.3. OSH Implementation Strategy

OSH visibility and culture in practice in the FPMU is the responsibility of all parties regardless of level or job designation. All employees must be mindful at all times of the OSH requirements in the FPMU and to provide the commitment and cooperation to achieve the OSH objective and shall have the right to withdraw themselves from work hazards which has been identified to have imminent risk(s) of bodily harm if work is continued.

Within the framework of the safe work procedures and instructions, forest management must take due consideration of all employees' health and safety during land clearing, planting, tree felling, skidding, log handling and scaling, land and river transportation, road construction and maintenance,

and of those working in the camp office, nursery and workshop or in any of Samling's working areas located within the FPMU. Where practicable, relevant salient points reflecting those set out above, will be incorporated into the individual position's job description.

15.4. Training of Forest Workers

As required under The Forests (Trained Workmen) Rules, 2015, forestry workers who are engaged in any one of the following activities: tree felling, log extraction or log loading, must be trained by STA Training Sdn Bhd trainers or by other STA or FDS approved trainers.

15.5. Composition and functions of Occupational Health and Safety and Environment

A Health, Safety Environment and Committee (HSEC) comprises: (a) Chairman; (b) Secretary; (c) representatives of employer; and (d) representatives of employees. The functions of the HSEC are as follows:

- It shall assist in the development of safety and health rules and the safe systems of work;
- It shall review the effectiveness of the HSE programmes;
- It shall carry out studies on the trends of accidents, near-miss accidents, dangerous occurrences, occupational poisonings or occupational diseases which occur at the place of work;
- It shall report to the Samling management any unsafe or unhealthy conditions at the FPMU;
- It shall review the HSE policies at the place of work and make recommendations to the employer for any revision of such policies;
- It shall meet as often as may be necessary but shall not meet less than once in three months;
- It shall furnish a copy of the minutes of every meeting to every member and to the Samling management within two weeks after the meeting has taken place; and
- It shall ensure the Notification of Accident, Dangerous Occurrence, Occupational Poisoning and Occupational Disease (NADOPOD) Regulations 2004 are complied with.

15.6. DOSH Guidelines and ILO References

DOSH's *Guidelines for Occupational Safety and Health in the Logging Industry* and the ILO Code of Practice of Safety and Health in Forestry Work, 1998 are used as the basis to develop the mitigation measures in safe work procedures for the prevention of injury and reduction of health risks in harvesting operations. It provides training information and guidelines for risk control in the core activities of the upstream timber industry which are primarily: tree felling, ground-based and cable log extraction, loading and transportation of logs by road, road building and maintenance.

16. Monitoring

16.1. Introduction

The MTCS area has only recently been established in the MARUDI LPF and, furthermore, certification status only achieved on 15th January 2019. For these reasons the monitoring of various attributes is also a new feature in the LPF's management portfolio. With the exception of growth rates, which have been monitored through an extensive network of PSPs for many years, most other monitoring records have only recently started to be maintained.

16.2. Elements to be Monitored

The following elements are monitored:

a) **Yield of forest products** (logs) harvested is monitored through the daily trucking reports. These reports are summarised by year in Section 10.1 of Chapter 10. Table 10.1 shows the monitoring of the past log production. Figure 10.1 shows the result of monitoring the accumulated production to date and comparing it against the ACC.

b) **Growth rates** are monitored through a strong network of PSPs. The actual growth rates of mangium based on the real production and that for pellita based on PSP data are discussed in Chapter 9.

c) By means of planting records and maps the composition and changes of the **flora are monitored** and recorded over time.

d) The annual summaries for the **monitoring of fauna** are shown in Table 12.1

e) As the EIA (2007) and SIA (2018) and attest, MARUDI LPF is not in any way fundamental to meeting the basic needs of the communities within or nearby, and so there is little to actually monitor in this respect. What absolutely minimal current use is made of the LPF in terms of NTFPs will surely lessen as the population of the nearby communities ages, continues to decline and to change its consumption patterns to a more modern way of life.

f) The extracts from the annual **Social Impact Monitoring** report show that the **impact of harvesting and operating** in ITP area has no, or negligible, social impact other than in providing employment for those with the relevant skills or for those who wish to obtain such skills. Employment levels are monitored by recording the actual numbers of locals employed each year – see Table 7.1.

g) Monitoring of the **environmental impacts of harvesting** and other operations and of compliance with the EIA requirements is monitored half-yearly by Ecosol Consultants Sdn Bhd who produce the Environmental Monitoring Reports (EMR).

h) Productivity (for harvest productivity this has already been covered in volumetric terms in Chapter 10) and the efficiency of forest management are **monitored by budgetary controls** under the HQ accounts section.

i) The risk of **invasion[15] by exotic species** planted by MARUDI or of invasion of the LPF by exotic species planted by external third parties is **monitored** during the regular patrol reports. To date no invasion of significance has been note as attested by the patrol reports.

j) **Regular monitoring of pests and diseases** is through information captured at the time of PSP measurement together with *ad hoc* monitoring.

17. Climate Change - Adaption, Mitigation and Monitoring

17.1. Introduction

Forests has a significant function in climate change mitigation by acting as “sinks”, i.e. absorbing carbon from the atmosphere and storing it in biomass and soils. However, when the forests are cleared or degraded, they are also significant sources of greenhouse gas emissions. Forests, therefore, are important components in strategies for adapting to climate change.

Sustainable Forest Management (SFM) can help reduce the negative effects of climate change on forests and forest-dependent people. SFM is consistent with climate adaptation and mitigation whereby the planning will factor climate change and the management practices will be adjusted accordingly. The planning will put greater emphasis on risk management and to weigh the costs of changes in forest management against the likely benefits.

In 2010, the **Conference of the Parties** (**COP**) to the United Nations Framework Convention on Climate Change (**UNFCCC**) adopted a decision on reducing emissions from deforestation and on the conversion

[15] *'Invasion'* here means an exotic species is growing where it was not intended that it should.

of forests, sustainable management of forests, and enhancement of forest carbon stocks, usually known as ***REDD+***. The accessibility of benefits from ***REDD+*** activities to individual forest managers would depend on the arrangements in place in the country for ***REDD+*** benefit-sharing.

Last but not least, the forest management should also be aware of the policy incentives instituted by governments, or market incentives, such as carbon credits or demand for bio-energy. Forestry projects are favoured by the voluntary carbon markets because of their additional social and environmental benefits (known as co-benefits).

17.2. Policies on Climate Change

Forest management is affected by climate change policies made at the national and global levels. Under the **Malaysian Timber Certification Scheme (MTCS ST 1002:2021)**, forest management shall comply with the **National Policy on Climate Change, 2002** and the **UN Framework Convention on Climate Change, 1992.**

17.3. Adaptation and Mitigation in Forestry

Adaption and mitigation are the two main responses to climate change. The mitigation addresses the causes of climate change whereas the adaptation on its impacts.

In the forest sector, adaptation encompasses changes in management practices design to decrease the vulnerability of forests to climate change and interventions intended to reduce the vulnerability to climate change.

Mitigation strategies in the forest sector can be grouped into four categories: reducing emissions from deforestation; reducing emissions from forest degradation; enhancing forest carbon sinks and product substitution.

17.4. Adaption Actions

The actions for adaptation to climate change shall address risks or impacts. These actions are drawn mostly from existing forest management practices.

17.5. Mitigation Actions

Mitigation actions on climate change shall focus reducing **Green House Gases (GHG)** emissions by source and increasing GHG removals by sinks. These actions can be grouped into four general categories:

- Maintaining the area under forest by reducing deforestation and promoting forest conservation and protection;
- Increasing the area under forest (e.g. through afforestation and reforestation);
- Maintaining or increasing carbon density at the stand and landscape level by avoiding forest degradation and managing timber sustainably; and through the restoration of degraded forests, e.g. enrichment planting; and
- REDD+ activities / Voluntary carbon markets as a means to sell carbon credits for carbon sequestered by the forests.

17.6. Monitoring and Evaluation

Monitoring of the climate change adaption and mitigation actions is an additional and significant burden. Nevertheless, the existing databases, criteria and indicator processes and forest certification schemes can form a framework for monitoring.

Regardless of the scale of monitoring required, forest management should take a precautionary approach and involve local people when addressing possible social and environmental impacts.

Monitoring will require the collection of data on indicators of climate-induced impacts (e.g. forest productivity, forest health and forest pests). Many of these data will normally be collected in a standard forest inventory.

For biodiversity, the ideal species for monitoring are those that are expected to be vulnerable to climate change and that are also easy to census. Ideally, such species will also be species of special concern.

For water monitoring, dry season base flow and suspended sediments during periods of low flow might be the most appropriate indicators. Macro-invertebrates in streams can serve as good indicators of ecological integrity.

For fire susceptibility, monitoring fuel loads and moisture content are the first steps in assessment.

Social factors can be monitored by engaging with Community Representative Committees (CRC), provided of course that a community has decided to form and maintain an active CRC, or by the census data or rural development databases maintained by government.

Where forest carbon needs to be monitored this will almost certainly be a requirement for the continued verification of a validated carbon project registered under the likes of Verra. Such a project would require a Carbon Licence issued by FDS and would be outside the scope of a forest management certification program such as the MTCS.

17.7. Greenhouse Gas (GHG) Inventory Accounting

The initiative to reduce GHG emissions in Samling's timber operations started in 2023 with baseline accounting of GHG emissions for Scope 1 and Scope 2 for the year 2022. This in-house accounting reporting exercise was conducted by a third-party consultant engaged to ensure that the scope coverage, methodologies and verifications used in the accounting exercise were in accordance with the:

- GHG Protocol Corporate Accounting Reporting Standard, covering Scope 1 and Scope 2,
- 2006 IPCC Guidelines for National Greenhouse Gas Inventories ("2006 IPCC Guidelines"); and the
- 2019 Refinement to the 2006 IPCC Guidelines.

Scope 3 studies will be developed at a later stage.

17.8. Conclusion

Forests provide a wide range of goods and ecosystem services to the stakeholders and climate change, combined with deforestation, forest degradation and population pressure, may threaten the continuity of such provision.

Measures should be taken to ensure any adaption process adopted is compatible and aligned with established SFM practices in order to meet the economic, social and environmental needs of stakeholders. SFM practices can help reduce the economic, social and environmental vulnerability of forest and forest-dependent people to climate change.

Climate change mitigation programs (e.g. REDD+) are emerging that can increase the stock of carbon in forests. These can help offset the costs of actions (from carbon credits) to reduce GHG emissions due to deforestation and forest degradation.

Forest management can attempt to assess the cost-effectiveness of climate change adaption and mitigation options and identify the most feasible based on the available technical capacity and level of support.

18. Cost Benefit Analysis

18.1. Costs Relating to LPF Development

18.1.1. Financial Costs

- Log extraction cost
- Transport cost (tough road condition)
- Land rent and license fee
- Plantation establishment and infrastructure costs

18.1.2. Non-Financial Costs

- Change in environment and landscape – from residual natural forest to ITP monoculture
- Change in social dynamics

18.2. Benefits Relating to LPF Development

18.2.1. Financial Benefits

- Residual logging income from preparing the sites for planting
- Planted forest logs income

18.2.2. Non-Financial Benefits

- Log material sustainability through planted forest
- Alleviates the pressure of natural forest by producing higher volumes of tree plantation
- Working opportunities for locals around the concession area and establish economy in the area

18.3. Social Aspects

Samling's Marudi ITP will contribute to the livelihood of local communities living in the area. Local communities welcome the employment and the income-generation opportunities presented. Potential land claim issues have been identified and to be mutually handled should it arise. Cooperation between the company, relevant government agencies and the community will help to minimise these impacts and increase the benefits brought about by the forest management operations.

19. Forest Plantation Management Plan – Review and Revision

19.1. Background

ITP is still a relatively young industry in Malaysia. There is much that is not yet known in growing, harvesting, processing and marketing. Planting only started in MARUDI in 2009. The Samling mills that use MARUDI's ITP logs are still addressing the technical challenges and changes required when processing plantation logs and in marketing the products made from BORNEOTEAK® and pellita. Other plantation species have been trialled and are now planted operationally; the challenges of processing and marketing these species at scale and economically are still to come.

19.2. Review and Revision

Reviews and revisions will be conducted as in the following sections.

19.2.1. Optional Review

An annual review of the MARUDI Forest Plantation Management Plan will be considered and undertaken if thought appropriate. A revision may follow if deemed necessary.

19.2.2. Revisions

The FPMP will be reviewed and revised as deemed necessary in the last year of this 10-year plan.

In order to incorporate any major policy change in the management plan a specific *ad hoc* revision may be required.

The Assistant General Manager Refor is required to review revisions which will then be endorsed by Samling's Chief Operating Officer.

20. Internal Audit and Management Review

20.1. Introduction

rest management activities are subject to internal audit and management review at planned intervals as required under Malaysian Criteria & Indicator (MTCS ST 1002:2021 SFM) of the Malaysian Timber Certification Scheme) for sustainable forest management. Both internal audit and management reviews will ensure that there is continual improvement in the management system.

The Internal Audit and Management Review Procedure is used as the basis for the annual internal audit. It outlines the frequency, methods, responsibilities, planning requirements and reporting of the internal audit process.

20.2. Internal Audit

The internal audit shall be planned and conducted once a year. The objectives of the audit plan shall ensure that the FMU:

(a). meets the requirements of its management system; and

(b). its management system conforms to the requirements of MC&I ST 1002:2021 (SFM).

The internal audit plan shall define the audit criteria and scope of each audit. The auditors conducting the audit must ensure objectivity and impartiality of the audit process. The results of the audit will be presented during the management review meeting. All information gathered during the internal audit should be documented and retained as evidence of the implementation of the audit program and of the audit's results.

20.3. Management Review

The Management Review shall be conducted annually.

20.4. Non-conformity and Corrective Action

When any non-conformity is encountered, applicable action shall be taken to control and correct it. The consequence shall also be dealt with. The non-conformity shall be reviewed and the causes of it shall be determined. The need for the action shall be evaluated to eliminate the causes of the non-conformity and ensure that similar non-conformity does not recur or occur elsewhere.

20.5. Continuous Improvement

By undertaking the annual internal audit and management review, the sustainable management of the forest shall be continuously improved by addressing the suitability, adequacy and the effectiveness of the sustainable management system. The sustainable management system shall also conform to the Malaysian Criteria and Indicators for Sustainable Forest Management (MC&I MTCS ST 1002:2021 -SFM) under the Malaysian Timber Certification Scheme.

20.6. Risk and Opportunity Assessments

20.6.1. Risk assessment

Risk assessment is done to understand the internal elements (strengths and weaknesses) and external factors (opportunities and threats) which impact on the business strategic direction. All the relevant issues of internal strengths and weaknesses should be identified. Those items of potential high risk should be discussed and evaluated during the management review meeting before approval.

20.6.2. Opportunity assessment

All relevant opportunities identified should be analysed and be managed in order to maximize the benefits to the company.

20.7. Internal Audit and Management Review Procedure

The Internal Audit and Management Review Procedure is used as the basis to the annual internal audit. It outlines the frequency, methods, responsibilities, planning requirements and reporting of the internal audit process.