

**Samling Reforestation (Bintulu) Sdn Bhd**

**A member of Samling Global Limited**



**PUBLIC SUMMARY**

**Forest Plantation Management Plan**

**for the**

**MTCS Area within MARUDI LPF/0008**

**For the period**

**1<sup>st</sup> January 2018 to 31<sup>st</sup> January 2028**

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# PUBLIC SUMMARY

## Forest Plantation Management Plan

### MTCS Area within MARUDI LPF/0008

#### 1 Related Documents and Systems

There are numerous related documents. 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, East 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, and 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 Forest Plantation.v2 – operated by the Malaysian Timber Certification Council (MTCC). It is intended that the ethos of MTCS compliance should be embedded in MARUDI's management culture for the *whole* LPF and not just the area proposed for certification under the MTCS.

**NB** Use of 'MTCS area' throughout this FPMP serves only to identify the area which at the time of preparing the plan was *proposed* for certification under the MTCS. Its use should not be taken as implying that the area was certified at the time of preparation.

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 complies with the MTCS principles which amongst other attributes embrace sustainability and compliance with social and environmental standards.

##### 3.2 Certification Requirements

The MTCS requires:

- Practicing the guidelines and requirements set out by the ten principles of the MTCS.
- Developing a sound policy base derived from the ten principles and ensuring they are communicated and followed in the workplace.

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

At the time of preparing this FPMP MARUDI LPF was not yet certified under any certification scheme. The intention is to certify those areas which are eligible under MTCS.

SIRIM conducted the MTCS Stage 1 audit on 24 & 25 January 2018 and Stage 2 will be conducted 16-19 July 2018.

### 3.4 Area Eligible for Certification under MTCS

Under MTCS only those areas of degraded and residual forest for which Operation 5 of the PEC that was approved on or before 31 December 2010 are eligible for certification.

Section 5.2 and Table 5.1 give details of the determination of the area eligible.

## 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. This is controlled in companies such as Samling by using these documents as resource consents. These two pieces of legislation therefore act as a method of controlling adverse management effects.

There are numerous Acts and Regulations that form the basis of forest plantation management practices at MARUDI. 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.

### 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 assist to maintain the value of the forest services
- protect the natural forest from human interference in the Conservation Areas
- maximise harvest 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. 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. The area under SMZs represents 31% of the total forested area of the MTCS area (Table 5.2).

SRB also recognises the importance and significance of international agreements in ITP management and it will give governing authorities as much cooperation as possible to help 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
Swampy (mineral soil)
Rocky (skeletal soils)
Steep areas $>35^\circ$ – mandatory; 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 or which would otherwise have been planted

A zone type may be mandatory, e.g. a river buffer zone must be established along permanent water courses – see Table 4.2 – and steep areas in excess of  $35^\circ$  must not be cleared for planting. 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. In reality all the above SMZs are effectively conservation areas and are totally protected from encroachment. And there are 'Hobson's choice' zone types where the physical characteristics of the site preclude the option of planting, e.g. marshland and skeletal soils.

**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 Jan 2003, Ecosol Consultancy Sdn Bhd

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.

#### 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 in Marudi). There should be no unauthorised invasive human activity within a SMZ. However, unauthorised 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 years prior to considering 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 5.3 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 6,170ha; this is just over 85% of the non-productive area and 31% of the gross MTCS area.

## 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 has been requested 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 totally 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 include 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 m<sup>3</sup>/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. Some of the older FTLs would have been in force for at least 40 years prior to the LPF operation starting. This means that some forested 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 has (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

Consequent of the changes required by PEFC's endorsement of the recent revision of the MC&I Forest Plantation.v2<sup>1</sup> under which the MTCS operates, Marudi LPF is no longer 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 ([RIGHT-Click here to access MAP 5.4](#)). Table 5.1 shows the areas and basic soil type of the coupes that comprise the whole LPF. It may be noted that the 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

<sup>1</sup>NB The MC&I Forest Plantation.v2 is not a stand-alone document; it must be interpreted with the MTCC's guidelines to hand. These guidelines are known as GD-FP 2/2016.

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 are for various reasons – steep areas, river buffer zones etc. – notplantable.

### 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 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 might be 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-Feb-18

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.

The area recorded as planted and potentially plantable, which together comprise the ITP production area - is 12,707ha (Table 5.3). The production area, together the SMZ areas and a small area of non-forest land types comprise the total MTCS area of 19,941ha. The location of the components of the MTCS area is shown in Map 5.4.

## 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. (Clip here to access MapL08\_MTCS\_MAP\_5-1\_rev1).

A statement of land types and land use for the MTCS area is given in Table 5.3. The total MTCS area of 19,941ha represents about one third of the gross LPF area (55,822ha – FDS revision, Oct 2012).

**Table 5.3: Area Statement for MTCS Area within MARUDI LPF/0008 at July 2017**  
(hectares)

Land Type	Gross Area	Non-productive Areas <sup>4</sup>										ITP Production Areas			
		Non-forested Areas				Protected Forested Areas (SMZs)						Total	Plant ed <sup>2</sup>	Plant able <sup>3</sup>	Total <sup>6</sup>
		Wat er	Road line	Oth ers <sup>1</sup>	Total Non-Forested Area	Cons ervati on <sup>5</sup>	Zone	Gull y	Ste ep	Total Prote cted Area					
Mineral	19,941	12	775	277	1,064	4,740	1,110	5	315	6,170	7,234	5,805	6,902	12,707	
<b>Total</b>	<b>19,941</b>	<b>12</b>	<b>775</b>	<b>277</b>	<b>1,064</b>	<b>4,740</b>	<b>1,110</b>	<b>5</b>	<b>315</b>	<b>6,170</b>	<b>7,234</b>	<b>5,805</b>	<b>6,902</b>	<b>12,707</b>	
% Distribution for Whole MTCS Area		0%	4%	1%	5%	24%	6%	0%	2%	31%	36%	29%	35%	64%	
% Distribution for Non-productive <sup>4</sup> & ITP Production Area		0%	11%	4%	15%	66%	15%	0%	4%	85%	100%	46%	54%	100%	

Sources: LPF Licence, Block Master 17  
July 2017 Excel Marudi FPMP Tab 5.1 etc.

- 1) Rocky, swampy & sandy areas, proposed nursery, temuda claim & others
- 2) See Note in Chapter 5.5, regarding the minor discrepancy between this figure & that shown in Table 5.4
- 3) Approved under PEC Opt5 on or before 31st December 2010; assessed as plantable but still not recorded as planted at map record date
- 4) Non-productive as in not producing industrial timber
- 5) International Buffer Zone, kerangas forest, green belt & water catchments
- 6) This is lower than the approved PEC gross operable area because the latter is gross.

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

Table 5.4 shows the distribution of the major species and years of planting (YOP) for the MTCS ITP resource at 7<sup>th</sup> July 2017 as extracted from the Block Master at that date.

Two species, mangium and pellita, comprise almost 74% of the planted area and *Acacia* hybrid contributes a further 18%. *Falcata* is included in Table 5.4 in order that the area planted might be compared with that planted in Samling's other LPFs where it is an important component.

**Table 5.4: Species by Year of Planting for Marudi MTCS area at July 2017**

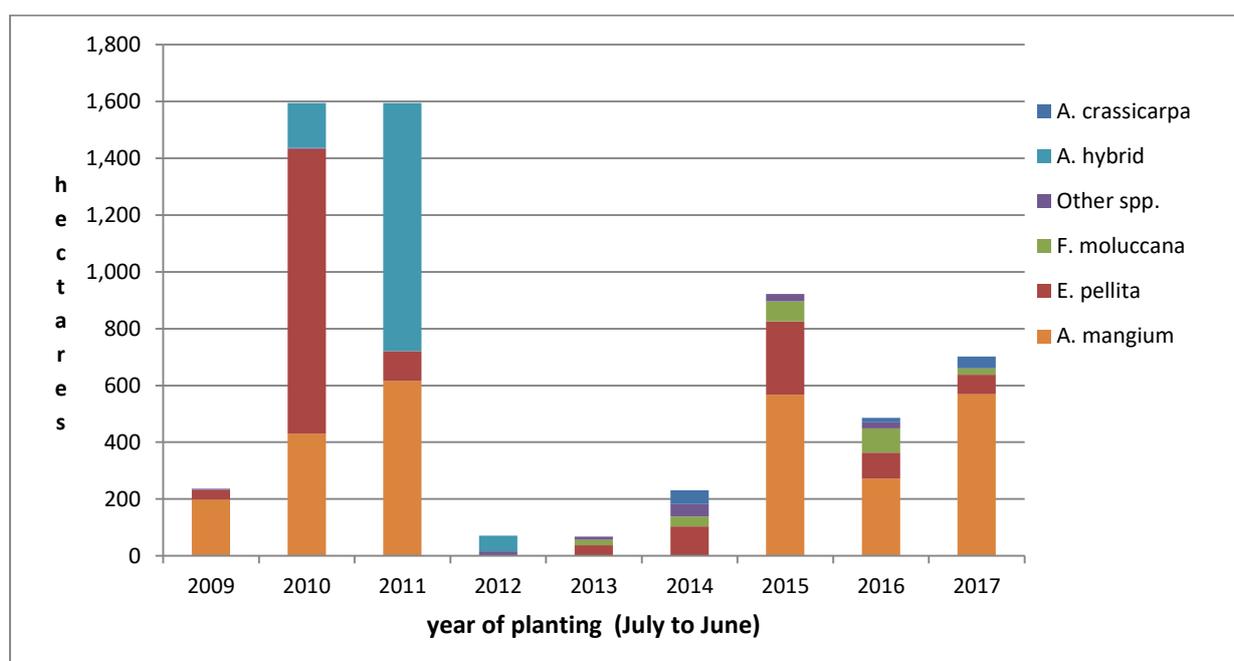
Species	Year of Planting (YOP)									Grand Total
	2009	2010	2011	2012	2013	2014	2015	2016	2017	
<i>A. crassicaarpa</i>						47.5		16.3	41.4	<b>105.2</b>
<i>A. hybrid</i>		157.7	872.4	55.6						<b>1,085.7</b>
<i>A. mangium</i>	198.7	429.7	616.4				566.9	271.9	569.2	<b>2,652.8</b>
<i>E. pellita</i>	33.1	1,002.7	104.9		38.0	103.7	257.9	91.3	68.3	<b>1,699.9</b>
<i>F. moluccana</i>					18.8	34.7	71.0	85.6	22.7	<b>232.8</b>
Other spp.	4.5	4.0		15.7	10.6	44.7	26.4	21.0		126.9
<b>Total</b>	<b>236.3</b>	<b>1,594.1</b>	<b>1,593.7</b>	<b>71.3</b>	<b>67.4</b>	<b>230.6</b>	<b>922.2</b>	<b>486.1</b>	<b>701.6</b>	<b>5,903.3</b>

Source: Marudi Block Master at July 2017; Marudi FPMP Tabs 5.1, 5.2, 5.3

NB The areas in Table 5.4 are those which have passed post-plant QC. Table 5.4 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 five 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 July 2017**



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. With a weighted average rotation age of around 9 years the annual area that would be harvested if the MTCS area had a normalised age class distribution would be about 655ha (derived by: 5,903ha/9yrs). The harvesting plan will take this+ into account when determining the annual cut; it will also take into account the fact that the MAI of mangium peaks at 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. However, the approved annual planting program for the five years starting 2017-18 is almost 2,000ha (around 400ha/year). This means that the total planted area of the LPF will continue to increase and that the AC will also increase substantially over time. When considering sustainability it should also be kept in mind that Samling's downstream will eventually be supported by production from several of Samling's own 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.

## 6 Environmental Considerations

### 6.1.1 Environmental Limitations

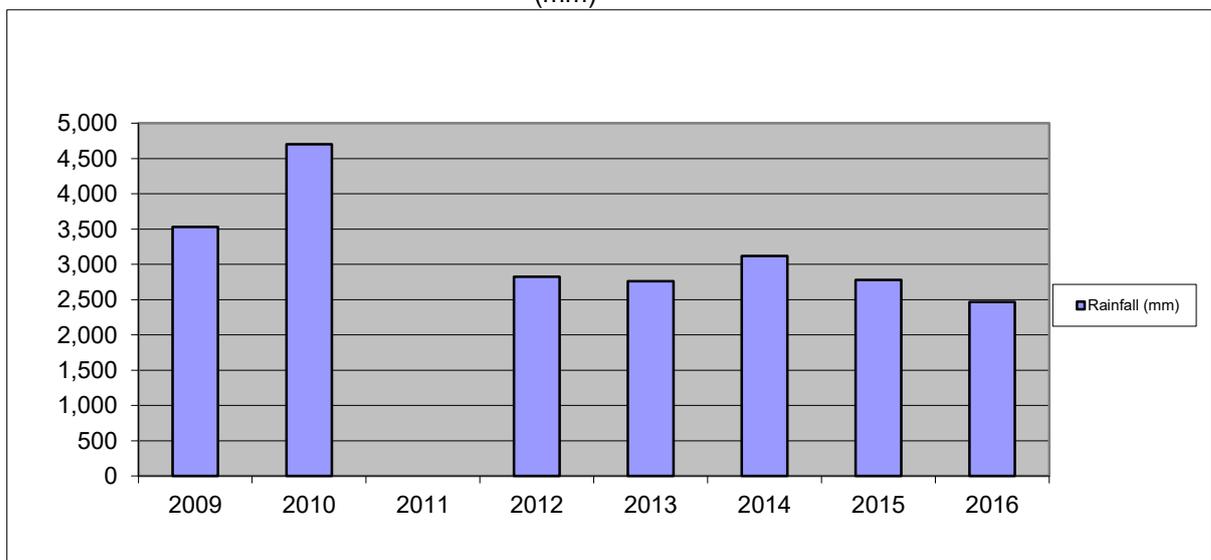
#### 6.1.2 Introduction

There are few environmental limitations for ITP in the LPF area. Similarly so 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.

#### 6.1.3 Rainfall

The annual rainfall recorded over 2009 to 2016 (2011 not recorded) at MARUDI nursery is shown in Figure 6.1. The average for 7 years is 3,219mm and has ranged from 2,469mm (2016) to 4,703mm (2010). On average there are 13 rain days a month and 160 rain days a year. The driest and wettest months recorded to date are March 2015 - 45mm - and January 2009 - 701 mm. But, whilst any month in a given year might be either the driest or the wettest in that year, November, December and January may be thought of as the wetter season accounting for about 35% of the average annual rainfall. Although 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

**Figure 6.1: Marudi LPF - Annual Rainfall – 2009 to 2010 & 2012 to 2016**  
(mm)



Source: Rainfall All LPFs Master (Excel)

The driest and wettest months recorded to date are March 2015 - 45mm - and January 2009 - 701 mm. Any month in a given year might be either the driest or the wettest in that year. However, as the figures below show, November, December and January may be thought of as the wetter season, accounting for about 35% of the average annual rainfall.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
mm	428	231	211	287	226	185	221	263	229	230	319	387	3,219
days	17	12	11	13	12	11	13	12	12	15	17	16	160

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

**6.1.4 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

#### 6.1.5 Harvesting

Harvesting (see section 10.3) 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 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 of new landings to facilitate extraction and loading are kept to the minimum necessary for efficient operation.

### 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<sup>2</sup> 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 pesticides in the field. However, experience in other ITPs indicates that there might at times be a need for very restricted use of a termiticide in response to an attack.

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 for controlled recycling at an approved centre.

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 with the external consultant's quarterly Environmental Monitoring Report (EMR). Reference to these reports will confirm that, to date, the results have 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 (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 MTCS area. From the experience gained in Segan and Lana, it is expected that this area will increase following re-demarcation prior to harvesting the first rotation areas established prior to implementing the standards required by MTCS.

### **6.3.4 Zero burning**

There will be a 'zero burn policy' for the preparation of second rotation sites for re-planting after harvesting. This practice has multiple beneficial effects: 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.)

### **6.3.5 Use of chemicals**

Apart from the insecticides and fungicides used, unavoidably, in the nursery only herbicides and fertiliser are currently used in the plantation. As stated in 6.3.2, both are used at low, or very low, rates of application.

## **6.4 Environmental Safeguards**

### **6.4.1 Environmental Monitoring Report (EMR)**

Ecosol Consultancy SdnBhd 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 is produced four times a year: January to March, April to June, July to September and October to December.

### **6.4.2 Use of chemicals**

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.

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 to procure and apply. Reducing these activities would have a substantial financial as well as environmental benefit to LANA.

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.

### **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 Monitoring exotic plant 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 four exotic genera (*Acacia*, *Eucalyptus*, *Gmelina* and *Falcataria* (syn. *Paraserianthes*) are currently planted commercially (as opposed to trialled). All four are known to regenerate naturally, to a greater or lesser degree, under MARUDI's conditions but this not is considered to be an adverse environmental impact.

To date no exotic species is known to have invaded areas outside either the LPF or the MTCS area. Mangium is a pioneering, short lived light demander and is only known to regenerate in open areas, e.g. burnt over SA. In the hill padi cropping cycle areas of SA regeneration of mangium might be considered as beneficial because it both protects and, as a nitrogen fixer, improves the soil.

Monitoring is by observation during the course of security patrols and by ad hoc comment from management staff made in the course of their duties.

### 6.5 Conservation of Bio-diversity

This has been briefly referred to in Section 4.4. 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: together these 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.

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..."*

The 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.

### 6.6 Residual Natural Forest

The history of the LPF referred to 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. However in terms of genetic diversity its flora is probably little changed but as no baseline study was undertaken prior to harvesting the natural forest the original diversity levels of both the flora and of 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 should, over many decades, allow the forest to recover in terms of structure: i.e. only time will allow the full expression of those species that are genetically pre-disposed to grow to a large size.

## 7 Socio-economic Context

### 7.1 Socio-economic Context

#### 7.1.1 Contribution by Current and Future Forest Operations

The ITP productive area within the MTCS area is just over 12,500ha. This is almost 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 economy of the Miri. All the log production will go to Samling's own downstream operations at Kuala Baram: peeler logs for Samling's plywood mills and saw logs to Samling Housing Products Sdn Bhd. Chip logs may go to Samling's JV partner - Daikin Sdn Bhd, also at Kuala Baram –

for the manufacture of MDF. Thus it is intended that the entire log production from MARUDI ITP will be processed locally, i.e., within the Miri region.

### 7.1.2 Employment and Provision of Services

At 31 December 2017 24% of employees were local and 13% were female. Most (95%) of the workers are Indonesians on two year contracts. MARUDI is an equal opportunity employer but only just over 17% of the workforce is female. This low rate of female participation reflects the nature of the work rather than any discrimination.

The competition for local workers from offshore oil and gas is, in part, the reason for the low participation of 'locals' and other Malaysians in the workforce.

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 greater part of the logistical support is supplied locally from Miri; e.g. engineering, spares and supplies.

### 7.1.3 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 mostly comprises disturbed MDF. Much of the remainder 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 the Formasi Abadi Sdn Bhd oil palm plantation. Initially the common boundary<sup>3</sup> 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. The planted area of MTCS area and that of the balance of the LPF were established primarily on much degraded residual forest land. Apart from the international buffer zone most of the land adjacent to these areas has a similar history.

There are no neighbouring or nearby suburban or residential developments which require the consideration of aesthetic values and additional safety considerations during forest operations. Marudi Town, the nearest township, lies on the Btg Baram, some 14 km west of nearest part of the MTCS area.

### 7.1.4 The Value of Forest Services

The EIA for the whole LPF was undertaken in 2007. The EIA stated that: "... a significant number of residents, especially the younger and more able bodied people, have left the settlements and are now working elsewhere..." with the result that the study recorded 53% of the potentially active working population (males and females aged 18 to 60) as having out-migrated. The EIA also determined that the core occupation of the area's communities was farming, and this is still the case.

The following extracts from the 2007 EIA indicate that even then there was no longer any significant dependence on the residual forest and the natural resources that were to be found in the LPF:

*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 Ian, 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..."

*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

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<sup>3</sup> The common boundary was established by a joint survey conducted in December 2017

products... still collecting the forest produce...for the people's own use and not for commercial purposes.”

The EIA in 2007 recognised no actual dependency on forest services in the form of NTFPs neither such as fish, wild meat, honey and rattan, nor for timber for boat and house building materials in the LPF.

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...”. And 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 are varying kampong communities within the MTCS...”. Here the draft report<sup>4</sup> was in error in that there are no communities within the MTCS – 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.

In the EIA assessment it was noted that as an ever increasing percentage of the population becomes wage earners and entrepreneurs, either locally or more probably after migrating to urban centres, demand for these services will continue to fall.

The HCVA(2018) and SIA (2018) came to similar conclusions regarding out-migration.

Whilst the depletion of NTFPs has had some effect on handicraft production it must also be considered that this is very much a casual occupation of the older generation. PVC strapping has in many areas substituted for the use of rattan – even where more readily available – for basket making.

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.

## 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.

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 objective of the Sarawak Planted Forest project was to produce chip wood - for a pulp mill near Samarakan, Bintulu that has yet to be built.)

### 8.2 Choice of Species

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<sup>4</sup> 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 further editions.

### 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 much of 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 been satisfactory but on the grey-white podzols it, along with all other species planted operationally to date, does not perform well. (See 9.3).

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.

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 kerangas forest occurred.

### 8.2.2 Site-species matching

There will no doubt be subtleties provided by differing chemical characteristics of the various series and compound associations of the mineral soils but Samling's recognition of any such subtleties and the ability to make use of them is some way off. Neither the EIA nor information is very 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 of this are all positive attributes of this species. However, in Sarawak there is insufficient knowledge of seed sources and related genetics, nursery practice through to ITP silviculture for this species which has yet to be proven in Sarawak as a reliable ITP species.

In Chapter 9, Plantations, in 'A Review of Dipterocarps'<sup>5</sup>, 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 ago. With the changes that have 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 BORNEOTEAK®.

Samling has 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 Stock, site preparation and maintenance

#### Good quality stock

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<sup>5</sup> Eds. Appanah, S & Turnbull, J. M. 1998 CIFOR

As a matter of course MARUDI will only plant selected stock with good genetic characteristics with preference given to seedlings from in-house collections.

### **Site preparation and establishment**

Before planting takes place some site preparation is necessary. This usually involves an 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.

MARUDI and considers a block to be established when a survival rate of 95% or more is achieved 30 days after passing planting QC.

### **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.

#### **8.3.2 Acacia mangium**

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.

### **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.

#### **8.3.3 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<sup>6</sup> SPH of good form and which have at least 80% of these stems pruned to 6.0m.*

The regime 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 be shortened and the block replanted with mangium or, possibly, with crassiparva.) 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.

### **Silviculture**

The objective is to produce primarily peeler logs. Samling's downstream has undertaken peeling trials of SEGAN pellita logs at 5.6yrs old. Further, more detailed, peeling trials were undertaken in 2017 at SPK, Kuala Baram.

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

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<sup>6</sup> This is considerably higher than the conventional stocking for solid wood ITP – a direct result of the ‘no thin’ policy.

restricted to a small DOS (diameter over stub) core along the pruned length and should yield a significant proportion of face and back veneer.

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; 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.

### 8.3.4 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* are now planted operationally.

## 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.

Schedules are produced by the MARUDI LPF manager and checked by the visiting HQ manager.

The recognition of *Ceratocystis* sp. in mangium and a stem canker in pellita – both in 2012 - means that the progress of the relationship between pruning and the incidence of these two diseases must be closely monitored.

## 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 but 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. PSPs are established when trees are 24 months old. 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. There are currently more than 750 plots distributed over the LPF. A very high proportion of these is in the MTCS area.

### 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). 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 significant 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.

### 9.3.3 Pellita

Sequential measurements have been taken on more than 260 (*sic*) plots. The harvest age has yet to be determined but it will probably be  $12 \pm 2$  years. Much depends on the approach taken by downstream to the processing of small diameter logs.

The determination of optimum rotation length is dependent on a robust PSP data base together with adequate information supplied by downstream as to log values applying to a range of log diameters. Whilst the 260 sets of PSP measurements provide data to mid-rotation data for the older age classes are currently lacking.

## 10 Allowable annual Cut, Annual Harvesting Plan & Systems, Financial Sustainability

*Sustainability: an enduring value. Sustainable [forest] management is a beguiling term and open to many interpretations. It contains many uncertainties and ambiguities. ♦ Duncan Poore, 2003*

### 10.1 Allowable Annual Cut (AAC)

The *sustainable* AAC (SAAC) for MARUDI LPF has yet to be determined. However, given that: new areas are still being planted outside of the MTCS area, that there is a requirement in the LPF licence conditions to replant harvested areas and that improved planting stock will be used, then, whatever level of AAC is determined at the start of harvesting, it will surely increase over time. The MTCS area will be a significant contributor to the final SAAC but the volumes produced from this area will fluctuate quite widely from year to year as a result of the highly skewed area distribution by year of planting (Fig. 5.1).

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

The annual cut is based on:

- 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.

With the objective of ensuring a sustainable harvest volume from the whole LPF whilst at the same time making sure that the mangium does not become over age the AAC should be reviewed annually.

### 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. Because of this it is not realistic to plan for reliable harvesting and transporting 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

The harvest plan follows the established Samling harvest plan style. It is dynamic and held in soft copy format only. This allows for easy and, more important, for continual revision as new and revised PSP information is generated. It consists of a register of the blocks planned for harvest in each of the next ten budget years; the blocks listed against each budget year will be the source of that year's AAC. The

register is updated to reflect the reduction factor that takes into account the difference of the actual yield from that estimated for harvest planning purposes.

### **10.3 Harvesting System**

As mentioned in 6.1.4 when discussing environmental consideration, 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 it helps to protect the fragile soils and in particular reduce erosion and compaction.

Extraction of trees harvested near the roadsides will be ground based. Site damage will be limited by the use of shovel mounted grapples.

Other benefits of a yarding system include:

- reduced disturbance to soils on steep erodible sites;
- reduced compaction when compared to a ground based system;
- it can be used from high vantage points minimising construction of new road infrastructure (this helps maintains water quality and minimises site disturbance); and
- It allows access to otherwise economically inaccessible areas.

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

### **10.4 Financial Sustainability**

The MARUDI MTCS area is a very small part of the MARUDI LPF and an even smaller fraction of the ITP area operated by the Samling Group. The Group has clearly been financially supportive of MARUDI for the past 11 years 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, once harvesting starts the net revenue from internal log sales should cover replanting and overhead costs for the remainder of the 60 year licence period.

## **11 Spatial Information and Management System**

### **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 Quantum GIS. 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. The distributions of the species planted and of the years of planting are also held as are 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.

Paper based copies are held as further "backup" should the electronic systems fail.

### **11.2 Management Systems**

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

## **12 Conservation, Conservation Areas, 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 no undisturbed primary forest has been identified within the MARUDI LPF.

This history and its small size lessen, but do not necessarily preclude, the prospects for MARUDI MTCS 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 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 Forest Reserve. Labi F.R. comprises mainly mixed dipterocarp forest (MDF) and, except for a small area classified as '*protected area*' in the north-west, the Brunei Forest Department has designated it to be sustainable production forest. The western boundary of the '*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 - will be also protected as SMZs. Full protection of the conservation areas and other SMZs will allow them to continue to develop 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..

It is Samling's policy that anyone working in MARUDI should have a positive approach to conservation and be involved with the process of protecting RTE species.

For example all new contracts, and those renewed, for establishment, silviculture and harvesting work contain the following, or similar, clause:

*"Sites which are known to be culturally sensitive or which are known to contain rare, endangered or threatened species are surveyed and placed on MARUDI maps. If these areas are identified on any map(s) issued with the Work Order, it is the responsibility of the Contractor to ensure his workers have been informed of them before work commences. Any new sites or rare, endangered or threatened species encountered will be reported to MARUDI management immediately."*

Where a current contract does not contain such a clause then the contractor is required to acknowledge and to agree in writing that he will comply with the conditions of this clause.

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 12.2 below) contains much more detailed information. These reports should be referred to for 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 Assessment and Analysis

#### 12.2.1 High Conservation Value Assessment

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

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 in protected areas (SMZs). At July 2017 5,805ha had been planted. A further 6,902ha is classed as plantable but, following survey and the establishment of RBZs and identification of other SMZs, the actual plantable area will be considerably less.

### 12.2.2 HCVA Analysis

It might be noted that:

1. the area has generally been very heavily disturbed by timber harvesting prior to the issue of the LPF licence;
2. further salvage harvest took place prior to the release of coupes for PEC Op.5 (clearing & site preparation);
3. the LPF has been in continuous operation for almost nine years;
4. 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
5. hunting by Samling employees and contractors is prohibited and furthermore as the populations decline there should be reduced pressure from hunting and fishing 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.

The HCVA shows that:

For **HCV 1 and 2**: the MARUDI MTCS area does have some HCV attributes. The RTE fauna species that have been identified are well served by the protected areas (SMZs). 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 are already demarcated on the ground, mapped and 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, the LPF and MTCS areas cannot be considered to be HCV contributors of any importance with regard to endemic species.

A bat roost located in Coupe 2, Block 58D has been recognised under HCV1.4. This will have a 100m wide buffer zone established around the periphery. Two salt licks were identified in SA and are consequently outside 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<sup>7</sup> 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.

Apart from the bat roost, which clearly must be, and has been, accorded HCV status, when the qualitative and quantitative aspects of these 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 can provide an equal level of protection for free ranging mammals and birds as could be provided by an area declared as an HCV area.

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

For **HCV4**: Water catchments have been identified, marked on the ground and mapped. These are for community use. The water catchments are of significant importance and concerns regarding water supply were expressed frequently 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<sup>8</sup>. However, it should be noted 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 are of no concern to them (see MTCS Area map at 1:50,000).

There is only a very small area of TCIV (1,372ha) in the LPF. As all of it is located and protected within the SMZs of the MTCS area this terrain type is not specifically mapped and identified on the management maps.

For **HCV 5**: 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 provided by the whole LPF. Timber and timber products are bought rather than self-collected. It is clear that for most communities what negative socio-economic impacts of the MARUDI MTCS area might have had, they have been greatly mitigated by development through government assistance, access and waged employment: the employment has provided for 52 Sarawakians, almost 60% of whom are local, directly employed in MARUDI ITP (and much increased now that harvesting has started) and (b) improved road access to Marudi town and within the LPF.

For **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 significance have been identified.

## 12.3 Social Impact

### 12.3.1 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 (May 2018). The assessment was guided by the '*Guidelines and Procedures for Social Impact Assessment and monitoring of Forest management Operations (Peninsular Malaysia)*'. UPM 2012.

### 12.3.2 SIA Report and Analysis

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<sup>7</sup>In the north of the LPF, Coupe 12 abuts the PSF of Brunei's Ulu Mendaram F.R..

<sup>8</sup>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.

The SIA states the objectives of the assessment<sup>9</sup> 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:

**1. 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.

It is often forgotten that a very significant rate of natural erosion can and does occur areas of high and heavy rainfall. This is especially true in the steep and broken terrain which comprises much of the land available to ITP in Sarawak. However, this rate of erosion is exacerbated by the removal of vegetation that establishment of ITP requires and the use of heavy equipment for road construction and timber extraction. This, removal of vegetation and heavy equipment, inevitably leads to some increased siltation of the rivers; but just how much can be attributed which cause is the subject of generally qualitative and unscientific argument.

**2. Local economy and livelihood**

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

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 population of which a large number but the demand for and the ability

A concern was noted regarding loss of land ownership and loss of land for farming. However, unless the land is titled, it owned by the State so the question of 'ownership' does not arise. The concern regarding loss of land for farming is a matter for clarification through the CRC.

In 2017 more than 50% of the staff was local i.e. from within the district but only just fewer than 5% of workers were local. The low participation rate of locals in the workforce reflects the perception by these

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<sup>9</sup> 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 did 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.

locals, and the reality, of contract work in the forest plantations being physically arduous and perception that it is not overly well paid. These perceptions, together with the need for regular and consistent working hours and with the work place far from home comforts, has resulted in the less than 5% figure for Marudi LPF. But this is the case for the ITP industry throughout Sarawak and to a slightly lesser degree for Sarawak's oil palm industry.

### 3. 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 forest resource is the dwindling traditional knowledge and shrinking traditional skill base of the communities. But the reduced availability of 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. 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.

However, it should also be acknowledged that even handicrafts move on and that the traditional skill of basket weaving has to some extent flourished with the realisation that PVC strapping can be used as a readymade substitute for rattan for certain handicrafts. With some adaptation of technique and design, this allows the traditional skills of basket weaving to be gainfully practiced without the need for (a) a rattan resource and (b) the very time consuming process of collecting and then processing the rattan to a state in which it can be used for handicrafts.

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 and similarly for government trainers to run courses on location in the villages.

In its 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...".

## 13 Multiple-Use

### 13.1 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, because it is SA, usually 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 but there are subsistence farmers in the SA within the LPF. The SA areas are generally quite far from the conservation areas meaning that collection of NTFP, e.g. wild fruit, vegetables, mushrooms, rattan, is very much opportunistic and can only be considered as a casual source of food, handicraft material or income.

Whilst not a use of the *forested* area, the use of established SA areas within the LPF (which were excluded from the plantable area statement in the LPF licence) still continues by subsistence farmers. However, there is no SA inside the MTCS.

Farming, whilst not a use of the *forested* area, is an important activity and subsistence farmers continue to farm established SA areas within the LPF. SA areas were excluded from the plantable area statement in the LPF licence. There is no SA inside the MTCS.

## 13.2 Others

MARUDI LPF is an active participant in Samling's R&D programme but there had no involvement in the now defunct Planted Forest Research Programme (PFRP)<sup>10</sup>. Although the ex-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.

Samling, through STA's Plantation Committee, is cooperating with Swinburne University (Kuching) in the development of a mycorrhizal based bio-fertilizer for *E. pellita*. A successful outcome might well benefit Samling's silviculture of *E. pellita*. This could be particularly important in MARUDI LPF where *E. pellita* has shown exceptionally poor growth to date.

## 14 Cultural and Historic Values

### 14.1 Cultural and Historic Values

In the course of the HCVA 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 or historic significance have been identified.

## 15 Occupational Safety And Health

### 15.1 Introduction

the conduct of forestry operations a safe and healthy work place, as far as practicable, is assured by compliance with the Occupational Safety and Health Act 1994 and the relevant legislative regulations and guidelines that are applicable to the respective work places.

### 15.2 Safety, Health and Environment (SHE) Policy Statement

The LPF management is committed to the following principles:

- 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 to and egress 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 SHE, and the implementation of Best Management Practices (BMPs) in the industry;

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<sup>10</sup>A long term R&D co-operative agreement which Samling has with the Sarawak Forestry Corporation.

- Review the SHE standards and practices periodically to ensure continued relevance and appropriate to the organisation.

### **15.3 Safety Practice Guidelines for Forestry Activities**

Safety practice is the responsibility of both the management and employees regardless of level or job designation. All employees must be mindful at all times of the Safety Practice Guidelines (Appendix VII).

However, the camp management is required to play an active role in carrying out measures to ensure the safety and health of all employees in the work areas.

Within the framework of the Safety Practice Guidelines, camp management must take due consideration of all employees' health and safety during tree felling, skidding, log handling and scaling, land and river transportation, road construction and maintenance, and of those working in the camp office and workshop or in any of Samling's working areas located within the FMU. Where practicable relevant salient points reflecting those set out above, will be incorporated into work instructions.

### **15.4 Training of Forest Workers**

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

### **15.5 In-house Training for Occupational Safety and Health**

#### **15.5.1 Safety and Health Committee**

The LPF must have a Safety and Health Committee (SHC). This will comprise: (a) Chairman; (b) Secretary; (c) representatives of employer; and (d) representatives of employees. The SHC shall operate in the manner prescribed by Samling HQ.

Within the framework of the Safety Practice Guidelines, the SHC will work with camp management to take due consideration of all employees' health and safety during tree felling, skidding, log handling and scaling, land and river transportation, road construction and maintenance, and of those working in the camp office and workshop or in any of Samling's working areas located within the FMU. Where practicable relevant salient points reflecting those set out above, will be incorporated into work instructions

#### **15.5.2 DOSH Guidelines**

DOSH's *Guidelines for Occupational Safety and Health in the Logging Industry* are used as the basis to develop the Safety Practice Guidelines for the better prevention of injury and health problems 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**

The MTCS is a very new to the Marudi LPF and certification status has yet to be achieved. For these reasons the monitoring of various attributes is also a very new feature in the LPF's management portfolio.

- Yield of forest products (logs) harvested will be monitored through the FMU's production records for royalty assessment held in the camp office.
- Growth rates will be monitored through the use of PSPs.
- Data from the HCV assessment will be used to assist in monitoring fauna in conjunction with ad hoc records of observations by FMU staff. Toolbox talks will develop staff awareness and competence in this respect.

- The SIA and HCV assessments clearly show the MTCS area *not* fundamental to meeting the basic needs of the nearby communities
- These assessments also showed that the impact of operating in the MTCS area will have no or negligible social impact other than in providing employment for those with the relevant skills or who wish to obtain such skills.
- Costs will be monitored by budgetary controls in which productivity and the efficiency of forest management will of necessity also feature.

## **17 Forest Plantation Management Plan – Review and Revision**

### **17.1 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. Although other plantation species have been trialled and are now planted operationally the challenges of processing and marketing them economically at a commercial level are still to come.

To take into account new knowledge, Samling R&D findings, and developments within the ITP sector and to ensure that as far as is possible MARUDI meets down stream's evolving requirements, it might be necessary to interpret parts of this FPMP with a degree of flexibility. Any required changes will be incorporated at the mid-term review or the end-term revision of this FPMP.

### **17.2 Review and Revision**

#### **17.2.1 Requirements**

The mid-term review and revision will take into account:

- new information from operational monitoring and research becoming available and being used to make significant improvements or necessary changes;
- new information becoming available to senior management which results in policy change;
- changes in downstream planning or requirements; and
- new or revised regulations imposed by the government.

#### **17.2.2 Mid-term Review**

A mid-term review of the MARUDI Forest Plantation Management Plan will take place following which a revision may be required.

#### **17.2.3 Revision**

The FPMP will be revised in the last year of the FPMP's ten year term.