



**Syarikat Samling Timber Sdn Bhd**  
A member of Samling Group of Companies

## **PUBLIC SUMMARY**

### **Forest Plantation Management Plan**

**for**

**LPF/0014 – SEGAN**

**1<sup>st</sup> November 2013 to 31<sup>st</sup> October 2023**

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**Edition 5**  
**(Revised – partially – 17<sup>th</sup> February 2020)**

Revised by:

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Chief Forester

Approved by:

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Chief Operating Officer

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### **Editions 5**

#### **Review and Revision History**

<b>Edition</b>	<b>Action</b>	<b>Date</b>
<b>2</b>	<b>Revision</b>	<b>15 November 2013</b>
<b>2</b>	<b>Review</b>	<b>12 November 2014</b>
<b>3</b>	<b>Revision</b>	<b>30 October 2015</b>
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## **1. Related Documents and Systems**

Numerous documents ranging from the LPF licence to the Segan fire plan are integral parts of this FPMP.

## **2. The Company**

Segan Licensed Planted Forest (SEGAN) is an industrial tree plantation (ITP) operating under a government licence (LPF/0014) held by Syarikat Samling Timber Sdn Bhd (SST) – forestry and forest products manufacturing company. Samling Reforestation (Bintulu) Sdn. Bhd. (SRB) is the contracting company engaged to undertake all reforestation work in SEGAN. SST and SRB, both members of the Samling Group which is head-quartered in Miri, the largest city in the north of the State of Sarawak, East Malaysia. SRB and SST are jointly referred to here as Samling.

Samling aims to produce an economically sustainable supply of logs from the SEGAN ITP which will help to support its downstream wood processing activities – plywood, sawn timber, fibre board and furniture components – located in Bintulu.

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/0014 and, in so doing, to comply with the Malaysian Criteria & Indicators for Forest Plantation Management Certification – the MC&I Forest Plantation.v2 of the Malaysian Timber Certification Council (MTCC). It is intended that the ethos of MTCS compliance should be embedded in SEGAN's management culture.

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

### **3.2 Certification Requirements**

The MTCS requires:

- 1] Practicing the guidelines and requirements set out by the ten principles of the MTCS.
- 2] Developing a sound policy base derived from the ten principles and ensuring they are communicated and followed in the workplace.
- 3] Developing open lines of communication involving employees and stakeholders in the development of economically sustainable forest plantation management practices.
- 4] Using best practice guidelines in its management regimes. This includes the implementation and continued use of sound, proven and economically viable forest plantation management, environmental, financial and social practices that protect the sustainability of the resources.

### **3.3 Certification Status**

SEGAN was successfully audited for compliance with the MTCS by SIRIM QAS International Sdn Bhd in December 2013 with SIRIM's Certificate for Forest Management (Forest Plantation) No. FPMC 0002 issued on 18 July 2014. (It should be noted that the significant delay between the audit date and issuing the certificate was not due to any problems in implementing the MTCS at Segan.) Following a re-certification audit SIRIM QAS re-issued their certificate from 18 July 2017 to 17 July 2020. A second re-certification audit was undertaken by SIRIM QAS 17-20 February 2020 and a recommendation was made to re-issue the certificate - now with a five years validity with an expiry date of 17 July 2025.

## **4. Forest Plantation Management**

### **4.1 Statutory Framework**

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

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

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

### **4.2 Forest Plantation Management Objectives**

The forest management objective was originally the economic production of pulpwood. Some 3-4 years after planting started this was changed to the **economic production of logs for supply to Samling downstream**. This supply is primarily for solid use, i.e peeler logs and saw logs with logs unsuited to these purposes chipped (for in-house fibre board manufacture). This still remains the primary objective. 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
- 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
- minimise harvest waste

### **4.3 Forest Plantation Management Strategy**

Samling uses the MTCS principles and criteria to formulate the management strategy for SEGAN to be employed in achieving the objectives set out above.

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 the conservation and enhancement of the LPF's bio-diversity. To date the area under SMZs represent 20% of the total forested area of the LPF.

## **4.4 Special Management Zones (SMZs)**

### **4.4.1 Zone types occurring in SEGAN**

SMZs are generally, but not necessarily, those areas of logged-over 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. R&D areas, although under special management, are within the ITP management area. In Sarawak there are a number of possible zone types but only those listed in Table 1 below have been identified as occurring within SEGAN to date.

**Table 1: Special Management Zones (SMZs) occurring within SEGAN**

Zone Types
Riparian buffer - mandatory; to EIA prescribed widths determined by the water course width
Swampy (mineral soil)
Rocky (skeletal soils)
Steep areas $\geq 35^\circ$ – mandatory; upper slopes (i.e. Outside riparian buffers)
Gulley - steep riverside areas outside the mandatory buffer zone
Conservation - voluntarily designated as such; otherwise, it might have been planted

A zone type may be mandatory, e.g. a riparian buffer zone must be established along permanent water courses and steep areas in excess of  $35^\circ$  should not be cleared for planting. Elective zone types are those such as conservation areas where at the manager's discretion a wildlife corridor has been demarcated in certain areas, some of which might otherwise be plantable land. 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. Such areas may also have an important conservation role.

The types are not mutually exclusive: e.g., a riparian buffer may contain marshland or even 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 role in the conservation of SEGAN's bio-diversity.

#### **4.4.2 Management of SMZs**

The major SMZ type is that of the riparian buffer zone (RBZ) which represents more than 9% of the gross LPF area. However, the guiding management principles are common to all SMZs that are currently identified in SEGAN.

## **5. Resource Description**

### **5.1 History**

Segan North (one three discrete areas that make up the LPF) comprises almost entirely shallow peat soils and was logged many years ago under various timber licences. The last of these licences -T/0103 and T/0119 - expired in July and June 1999 respectively.

This history of heavy logging no doubt led the authors of the EIA report dated June 1999, to conclude of Segan North "...Due to past heavy logging, the forest is no more intact with remnants of mostly medium sized trees occurring in patches..." (C3-21).

Along parts of the rivers of Segan North (Btg Kemena, Sg Segan & Sg Silas) there is a mosaic of alienated land. Given that the greater part of the alienated land is on what would be riparian buffer zone, or is SA, there are no direct consequences arising from this alienation for the management of the LPF.

In Segan West and Segan East the commercial content of the mixed dipterocarp forest (MDF) that once comprised almost all of the original vegetation was extracted many years ago under various timber licences: T/0143, T/0283 and T/4148. Apart from the areas yet to be brought under plantations, there are small, heavily disturbed MDF remnants within SMZs - in conservation areas, riparian buffers and steep areas and on the fringes of swampy mineral soil areas. By far the largest timber licence was T/0283 issued to Limbang Trading (Bintulu) Sdn Bhd in 1980. This is a related company which ceased operations in what was to become the LPF area in 2000. (The licence expired some time later.) Two other licences, (T/0143 and T/4148) issued over parts of what became the LPF, both expired prior to the issue of LPF/0014.

The area licensed for ITP is State land; it encompasses parts of the gazetted forest reserves known as Buan F.R (G.N. 809, 9-1-1977), Segan F.R. (G.N. 24 11-12-1930) and Bukit Minah F.R. (proposed).

#### **5.1.1 Conversion of primary forest**

As has been noted in the preceding section the natural forest within the LPF had been subjected to repeated heavy logging for almost forty years to the extent that no primary forest was known to remain at the time

the LPF licence was issued in 1999. **This means that no primary forest has been, or is still available to be, converted to ITP within the LPF area.**

### 5.2 Land Use

SST holds a 60 year lease over land on which it is licensed to establish an ITP. The lease (LPF/0014) was issued on 27th January 1999. The leased land is in three discrete areas some 15 to 35km South East of Bintulu, in the Bintulu District and Sebauh Sub-District of Bintulu Division. The three areas are known individually as: Segan West, Segan East and Segan North and are referred to as such in this management plan ([Click here to access MAP 5.1](#)). The original gross area has been revised by government agencies at least twice. It is now 10,332ha. About 55% is productive or potentially productive ITP area with the unproductive balance being SA and protected SMZs.

Table 5.2 below presents the area statement at 5<sup>th</sup> February 2020.

**Table 5.2: SEGAN (LPF/0014) – Area statement 5<sup>th</sup> February 2020**

Land Type	Gross Area	Non-productive Area <sup>6</sup>											ITP Production Area				
		Non-forested Areas					Protected Forested Area						Total	Planted <sup>1</sup>	Plantable <sup>2</sup>	Potential <sup>3</sup>	Total
		SA	Water	Road line	Others <sup>4</sup>	Total	Conservation <sup>5</sup>	RBZ	Gully	Steep	Total						
Nipah	233 2.3%	-	-	-	-	0	-	233	-	-	233	233	-	-	-	-	
PSF	2,984 28.9%	1,037	5	50	15	1,107	-	223	-	-	223	1,330	1,433	78	142	1,653	
Mineral	7,115 68.9%	1,495	27	157	252	1,931	510	584	21	83	1,198	3,129	2,968	1,081	-	3,985	
<b>Total</b>	<b>10,332</b>	<b>2,532</b>	<b>33</b>	<b>208</b>	<b>267</b>	<b>3,039</b>	<b>510</b>	<b>1,040</b>	<b>21</b>	<b>83</b>	<b>1,654</b>	<b>4,693</b>	<b>4,401</b>	<b>1,095</b>	<b>142</b>	<b>5,638</b>	
% Distribution - Certification Area		25%	0%	2%	3%	29%	5%	10%	0%	1%	16%	45%	43%	11%	1%	55%	
% Distribution - Non-productive <sup>4</sup> & ITP Productive Area		54%	1%	4%	6%	65%	11%	22%	0%	2%	35%	100%	78%	19%	3%	100%	

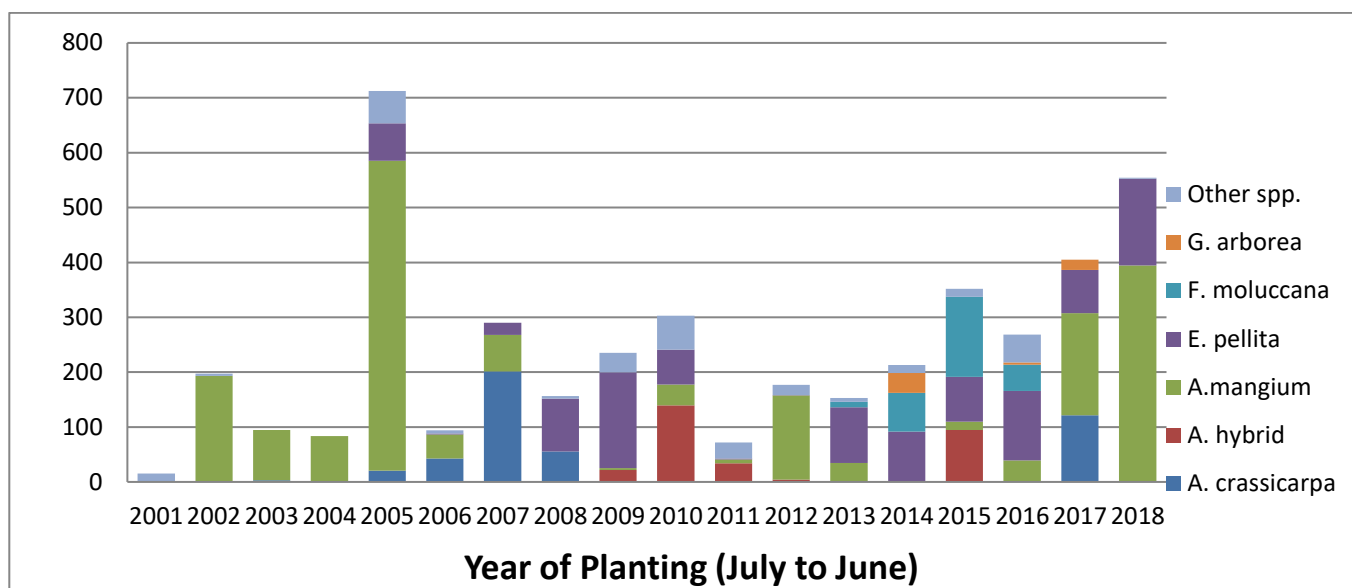
Sources: LPF Licence, Block Master 5<sup>th</sup> Feb 20

Layer used: Z:\GIS\Data\Edit\L14.gdb\Block\_Update\_2020\l14\_block\_update\_p\_20200205\_1

### 5.3 Industrial Tree Plantation (ITP) Resource

Four species account for almost 90% of the planted area. Falcata is included as it is an increasingly important component of the species diversity in Segan as well as in other Samling LPFs. Gmelina is included so that the area planted might be compared with that of some of Samling's other LPFs where it is an important component.

**Figure 1: Age Class Distribution for the Major Species - SEGAN (LPF/0014) 30 June 2018**



## 6. Environmental Considerations

### 6.1 Environmental Limitations

There are few environmental limitations for ITP in the licence area. The main limitation is the somewhat 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.

The average annual rainfall recorded over 12 years at Segan nursery is 4,150mm. It has ranged from a low of 2,948mm (2005) to a high of 4,943mm (2003) and has averaged 16.6 rain days a month and 183 days a year. This relatively high annual rainfall with frequent rain days impacts heavily on the efficient use of both labour and equipment and thus on operational costs.

The high level and frequency of the rainfall and steep terrain can make access to some areas difficult especially during the wetter season (October to January inclusive) when ungravelled roads can quickly become slippery and temporarily unusable. Similarly, harvesting and transporting on a year round basis to ensure regular log supplies to downstream mills is impossible. Log stocks must be built up at an all-weather depot, or at the mills, before the onset of the wetter season.

Harvesting is predominantly by yarding. This allows operation in the broken terrain whilst minimising the environmental impact, especially soil disturbance that can lead both to compaction and to increased erosion. Ground skidding is used in the few areas where the topography restricts the efficient use of yarding.

### 6.2 The Environmental Management Plan (EMP)

The EMP is a standalone 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 by good alignment and by construction of new roads; both of which must conform to the FDS standards in order to obtain a PHC (Permit to Harvest Coupe). Extensions of spur roads and clearing of new landings to facilitate extraction and loading are kept to the minimum necessary for efficient operation.

Section 10.2 describes the yarder system that is the main extraction method. The use of this system minimises soil erosion and compaction by reducing the need to enter the harvest block with ground based machinery.

### **6.3.2 Water quality**

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. It ranges from less than 70kg/ha for Acacia to less than 180 kg/ha for pellita. The herbicide load is also low with 4 to 5 litres/ha applied each round with an average of 3.5 rounds per rotation. 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.

Water quality is monitored by means of water sampling whereby samples are collected twice a year from sampling points identified by the EIA. These samples are analysed by an external laboratory with the results submitted to NREB and presented within the external consultant's six monthly Environmental Monitoring Report (EMR). Reference to extracts these reports on the Samling website will confirm that, to date, the results are within NREB acceptable parameters or in other ways compliant with the standards set in the EIA.

### **6.3.3 Riparian buffer zones (also known as river buffer zones) – RBZ**

Riparian buffer zones are established in accordance with the EIA recommendation. 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 riparian buffer zones also maintains, and over the longer term enhances, the biodiversity of the area.

### **6.3.4 Zero burning**

A 'zero burn policy' is in place for the preparation of second rotation sites. This practice has the benefit of reducing air pollution; conserving 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 then 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 and also impacts on tree improvement.)

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

### **6.3.5 Use of chemicals**

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

## **6.4 Environmental Safeguards**



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

Ecosol Consultancy Sdn Bhd is contracted to monitor and review SEGAN's compliance with the recommendations set out in the EIA. The results of their reviews are presented in Environmental Monitoring Reports (EMR) which are produced twice each year for the periods April to September and October to March.

#### **6.4.2 Use of chemicals**

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

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

However, SEGAN 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 SST as chemicals are expensive to procure and apply. Reducing these activities would have a substantial financial as well as environmental benefit to SEGAN.

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.

#### **6.4.4 Monitoring exotic plant introductions**

SEGAN's management is aware of the potential problems that might arise from the introduction of exotic species. However, no exotic species grown by SST has been identified as an invasive plant pest by any Malaysian government agency. Furthermore, only three exotic genera (*Acacia*, *Eucalyptus*, and *Gmelina*) are currently planted commercially (as opposed to trialled). All three are known to regenerate naturally, to a greater or lesser degree, under SEGAN's conditions but this is not considered to be an adverse environmental impact. To date only *A. mangium* has established itself outside of the LPF. However, it 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 it may be considered as beneficial because it both protects and, as nitrogen fixer, improves the soil. As the local demand for mangium logs increases this might also create economic opportunities for SEGAN's communities. If the nearby Samarakan pulp mill should eventuate this could improve local opportunities even more as, should FDS make the necessary changes, the local communities might be able to participate in supplying chip logs. (This is the case for those living near the Sipitang pulp mill and in the Hijauan Benkoka/Acacia Forest Industries area – both which are in Sabah.)

Monitoring is by observation.

#### **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 SEGAN's flora and fauna and of the ecosystems in which they are found, is very much dependent on the residual natural forest in the riparian buffer zones and the conservation areas which together represent more than 15% of the gross area of the LPF. There will be, as yet unidentified, contributions to bio-diversity from the *planted* forest areas. Indeed, even the areas of SA in their various stages have a part to play in contributing to the overall bio-diversity of an area.

As stated in Section 4.2.2 the SMZs are protected areas. This protection should ensure that the current level of bio-diversity does not diminish; indeed over time the diversity of the flora should increase with the arboreal component developing in terms of DBH and height (i.e. structure) with the species composition

becoming, albeit very slowly, more diverse (see 6.6 Residual Forest). The SEGAN plantation maps show that the SMZs are widely distributed throughout the LPF. Currently they represent about 16% of the *whole* LPF - including SA. It is expected that this percentage will continue to increase over time as the pre- and post-harvest GPS surveys better define the land categories. Between first revision of the FPMP in mid-2013 and this fifth revision the area under protected SMZ has already increased from 14.5 to 15.9% - representing an increase of almost 10%.

## **6.6 Residual Natural Forest**

### **6.6.1 Background**

The EIA stated (see 5.1) that both the MDF on the mineral soil and the PSF on the peat have been subject to very heavy logging.

The residual natural forest is very much secondary in physical structure although in terms of genetic diversity its flora is probably little changed. However, as no study was undertaken to establish baselines prior to harvesting the original levels of diversity of the flora (and of the fauna) of the no longer extant primary forest types remain unknown.

### **6.6.2 Monitoring and research**

In collaboration with Dr Ong Kian Huat<sup>1</sup> the *establishment* of a network of 25 PSPs, each of 400 square metres, was completed in October 2015. The initial objective is to monitor the development of the structure and composition of the residual natural forest under protection as a SMZ. The development (growth) of individual trees and any changes in arboreal species diversity will be recorded. It is Samling's expectation that this will be a long-term project running for at least the currency of the LPF licence and any extensions thereto. It is also expected that UPM, and others, will make use the PSP network for research into the many other areas of interest that are presented by these PSPs and the conservation areas. (See 12.3.2 for some initial results of this collaboration.)

## **7. Socio-Economic Context**

### **7.1 Contribution by Current and Future Forest Operations**

The net plantable area for the nine ITPs (including their oil palm component) in the Bintulu District was 285,230ha in December 2011. With only about 5,000 ha currently planted (including TUP) SEGAN is a very small contributor to the District's ITP total. The area of SEGAN's immediate neighbour, Sarawak Planted Forest, is, alone, in excess of 125,000 ha planted (although not all is in the Bintulu District).

The SEGAN resource is however important to Samling and to the District's economy as logs are produced only for Samling's own downstream operations: plywood, sawn timber, furniture, door skins and wood pellets.

Harvesting of *A. mangium* started in 2010. Harvest planning is based on a sustainable allowable annual cut with rotations of 8 to 12 years depending on species.

Maintaining a sustainable flow of logs suitable for Samling's solid wood downstream requirements is the key management objective at SEGAN.

The determination of the AAC is based on:

- the most recent PSP results;
- areas of mangium being over age and having negative increment; and
- the need to normalise the plantation.

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<sup>1</sup>Faculty of Agriculture and Food Sciences, Universiti Putra Malaysia, Bintulu Sarawak Campus.

## **7.2 Employment and Services**

At 30 September 2018 SEGAN employed 39 full time staff at supervisor level and above; of these 33 are Sarawakian. However, only 20 of the 79 strong in-house labour forces are locals. The competition for local workers from offshore oil and gas employment and the oil palm industry (both own planting and estates) is strong. Segan is an equal opportunity employer: 43% of the local Sarawakian work force is female – primarily in the nursery.

Establishment, plantation maintenance and harvesting in SEGAN is done using a mix of contractors and in-house labour; trucking is mainly by contractors. The greater part of the logistical support is supplied locally from Bintulu, e.g. engineering, spares, supplies and waste disposal.

## **7.3 Adjacent Lands**

SEGAN ITP was established primarily on degraded forest land and the adjacent lands have a similar history. Much of the common boundary is shared with Sarawak Planted Forest Sdn Bhd where, in the Segan West, there is sometimes a mutual riparian buffer zone or conservation area, albeit of very heavily disturbed remnant mixed dipterocarp forest. A significant length of the LPF's common boundary is shared with two oil palm estates. Most of the balance of the LPF boundary is formed by either Sg Segan or Btg Kemena.

In addition to the above-mentioned adjacent areas SEGAN's boundaries also abut on to, or pass through, what is categorised as shifting agriculture (SA) much of which is in fact settled agriculture. This agriculture sometimes extends well inside the LPF area.

There are no immediate neighbouring suburban or residential developments which would be important for the consideration of aesthetic values and additional safety considerations during forest operations. The proposed Samarakan Township is to the south of the West and East blocks and does not impinge directly on the ITP.

## **7.4 The Value of Forest Services**

As the Socio-economic Profiling Study clearly shows there is virtually no demand for forest services in the form of boat and house building materials and non-timber forest products such as fish, wild meat, honey, sago, nipah, rattan etc.

No felling of trees for the purpose of providing timber for own use in boat building, house building, and repair has been observed in the LPF and specifically in the SMZs, for some time.

The interest in oil palm has resulted in occasional encroachment into demarcated river buffer zones. When encroachment is noted by SEGAN staff a report is made to the authorities (FDS and NREB) who generally respond to inspect and to talk to the perpetrators.

## **7.5 Socio-economic Survey**

### **7.5.1 No significant impacts**

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

An identifiable positive economic impact results from the employment provided with 23 local people (out of 53 Sarawakians) directly employed in SEGAN. Further opportunities for employment have been created in the downstream activities that process the logs from SEGAN in the Bintulu District.

Apart from providing employment for local people in the SEGAN ITP another positive impact has been as a result of SEGAN giving assistance with preparing sites for new housing. However, this assistance has necessarily been quite restricted because the requesting communities are very often a) not registered with the District Office, and b) are actually on land licensed to others – quite frequently SEGAN's neighbour, SPF.

## 7.5.2 Consultations

The number of communities actually within the LPF is very small. In each of the Sebauh and Samarakan areas there are only three. Without exception these are all within SA, as are all the other nearby communities. This means that the ITP operations have little or no direct physical impact on any communities within or close to the LPF. Consultations are usually in the form of the negotiations that precede obtaining permission to clear degraded residual forest – termed as either old or new temuda - for new planting. It follows from this, as stated in 7.5.1, that, other than the provision of employment, the SEGAN ITP operation has little or no social, or environmental, impact - either direct or indirect - on the various nearby communities.

## 8. Establishment and Silvicultural Systems

### 8.1 General

SEGAN LPF was one of the earliest ITPs to be established in Sarawak: planting started in 1999/2000. 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<sup>2</sup>.

### 8.2 Choice of Species

#### 8.2.1 Background

When planting started in 2000 the management objective was to produce only chip wood. This objective was revised 3-4 years later to the current objective. At that time mangium was the species of choice throughout Malaysia and, generally, it still is. The perceived wisdom at the time was that mangium would 'grow well - anywhere'. Time has clearly shown that this is not correct. Although it has performed reasonably well in SEGAN, mangium's performance to date has been well below the forecasts made prior to start-up of the LPF.

*Acacia mangium* and *Eucalyptus pellita* are the main species.

Alternative species are still being trialled by R&D and some species that did not perform well in earlier trials are being tried again: two in particular being *Paraserianthes falcataria* (falcataria) and *Gmelina arborea* (gmelina).

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.

#### 8.2.2 Site-species matching

The peat soils are physically and chemically very different to the mineral soils and with the exception of *Melaleuca* spp. no species has been identified that is particularly better suited to peat than to mineral soils.

There will no doubt be subtleties provided by differing chemical characteristics of the various series and 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. With the exception of the associations that include the Bako series, all the major mineral soil associations are capable of supporting ITP species. However, the Bako series – which gives rise to kerangas soils and the associated kerangas vegetation – is only a minor component of each of the two associations in which it has been recorded.

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<sup>2</sup> "The Establishment & Management of *Acacia mangium* for solid wood products." by Boden, D. and Molony, K. (August 2015) was commissioned by SFC. It contains little factual information that is applicable to Sarawak regarding growing mangium for solid wood use. The authors conclude that growing mangium for this use cannot be recommended at present!

Over time the planted species diversity might better reflect the diversity of planting sites available. But any successful increase in species diversity will require: a] a wider range of economic species than has currently been identified; and, b] a much greater knowledge of both the soils and of the requirements of the economic species that might be best suited to them. Soil maps are available, but these are based on reconnaissance level surveys and produced at a scale of 1:250,000.

### 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 very positive attributes of this species. However, in Sarawak to date there is insufficient knowledge of seed sources and related genetics, nursery practice through to ITP silviculture for this species. There has been at least one relatively large scale failure and a success in Sarawak at an operational ITP level is unknown - to Samling at least. An earlier trial of this species in Segan was a failure but Samling continues to plant it, and *N. macrophylla*, on very limited areas of selected sites elsewhere.

*Pterygota alata* was introduced in 2011 and from the outset suffered badly in Segan from an insect defoliator; the good early day performance shown in other Samling LPF's generally failed to follow through. Similarly with *Alstonia macrophylla* where the good early day performance in Segan did not continue. In 2013 *Endospermum malaccense* and *Dyera costulata* were brought in as tissue culture ramets but did not progress beyond the nursery.

Trials of other species of *Alstonia* have been failures as was that of *Octomeles sumatrana*. (Despite the early failures, in 2015 two seed lots of *Octomeles* were obtained from Sabah for further trial.) *Casuarina equisetifolia* (Coupe1/13E) has shown very variable performance with some well grown individuals and others stunted and moribund. A temporary growth plot established in coastal natural regeneration on reclaimed land showed satisfactory growth performance over almost two years (the annualised DBH PAI was about 4cm over a range of diameters). Peeling tests also were satisfactory. (Its high basic density means that it can be used for construction grade plywood.) Given this information and the need to identify a species that will perform on kerangas and kerangas type sandy soils (e.g. Bako series - 8.2.1) trials of *Casuarina*, (not necessarily confined to *C. equisetifolia*), might justifiably be undertaken.

A trial of *Sandoricum* sp. (sentul or kelampu) was established in 2000 and was unsuccessful.

Three *Melaleuca* spp. have been planted at operational level on peat soils (Coupes 6 and 7). Survival has generally been very good. Only *M. leucadendra* has been tried on low-lying, mineral soils with impeded drainage (2/9D) where again survival was very good but it scored badly for growth and for both branch size and frequency. However, the weighted MAI at 5.8 years was 5.1m<sup>3</sup>/ha, as determined from six PSPs established in Kuala Baram, and does not warrant further planting for the current objectives.

Durian has been planted but not in a formal trial. It scores well for form and for peeling and sawing timber properties. It is said by some fruit growers to grow 'quite quickly' and it could be reasonably P&D resistant.

Samling has spent much time and money on trials of native species. However, at the present time neither Samling nor - so it would appear - any other company in Sarawak has accessed sufficient and reliable information on the use of Sarawak native species in ITP for SEGAN to adopt any other choice of species scenario than that described here.

The recent part assessment of Samling's large scale open planting of kapur (*Dryobalanops lanceolata*) in Ulu Baram (Kelesa FMU T/0412) gave some useful information. A 100% enumeration of all 1,260 surviving planted trees was undertaken in a 62ha block planted at 200 SPH. Survival some 14-15 years after planting was around 50%. DBH averaged 5.8 cm. The stocking for the DBH classes was as shown below:

DBH class	SPH
11-15	10.6
16-20	1.7
21-25	0.4
26-30	0.1

Around 15 years after planting there were only 2.2 surviving trees per hectare of  $\geq 16$ cm DBH, i.e. regardless of stem quality class.

A similar exercise was undertaken for an area of *Shorea macrophylla* - a protected species. The data have yet to be processed but the survival appeared to be at a similar level as the kapur but the growth rate was considerably higher. It is not clear how FDS will treat a planted but protected species when it comes to harvesting. Until this is clarified there should be no further consideration of planting *S. macrophylla*.

In Chapter 9, Plantations, in 'A Review of Dipterocarps'<sup>3</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 moving to the problem of sourcing seed and then moving to undertaking trials.

#### 8.2.4 Utilisation of species selected – end uses

Table 8.1 shows the end uses for the species that have been planted in SEGAN including the possible end uses for the two species which have recently become operational species. Gmelina has already been subject to downstream peeling trials and was satisfactory. It is known to be a versatile species for processing and is a medium quality sawn timber. Falcata is well known in Java as a peeler species but downstream will need to run tests to confirm acceptability for sawing and use in high density fibreboard.

**Table 8.1: End uses of operationally planted species**

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

#### 8.2.5 BORNEOTEAK®

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

### 8.3 Current Establishment and Silvicultural Regimes

#### 8.3.1 *Acacia mangium*

As may be noted the intention is to produce logs that will be suitable for peeling and for sawing. The determinant of suitability is primarily diameter – currently  $>18$ cm sed with an expectation that this will be reduced in time

<sup>3</sup> Eds. Appanah, S & Turnbull, J. M. 1998 CIFOR

## **Good Quality Stock**

As a matter of course Segan will only plant selected stock with good genetic characteristics.

## **Site Preparation and Establishment**

Before planting takes place some site preparation is necessary. This usually involves a herbicide application to kill any emergent weeds, particularly natural regeneration 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

## **Maintenance**

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

## **Silviculture.**

The intensive silviculture regime with four pruning lifts was 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 and yield a proportion of face and back veneer.

### **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 SEGAN 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.

## **9. Monitoring Plantation Forest Growth and Dynamics**

### **9.1 Permanent Sample Plots**

SEGAN is active in the use of permanent sample plots (PSPs) to monitor the growth and to develop growth models.

SEGAN has established, maintains and regularly measures an intensive allocation of PSPs to monitor forest growth and dynamics.

### **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 SEGAN *Eucalyptus pellita* (pellita).

Taper functions will be developed for pellita and other species when there are a sufficient number of representative trees old enough to provide the required DBH range of sample trees.

### **9.3 Result of Monitoring Plantation Tree Growth and Site Productivity**

Growth is highly variable with MAI's ranging from less than 8 to more than 20m<sup>3</sup>/ha. Annual mortality of mangium towards the end of the over extended rotation averaged 13% with a range between blocks of 4% to 35%. The rotation length will be continually reviewed as more PSP data from older trees become available, both from SEGAN and Samling's other LPFs, and more detailed recovery analysis is undertaken by downstream.

## **9.1 Monitoring of Pests and Disease**

### **9.1.1 Regular monitoring**

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

### **9.1.2 Ad hoc monitoring**

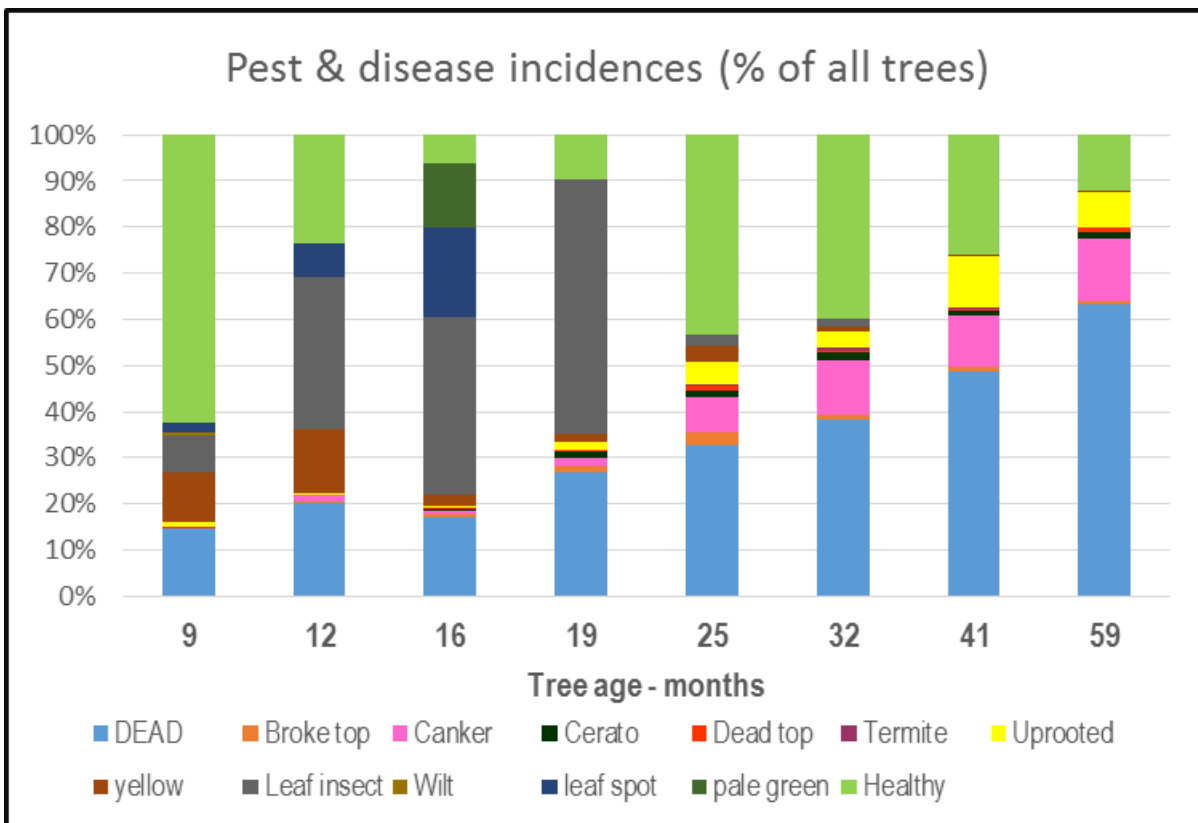
Ad hoc monitoring is undertaken for specific purposes. Figures 9.1 and 9.2 show the results of long term *ad hoc* monitoring of P&D. The main focus was primarily to monitor the progress of *Ceratocystis* which had

been identified in C.01/4B in 2013. As may be noted in Figure 9.2 the incidence of Ceratocystis has yet to become a significant contributor to mortality

**Figure 9.1 – Survival and mortality by age in 2<sup>nd</sup> rotation *Acacia mangium* in Segan 01A/04**



**Figure 9.2 – Mortality and contributing factors in 2<sup>nd</sup> rotation *Acacia mangium* in Segan 01A/04 from age 9 to 59 months**





## **10. Sustainability: Annual Cut, Harvesting Plan & System, Financial**

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 area of ITP planted on mineral soil continues to increase consequent of successful discussion with local land claimants. This is a very slow process but the new planting on such areas, together with improvement of both genetic material and management practice should in due course allow an increase in the AAC.

Early year PSP data from second rotation mangium areas indicate survival and growth rates that are probably somewhat lower that of the first rotation. However, mangium is still a strong option for limited areas of second rotation planting. Monitoring of mortality is via the PSPs.

### **10.2 Harvest Plan**

FDS require a five year harvest plan which following approval SFC then approves annual harvest plans. The in-house harvest plan is dynamic. It is held in soft copy format only (/SEGAN volume forecast) allowing for easy and continual revision as new and revised PSP information is generated. It consists of a register of 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 harvest volume. The register is updated to reflect the reduction factor that takes into account the variance of the actual yield from that estimated for harvest planning purposes.

The sustainable annual cut for the ITP has been determined taking into account the mineral soil areas (i.e., Segan West and Segan East only). The age class structure is heavily skewed towards the older years (see Figure 5.1). The management objective is to achieve a normal forest age class structure whilst at the same time trying to maintain a regular flow of mangium logs to downstream. This means that some blocks might be harvested when considerably older than their target rotation age and would result in negative increment. Despite the objective of creating a normal plantation age class structure the harvesting rate might have to be increased to avoid the financial losses that would result from negative increment. However, any effect arising from such an increase will be cushioned by the past years of harvesting significantly well below the AAC.

### **10.3 Harvest System**

Because of the steep, broken terrain yarding is the primary harvesting system used at SEGAN. As well as being economically more efficient the use of this system also helps to protect the fragile soils and in particular reduce erosion and compaction. Avoidance of the latter effect is of particular importance when replanting with eucalypts.

Currently SEGAN uses a mix of semi-mobile integral tower skyline yarders of its own manufacture and shovel yarders. These yarders run cable systems that enable partial or full suspension of felled trees when yarded to a landing for partial processing. SEGAN uses a combination of in-house and contractor crews for the targeted AAC of 42,000MT/year.

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.

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

## **10.4 Financial Sustainability**

SEGAN is the smallest of eight ITPs licensed to the Samling Group. The Group has clearly been financially supportive of SEGAN for the past 18 years and of the other ITPs since their start-ups. It should be assumed this will continue to be so for the foreseeable future. However, SEGAN should be in a cash flow positive position for the remainder of the 60 year licence period with net revenue from log sales more than covering replanting and overhead costs. (See Annual Budget – soft copies held in SEGAN & Miri HQ.).

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

### **11.1 Spatial Information**

With the ArcGIS Samling has a GIS that contains detailed spatial information for the LANA LPF. Data are captured by the QS team using Garmin 76CSx. LiDAR commissioned by Samling covers part of the area. GPS tracks are downloaded using OziExplorer. Tracks are then cleaned and processed using Quantum GIS. GIS data is 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 legal, coupe and block boundaries, protected areas, land-use and related spatial information, such as contours and transportation features. Harvest planning will be done manually on maps generated from the GIS and where available - with LiDAR providing contours at 5m intervals. Currently, purchase of IFSAR data for those areas not covered by LiDAR is under consideration.

GPS tracks are backed up at LANA. After arrival at Miri HQ 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**

Plantation event information is captured by the SEGAN office through the use of Project Job Order (PJO) forms in the Enterprise Resource Planning System (ERP) - Microsoft Dynamics AX. At Miri HQ a copy of this event information is then updated into ATLAS GeoMaster. Plantation executives may download the event information into GeoMaster Mobile app and then view the event information onsite using a smart phone.

Payroll and financial information, stock ordering and stock control are managed using the ERP system

## **12. Conservation, Conservation Areas and High Conservation Value Areas**

### **12.1 Conservation**

Given the past history of wide spread, heavy harvesting with multiple re-entry it is not surprising that undisturbed primary forest has yet to be identified within the ITP. Apart from the boundaries formed by Btg Kemena, Sg. Segan and Sg. Binia most of the LPF boundaries are mutual with oil palm estates (or areas designated to become oil palm estates), shifting or settled agriculture or with Sarawak Planted Forest's ITP.

This history, its small size and occupations of its neighbours all mitigate against, but do not necessarily preclude, Segan having much relevance to conservation in general and as a haven for endangered, rare, threatened species (ERT) in particular. This is of course especially true for larger animals. But however limited the potential might be SEGAN 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 ERT 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 harvesting.

It is Samling's policy that anyone working in SEGAN should have a positive approach to conservation and be involved with the process of protecting ERT species. Contractors are asked to note, either verbally or in writing, the location and type of any rare or threatened species they come across in their day to day activities.

As a forestry company with increasing ITP interests SST also views its forest plantations as a contributor to reducing pressures on the harvesting of MTH in Sarawak and Malaysia (and therefore globally).

### 12.2 High Conservation Value Areas

Assessment of HCV followed the WWF Toolkit for Malaysia using an external consultant following which stakeholder meetings were held.

Whilst no areas of HCV have been designated almost 16% of the whole area of the LPF, has been classed as Special Management Zones. These SMZs are actually demarcated on the ground prior to GPS tracking and mapping and are protected areas.

### 12.3 Wildlife Monitoring

#### 12.3.1 Fauna

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

**Table 12.1: Segan wildlife monitoring record - annual animal sightings<sup>4</sup>**

Annual summary of sightings						
Common/Local Name	Scientific Name	Year				
		2014	2015	2016	2017	2018
Asian Black Hornbill (Kekalau)	<i>Anthracoceros malayanus</i>	9	4	11	2	5
Sambar Deer (Rusa/Payau)	<i>Cervus unicolor</i>	7	3	3	2	0
Bearded Pig (Babi Berjanggut)	<i>Sus barbatus</i>	6	4	7	4	4
Pig Tailed Macaque (Beruk/Nyumboh)	<i>Macaca nemestrin</i>	3	3	0	0	6
Plantain Squirrel (Tupai Pinang)	<i>Callosciurus notatus</i>	2	2	2	6	8
Slow Loris (Kongkang)	<i>Nycticebus coucang</i>	2	2	0	4	4
Python (Ular Sawa)	<i>Python sp.</i>	2	2	0	2	2
Malayan Porcupine/Common Porcupine (Landak)	<i>Hystrix brachyura</i>	2	3	5	6	5
Long-tailed Macaque (Kera)	<i>Macaca fascicularis</i>	1	1	8	1	1
Mousedeer/Chevrotain (Pelanduk)	<i>Tragulus napu</i>	1	2	0	0	0
Flat-headed Cat (Kucing Hutan)	<i>Felis planiceps</i>	1	1	0	0	0
Sun Bear (Beruang Madu)	<i>Helarctos malayanus</i>	1	0	0	0	0
Wrinkled Hornbill (Burung Enggang Kedut)	<i>Aeros corrugatus</i>	1	0	1	0	0
Rhinoceros Hornbill (Kenyalang)	<i>Rhinoceros buceros</i>	1	1	0	0	0
Bulwer's Pheasant (Sempidan)	<i>Lophura bulweri</i>	1	0	0	0	0
Prevost's Squirrel (Tupai Gading)	<i>Callosciurus prevostii</i>	0	3	0	0	0
Muntjac/Barking Deer (Kijang)	<i>Muntiacus sp.</i>	0	0	3	3	3
Monitor Lizard (Biawak)	<i>Varanus salvator</i>	0	0	1	5	9

Source: Patrol reports & ad hoc notifications

<sup>4</sup> As recorded through any evidence of existence e.g., sighting, spoor, droppings, calls, scratchings, etc. etc.

### 12.3.2 Flora

Twenty-five PSPs were established by SEGAN in conjunction with UPM during 2015. The plots are 400m<sup>2</sup> in which all living trees  $\geq 10$ cm DBH were measured and identified in most cases to species level. In total some 923 individual trees were tagged with the following distribution:

Families - 49  
Genera - 127  
Species - 300

By far the most dominant family is the Dipterocarpaceae with 253 individuals recorded followed by the Euphorbiaceae with 53 individuals recorded. Interestingly seven of the dipterocarps identified are in the Sarawak Plant Red List with an additional four in the Malaysian Plant Red List:

	<b>Red Plant List</b>	
	<b>Sarawak</b>	<b>Malaysia</b>
<b>Dipterocarpus cuspidatus</b>	<b>X</b>	-
<b>Dipterocarpus sarawakensis</b>	-	<b>X</b>
<b>Dryobalanops beccarii</b>	-	<b>X</b>
<b>Shorea materialis</b>	<b>X</b>	<b>X</b>
<b>Dipterocarpus tempehes</b>	<b>X</b>	<b>X</b>
<b>Shorea atrinervosa</b>	-	<b>X</b>
<b>Shorea dasyphylla</b>	-	<b>X</b>
<b>Shorea acuminatissima</b>	<b>X</b>	-
<b>Shorea agamii</b>	<b>X</b>	-
<b>Shorea biawak</b>	<b>X</b>	-
<b>Shorea domatiosa</b>	<b>X</b>	-

## 13. Social Multiple-Use

### 13.1 By the Local Population

#### 13.1.1 Recreational Pursuits

Personal safety on logging roads is an unavoidable issue and security of both the company's and contractors' equipment and workers' property is an on-going problem. This leaves little opportunity for recreational pursuits within the LPF by the general public. Members of NSSB and other such organizations are of course encouraged to approach SST to discuss arranging visits which should serve to further our knowledge of the area's biodiversity.

#### 13.1.2 Hunting and Fishing

Hunting is prohibited other than for members of the local community and then only for personal consumption. The opportunities for fishing within the LPF are very limited. Where Sg Segan forms the LPF boundary the actual water course lies outside of the LPF; where it passes through Coupe 1 access is by boat as road access is restricted but the river here is generally very shallow and boulder strewn making travel difficult.

#### 13.1.3 Other

Some very limited use is made of the nipah fringes (Table 3) of the Btg. Kemena, Sg. Segan, Sg. Silas and Sg. Binai by people from Kpg. Kuala Segan which lies downstream of the North Block. Although there is very small sago 'factory' just downstream of Kuala Segan there is no evidence that use is made of sago from within the LPF.

Whilst not multi-use of the *forested* area, the use of the long-established SA areas within the LPF (but which are excluded from the plantable area statement in LPF licence) still continues - often in a more settled manner with oil palm and rubber planted by individuals as opposed to estate operators.

### **13.2 By Others**

Samling has an arrangement with the Faculty of Agriculture and Food Sciences, Universiti Putra Malaysia, Bintulu, Sarawak Campus for the establishment of a monitoring network of PSPs (see 6.6.2). It is Samling's hope that this will be a very long-term monitoring project that will provide numerous areas of research for MSc and PhD students.

SEGAN also hosts students from this faculty from time to time giving them work experience and insights to a career in tropical forestry.

SEGAN has been providing field assistance to research workers from the Biotechnology Program of the Faculty of Engineering, Computing & Science (Swinburne University of Technology Sarawak Campus). This is in support of a project entitled: An Ecosystem Approach towards Formulation of a Biofertiliser Containing Growth-Enhancing Rhizospheric Microorganisms for Silviculture of *Neolamarckia cadamba* and *Eucalyptus pellita* in which both the Sarawak Forestry Corporation (SFC) and Sarawak Timber Association (STA) are collaborators.

On 29<sup>th</sup> January 2016 Samling entered into a long-term R&D co-operative agreement with SFC for planted forests.

### **14. Cultural and Historic Values**

No sites of cultural or historic value were identified within SEGAN by the EIA. None has been subsequently identified on the ground and local knowledge indicates that there are none.

The EIA states that there are no salt licks within the ITP and subsequent enquiries have reinforced this statement and confirm that there are none known nearby.

## **15. OCCUPATIONAL SAFETY AND HEALTH**

### **15.1 Introduction**

In 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 Health, Safety, and Environment (HSE) Policy Statement**

The FMU 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, egress to and from work places, emergency response (ERT) for rescue, control of environmental spill and natural disaster in so far as practicable;
- Provision of information, work instruction, training and supervision for all staff to enhance work competencies, skills and awareness in SHE, and the implementation of Best Management Practices (BMPs) in the industry;
- 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. The role of camp management is as follows:

- To hold regular Health and Safety Committee meetings and to enforce procedures to reduce or eliminate health and safety hazards in the work place;
- To carry out safety and health inspections and enforce disciplinary measures on errant employees to ensure the safe operation of the Samling's machinery, tools and equipment and to provide a healthy environment;
- To give proper instruction and orientation on safe working procedures and health, awareness to all new employees when they report for work and to ensure that hazardous activities are only to be carried out by competent personnel;
- To select key personnel to undergo training on safety and health matters as may be decided by Samling;
- To ensure that all employees use appropriate Personal Protective Equipment (PPE), such as safety helmets, gloves and vests, during field operations;
- To consider the Safety Officer's and /or the Safety Committee's findings and recommendations with regard to the cause of any accidents and to review any form of unsafe practices as and when reported and to take appropriate corrective actions;
- To promote co-operation among all Samling's employees and contractors in propagating, developing and carrying out measures to ensure safety for everybody;
- To prohibit the consumption of alcohol in the work place and to have zero tolerance of any form of drug abuse;
- To ensure proper road safety signboards are displayed;
- To notify the relevant authorities of any accident arising out of employment by Samling that results in death, or in serious bodily injury that prevents an employee from attending his normal work for more than four calendar days, by the quickest means available; and
- Where a dangerous incident occurs in the work place, to notify forthwith to the nearest Department of Occupational Safety and Health (DOSH) office by the quickest means available, and within seven days, report the incident using the approved DOSH form.

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**

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

## **16. Monitoring**

### **16.1 Introduction**

This is the first mid-term review of the SEGAN FPMP and the short term results of monitoring some aspects of the LPF's operation have been captured. The elements monitored, and the results are referred to, in the following section.

### **16.2 Elements to be Monitored**

The following elements are monitored:

- a) Yield of forest products (logs) harvested is monitored through the daily trucking reports. These reports are summarised by year in Section 10.2 of the FPMP where Figure 10.1 shows the result of monitoring the accumulated production to date and comparing it against the ACC.
- b) Growth rates are monitored through a strong network of PSPs. The actual growth rates of mangium based on the real production and that for pellita based on PSP data discussed in Chapter 9.
- c) i] The 25 PSPs in remnant natural forest established by SEGAN in cooperation with UPM are currently in the process of being re-measured for the first time. Some initial results are shown in in Section 12.3.2. On completion of the first re-measurement the data will be processed.  
ii] The annual summaries for the monitoring of fauna is shown in Table 12.1
- d) As both the SIA and EIA attest SEGAN LPF is not in any way fundamental to meeting the basic needs of the nearby communities and there is little to actually monitor in this respect. What absolutely minimal use is made of the area in terms of NTFPs will surely lessen as the nearby population ages, continues to decline and to change consumption patterns to a more modern way of life. The impact of operating the ITP area has no or negligible social impact other than in providing employment for those with the relevant skills or for those who wish to obtain such skills. Employment levels are monitored by recording the actual numbers of locals employed at the same month each year. Compliance with the EIA requirements is monitored by the half yearly EMR.
- e) Productivity (for harvest productivity this has already been covered in volumetric terms in Chapter 10 of the FPMP and the efficiency of forest management are monitored by budgetary controls under the HQ accounts section.
- f) The risk of invasion<sup>5</sup> by exotic species planted by SEGAN or of invasion of the LPF by exotic species planted by external third parties is monitored during the regular patrol reports. To date no invasion of significance has been note as attested by the patrol reports.
- g) Regular monitoring of pest and disease is through information captured at the time of PSP measurement together with ad hoc monitoring – see Figures 9.1 and 9.2 in Chapter 9.

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

### **17.1 Background**

ITP is still a relatively very young industry in Malaysia. Planting only started in SEGAN in 2000. The Samling downstream mills that use Segan's ITP logs are still addressing the technical challenges and changes required when processing plantation logs and in marketing the products made from BORNEOTEAK®. Although other plantation species have been trialled the challenges of processing and marketing them at a commercial level are still to come.

To take into account new knowledge, Samling R&D findings, developments within the ITP sector and to ensure that as far as is possible SEGAN meets downstream's evolving requirements an annual review of the FPMP may, at management's discretion, still be necessary for the next few years. This will be followed by

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<sup>5</sup> 'Invasion' here means an exotic species growing where it was not intended that it should.

revisions as deemed appropriate. This somewhat frequent review schedule is recognised by Samling as being an important part of an on-going learning and implementation process. This process will assist in ensuring continual improvement of the management of SEGAN ITP and, in particular, the achievement of the primary management objective.

## **17.2 Review and Revision**

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

### **17.2.1 Optional Review**

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

### **17.2.2 Revisions**

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

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

Other than a mid-term or end of term review that indicates the need for a revision of the FPMP a revision may result from any one of a number of triggers such as:

- new information from operational monitoring or research becoming available and being used to make significant improvements or necessary changes;
- new information becoming available to senior management and resulting in policy change;
- biotic or weather events the nature of which have or might have a significant impact on the management objectives;
- changes in downstream planning or requirements; and
- new or revised regulations imposed by the government.

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