



Syarikat Samling Timber Sdn Bhd
A member of Samling Global Limited



PUBLIC SUMMARY

Forest Plantation Management Plan for LPF/0014 – SEGAN

Edition 3
(Revised 30th October 2015)

Subject to annual review

Revised by:

David Marsden
Chief Forester

Approved by:

James Ho Yam Kuan
Chief Operating Officer

PUBLIC SUMMARY

Forest Plantation Management Plan for LPF/0014 – SEGAN

Edition 3

Review and Revision History

Edition	Action	Date
2	Revision	15 November 2013
2	Review	12 November 2014
3	Revision	30 October 2015
3	Review	04 November 2016

Contact person:

David Marsden
Chief Forester
marsdend@samling.com.my

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.)

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. Within 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° 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

The North Block, comprising almost entirely shallow peat soils, 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 the North Block: "...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 the North Block (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 the West Block and East Block 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 licensed area 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 subsequently.) 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 areas known respectively 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 – 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

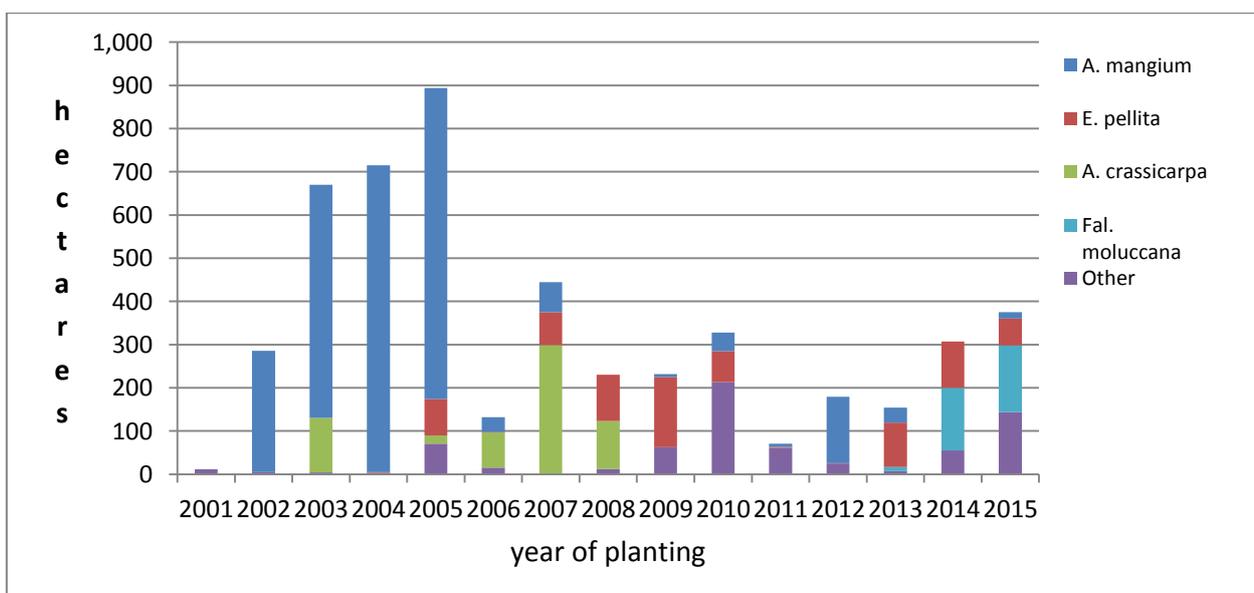
SST holds a 60 year lease over land on which it is licensed to establish an ITP. The lease (LPF/0014) was issued on 27th January 1999. The leased land is in three discrete blocks some 15 to 35km south east of Bintulu, in the Bintulu District and Sebauh Sub-District of Bintulu Division. The three blocks are known individually as: the West, East and North blocks and are referred to as such in this management plan. The gross area is 10,908ha of which only 54% is productive ITP area. The unproductive balance is SA and protected SMZs.

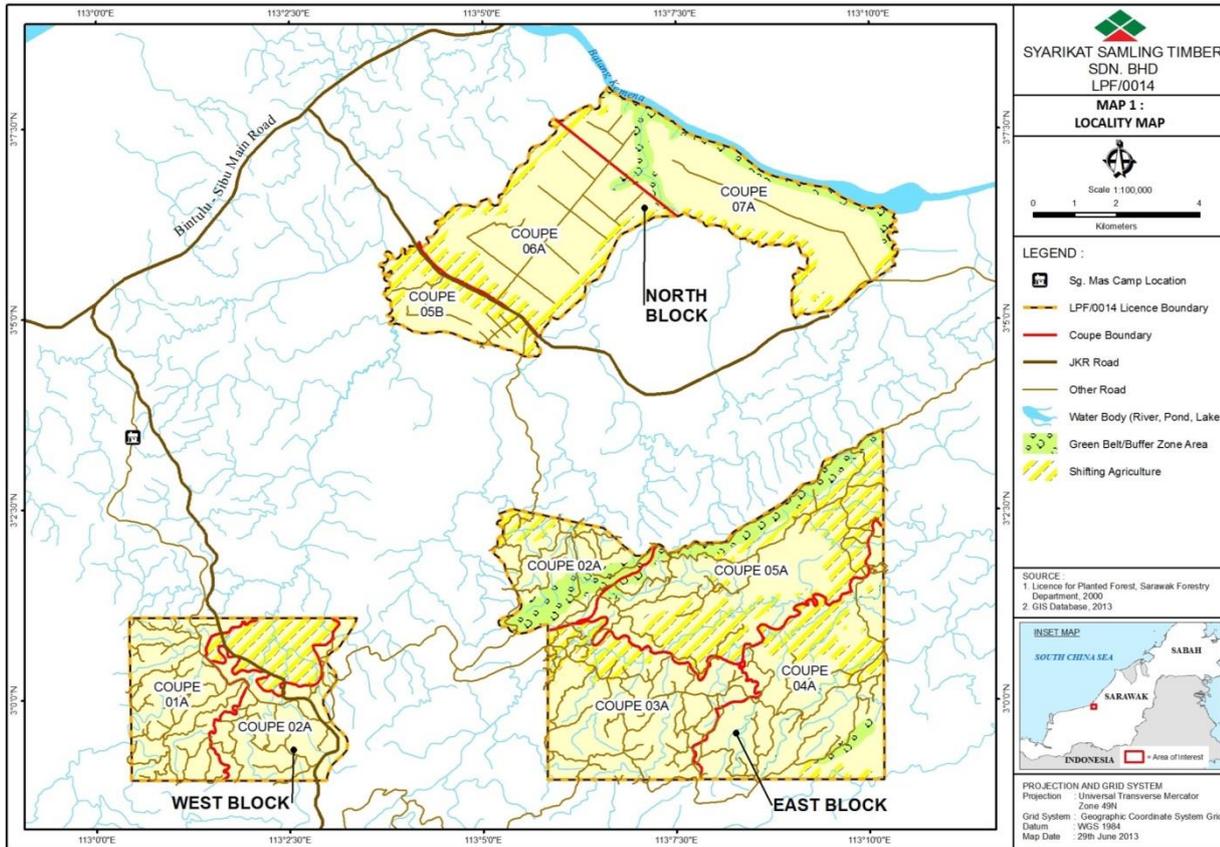
5.3 Industrial Tree Plantation (ITP) Resource

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) 20 June 2015

(Source: Segan Block master June 2015 File: FPMP Tab 1 & 2)





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 - 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.

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 for re-planting. 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.)

'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 government agency. Furthermore, only four exotic genera (*Acacia*, *Eucalyptus*, *Gmelina* and *Paraserianthes*) are currently planted commercially (as opposed to trialed). All four are known to regenerate naturally, to a greater or lesser degree, under SEGAN's conditions but this not is 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 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 more than 15% 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 second revision the area under protected SMZ has already increased from 14.5 to 15.2% - representing an increase of almost 5%.

At present the area designated as protected and forested SMZ represents almost 22% of the total forested area within the LPF.

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 in the past.

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 prior to logging to establish baselines 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

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.

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 5,000 ha currently planted 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 only produces logs only for Samling's own downstream operations.

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 SAAC 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.

7.2 Employment and Services

At 30 September 2015 SEGAN employed 15 full time staff at senior supervisor level and above; of these six are expatriates and one is a West Malaysian. A further 51 Sarawakians are employed in administration, R&D, nursery and operations with the balance comprising 96 Indonesians on two year contracts. The competition for local workers from offshore oil and gas employment and the oil palm industry (both own planting and estates) is strong. However, almost 70% of the SEGAN's Sarawakian work force can be considered as 'local', e.g. Ulu Sebauh Road, JKR Samarakan Road, Bintulu and Tatau etc. Segan is an equal opportunity employer: of the Sarawakian work force 35 are male and 24 are female.

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 West Block, 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 impact

From the results of the Socio-economic Profiling Study 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.

An identifiable positive economic impact results from employment provided with 42 local people (out of 59 Sarawakians) directly employed in SEGAN. Opportunities for further employment are 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 perhaps the greatest impact has been as a result of SEGAN giving assistance with preparing sites for new housing. However, this assistance has necessarily been somewhat 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 it is 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.

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 agencies¹.

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* (falcata) 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.

8.3 Current Establishment and Silvicultural Regimes

8.3.1

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 >18cm sed with an expectation that this will be reduced in time

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.

¹ "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!

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 Result of Monitoring Plantation Tree Growth and Site Productivity

Growth is highly variable with MAI's ranging from less than 8 to more than 20m³/ha. 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.

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 Sustainable Allowable Annual Cut (SAAC)

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 SAAC.

Pending further assessment it is has been assumed that peat areas will not yield a commercial harvest.

Early year PSP data from second rotation mangium areas indicate survival and growth rates that are probably not too dissimilar to that of the first rotation. Mangium is therefore a strong option for limited areas of second rotation planting. Monitoring of mortality is via the PSP.

10.2 Harvest Plan

The harvest plan is dynamic. 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 SAAC. The register is updated to reflect the reduction factor that takes into account the variance of the actual yield from that estimated.

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.

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 15 years and of the other ITPs since their start-ups. It should be assumed this will continue to be so for the foreseeable future.

11. Conservation, Conservation Areas and High Conservation Value Areas

12.1 Conservation and Conservation Areas

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 22% of the forested area of the LPF, excluding forested belukar, have been designated as Special Management Zones: meaning that they are actually demarcated on the ground and protected.

13. Social Multiple-Use

13.1 Local Population

Hunting is prohibited other than by members of the local community and then only for personal consumption.

Limited use is made of the nipah fringes of the Btg. Kemena, Sg. Segan, Sg. Silas and Sg. Binai by people from Kpg. Kuala Segan which lies downstream of the North Block.

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.

15. Forest Plantation Management Plan – Review and Revision

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 is necessary for the next few years. This will be followed by revisions as deemed appropriate.