

PESAMA TIMBER CORPORATION SDN BHD (PESAMA)

PUBLIC SUMMARY OF THE SUSTAINABLE FOREST MANAGEMENT (SFM) OF CHERUL FOREST CONCESSION (CFC) UNDER THE 2ND CYCLE OF THE MALAYSIAN SELECTIVE MANAGEMENT SYSTEM (SMS)

KEMAMAN, Terengganu

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(UPDATED)

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ACRONYMS AND ABBREVIATIONS

AWA	Annual Working Area
C	(Forest) Compartment
CFC	Cherul Forest Concession
CSR	Corporate Social Responsibility
DBH, dbh	Diameter at breast height
DF	Directional Felling
FRIM	Forest Research Institute of Malaysia
GFTN	Global Forest Trade Network
GLC	Government-Link Company
GPB	Golden Pharos Berhad
HCVF	High Conservation Value Forest
FMP	Forest Management Plan
FMU	Forest Management Unit
FSC	Forest Stewardship Council
JPNT	Jabatan Perhutanan Negeri Terengganu
KPKKT	Kumpulan Pengurusan Kayu Kayan Terengganu Sdn Bhd
m.a.i.	mean annual increment
MEI	Measurable Effectiveness Indicator
MTCS	Malaysian Timber Certification System
NFA	National Forestry Act
NFP	National Forestry Policy
NGO	Non-Governmental Organization
OSH	Occupational Safety and Health
P&C	Principle and Criteria (of Forest Stewardship)
PCT	Potential Crop Tree
PESAMA	Pesama Timber Corporation Sdn Bhd
PSP	Permanent Sample Plot
R&D	Research and Development
RBP	Riparian Buffer Protection
RIL	Reduced Impact Logging
SFM	Sustainable Forest Management
SIA	Social Impact Assessment
SMS	(Malaysian) Selective Management System
SOP	Standard Operating Procedure
TP	Timber Production
TPA	Totally Protected Area
TRF	Tropical Rain Forest
TSFD	Terengganu State Forest Department
WWF	World Wildlife Fund

Public Summary **of The Sustainable Forest Management (SFM) of Cherul Forest Concession (CFC), Terengganu Under The 2nd Cycle Of The Malaysian Selective Management System (SMS)**

1.0 The Forest Management Plan (FMP) for Cherul Forest Concession (CFC)

Pesama Timber Corporation Sdn Bhd (Pesama) is one of the subsidiaries of the Terengganu State Government - linked company (GLC) Golden Pharos Berhad (GPB). Pesama manages the 23,243-hectare Cherul Forest Concession (CFC) in Kemaman district, Terengganu based on an agreement newly signed between the parties concerned on 2nd July 2017. Among others the agreement stipulates that the management of CFC should follow the dictates of the long-term Forest Management Plan (FMP) which covers a **30-year period** of 2009 till 2038.

The FMP was prepared in accordance with the requirements of the Malaysian *National Forestry Act 1984*, and geared to comply with the certification standards of established forest certification systems such as those of the Malaysian Timber Certification System (MTCS) and the Forest Stewardship Council (FSC). The FMP gives effect to the National Forestry Policy (NFP) whereby the management team of Pesama, under the general guidance of the Kumpulan Pengurusan Kayu Kayan Terengganu Sdn Bhd (KPKKT) seeks to manage CFC based on the globally-accepted principle of sustainable forest management (SFM). The latter places equal emphasis on the three key aspects of a sound forest resource management, namely

- (a) economic viability and technical feasibility of operation;**
- (b) corporate social responsibility and;**
- (c) environmental protection and biodiversity conservation.**

Along the same breadth, and in an effort to enhance and maintain its management standard and quality and international reputation, Pesama has adopted the Forest Stewardship Council's Principles and Criteria (FSC P&C) for Forest Management and Conservation, as the framework within which to identify Pesama's management priorities and strategies, and set measurable effectiveness indicators (MEIs) over the entire Plan period of 30 years from 2009 - 2038. Consequently, in view of this long time span Pesama regularly conducts reviews and revisions of the FMP from time to time on periodic basis so as to maintain the continued relevance and functionality of the FMP.

FSC P&C has determined the following as the criteria for a successful SFM:

- (a) the conservation of biodiversity,**
- (b) the maintenance of productive capacity,**
- (c) the maintenance of ecosystem health and vitality,**
- (d) the conservation and maintenance of soil and water,**
- (e) the maintenance of forests' contribution to the global carbon cycle,**
- (f) the maintenance of natural heritage, and**
- (g) the contribution to and maintenance of socio-economic values.**

In short, Pesama is committed to fulfill FSC P & C in its entirety. Pesama is also committed to the successful implementation of this FMP whose realization strongly depends on team working and mutual understanding within the company along with cooperation from other agencies and bodies, both from the government as well as the non-governmental sectors. Regular monitoring on the implementation of the FMP assists Pesama in identifying areas of strength within

the company as well as those weak areas needing strengthening, support and, re-prioritizing. A majority of the management prescriptions within the Plan are implemented by the Pesama with the assistance of its contractors. CFC was accordingly certified by FSC as a “well-managed forest” since 2012 upon fulfilling all 9 FSC P&C.

The present FMP for CFC will continue to be reviewed and revised from time to time at regular intervals in order to update and maintain its relevance and currency over time, *i.e.* in keeping with its functions and nature as a living document. Such review exercises are conducted by accommodating the latest and proven experiences, technology and information into the Plan taking into account changes in government regulations, shifts in consumer preferences at local and global levels, as well as sensitivities of local stakeholders and forest-dependent communities.

Forest Management System

The TRF timber resource, flora and fauna, including the trees and ecosystems within CFC are managed by Pesama under the Malaysian **Selective Management System (SMS)** whose practice has now entered well into the second, 30-year cycle of implementation since 2009. SMS dictates that all tree felling must follow the Reduced Impact Logging (RIL) and Directional Felling (DF) specifications and that trees to be felled (which numbers around 10 trees per ha) are chosen only from those that have reached certain sizes; usually 50.0 – 55.0cm in diameter at breast height (DBH) or above; *i.e.* contingent upon results of the analysis conducted on data from the Pre-Felling Inventory of the forest compartment concerned. Over-mature trees, mother trees, protection trees, fruit trees and nesting trees are not felled. On top of that, about 20% of the managed forest had been designated as non-productive and restrictive areas, together with

Riparian Protection Buffer (RPB) forests along permanent streams and rivers. RPB forests are set aside to serve as buffer zones wherein no encroachment or tree felling activities would be allowed. Pesama also maintains a network of High Conservation Value Forest (HCVF) areas within CFC, which presently include a saltlick for wildlife, a riparian ecosystem, and a fruit orchard area traditionally claimed by the local natives (Orang Asli) as belonging to them. All these procedures and restrictions are imposed and duly observed in order to maintain ecosystem integrity, stability and health as enshrined in the FMP. The FMP for CFC itself has been designed and prepared to serve as a general guide and instruction for Pesama to manage, develop and conserve in perpetuity, the invaluable natural mixed tropical rain forest (TRF) resource within CFC as a single and distinct Forest Management Unit (FMU), based on the precepts of **sustainable forest management (SFM)**.

Legislative and Administrative Framework

The Terengganu State Forestry Department (TSFD) regularly guides, supervises and monitors the SFM activities conducted by Pesama within CFC in order to ensure Pesama's compliance with:

- 1) National Forestry Policy (NFP) 1992;
- 2) National Forestry Act (NFA) 1984;
- 3) the "Cherul Forest Concession Agreement"; and
- 4) other relevant legislation as well as local and international certification standards, such as those of the Forest Stewardship Council (FSC) to which Pesama subscribes, and
- 5) the provisions and guidelines within FMP for CFC.

As a responsible company, Pesama commits itself to protecting the environment while at the same time positively contributes towards the economy of the state and society. The latter is accomplished by way of overcoming the shortfall in local timber raw material supply, providing employment opportunities for the people as well as practicing sound corporate social responsibility (CSR) as appropriate.

2.0 Management Objectives and Goals

With a total area of approx. 20,243 ha, the CFC is now being managed in its second cycle under the Malaysian Selective Management System (SMS). The first round of timber harvesting under the system's first 25-year cycle was completed in 2001 involving virtually all the productive virgin forest stands within the Production Forest category. For the second cycle, it has been decreed by TSFD that, as a precautionary and conservative measure, a new period of 30 years should be used and to be implemented within this FMU.

The following are the major management objectives of Pesama in managing CFC:-

- 1) To manage and conserve the forest resources within CFC, their biodiversity, functions and services as multifunctional resources; in such a way as to ensure that their values (be they economic, environmental, climatic, social, scientific, cultural, etc) are safeguarded and continuously upgraded in a sustainable manner in perpetuity, both quantitatively and qualitatively.
- 2) To develop and promote harvesting techniques which are environmentally-benign, economically-viable, technically-sound as well as socially-acceptable.

- 3) To help uplift the economy and social status of the forest-dependent communities in the region through the creation of employment and business opportunities as well as good neighbourliness.
- 4) To foster good governance, sound professional ethics and business goodwill with stakeholders, thereby leading to appropriate recognition by the relevant international such as FSC, and local certifying bodies of SFM.

The following are our strategic approach towards achieving SFM and safeguarding of the multiplicity of forest goods and services:

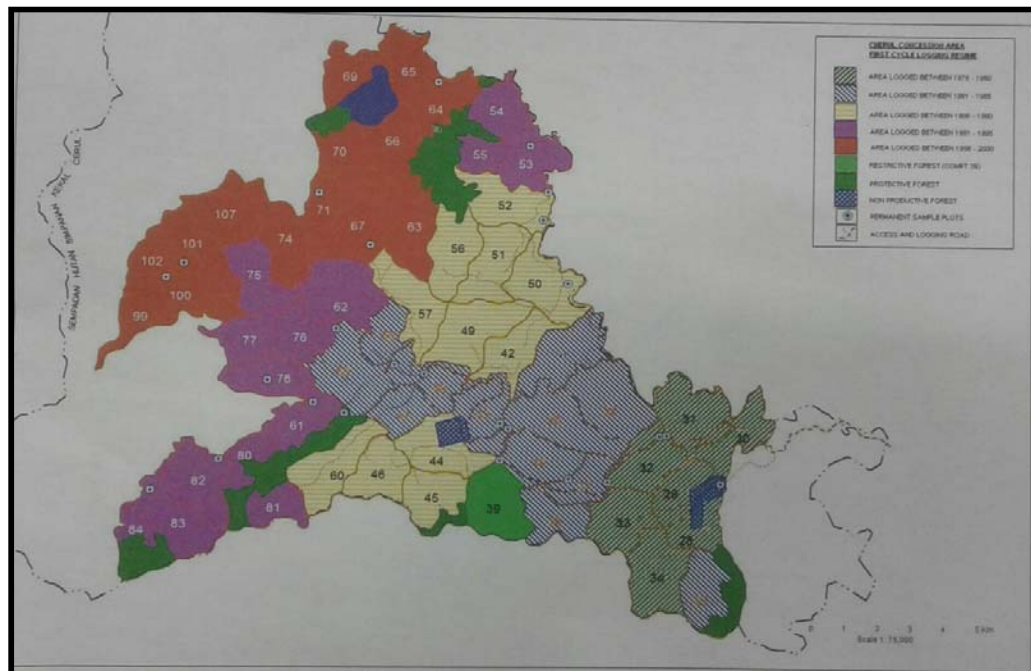
- 1) A continued assessment and evaluation of the current position, functional zoning and inventory of the resource and their local ecological and biological productivity within the context of current and future social and economic scenarios.
- 2) Learn past experiences (achievements as well as failures) and use these knowledge as well as results from research and development (R & D), to formulate plans and operational guidelines for future sustainability and growth in accordance with established management standards.
- 3) Implementation of corresponding mitigation, protection and conservation measures including strict adherence to the dictates of Reduced Impact Logging (RIL), continued and sustained enforcement of relevant documentary and field procedures, and establishment of a network of High Conservation Value Forests (HCVFs) within CFC.
- 4) Implementation and maintenance of a good corporate social responsibility (CSR) with relevant stakeholders, non-governmental organizations (NGOs) and regulating/ enforcement agencies.

- 5) Capacity building and training of staff and contractors in relevant areas that may contribute towards team learning, personal mastery and team working which, together would lead towards the realisation of SFM and forest certification.

Fig.1.Map of Terengganu
Showing the location of
Cherul Forest
Concession.



Fig. 2. Cherul Forest
Concession (CFC)
showing forest
compartments.



3.0 Present Situation: Natural Environment and FMU Administration

Natural Environment

The whole of CFC covers a total area of 20,243ha of natural mixed TRF which incorporates various forest functions and zones as follows (*note*: a particular tract of forest can assume more than one function):

- 1) Soil and water conservation area (*i.e.*, areas with slope gradient between 21° - 30°),
- 2) Soil and water protection area (*i.e.*, areas with slope gradient above 30°);
- 3) Riparian buffer protection;
- 4) Amenity forest;
- 5) Rare ecosystem protection;
- 6) Areas for sustainable timber production (TP);
- 7) Research forests.

Pesama will continue to refine the functional zoning of the FMU from time to time during the Plan period, *i.e.* upon considering the relevant factors and legal provisions. During annual operation planning, and prior to logging, the delineations on the maps will be checked and finalised in the field, for the annual coupe areas. Consequently, maps and compartmental figures for functions and zones will be updated continuously to incorporate new information obtained during micro-planning at ecosystem levels.

Administration Arrangement & Organisational Structure

The 9-person management team of Pesama consists of 1 General Manager who is assisted by 1 HR Manager, 1 Account Manager, 2 Marketing Executives, 1 IT Executive, 1 Operation Executive, 1 Safety & Health Executive, 1 Forest Supervisor. They are supported by 3 clerical-level staff who provide services in documentation and filing. The tasks in the field are accomplished by a combined team from both Pesama (4 persons) and KPKKT (3 persons).

This means that the total strength of company's personnel directly involved in forestry work currently stands at 19 persons including 6 females). The chart in **Figure 3** shows a simplified organisational structure of Pesama in CFC management, whereas **Figure 4** shows the FSC Team Task Force which draws its strength and expertise from within Pesama, KPKKT, a Resident Consultant and the Forest Contractor. **Figure 5** shows the Occupational Safety and Health Committee (OSH).

Table 1. Forest Functions In The Concession Area In Relation To The Functions Defined In The National Forestry Act.

National Forest Policy 1992 & National Forestry Act 1993		Forest Zonation in CFC	Area (ha.)
Production Forest	(1) Sustainable Timber Production, (2) Safeguarding of Water Resource, (3) Preservation of Biodiversity	Timber Production (TP), Water Catchment, Conservation (HCVF) (Gross Area)	17,968 (Gross Area)
Protection Forest	Soil Protection	Conditional zone Soil Protection	1,306
		(1) Non-Productive Area (2) Main & Secondary Forest Road (3) Matau in Compt. 43	104 10
	Safeguarding of Water Resources	Riparian Buffer Protection (RBP/ HCVF): (1) Sg. Cherul (2) Sg. Mas	72 24
	State Boundary	Kemaman – Kuantan	49
Amenity Forest	(1) Recreation; (2) Ecotourism; (3) Amenity, (4) Rare Ecosystem Protection	HOT SPRING IN C66, C69, C70	163
Research & Education F.	ITTO/JPSM Research Forest in Compartment 39		380
Mining concession		Parts of C28, C29, C43, C44	167
TOTAL (ha)			20,243

Fig. 3. PESAMA's Forest Management Organisation Structure

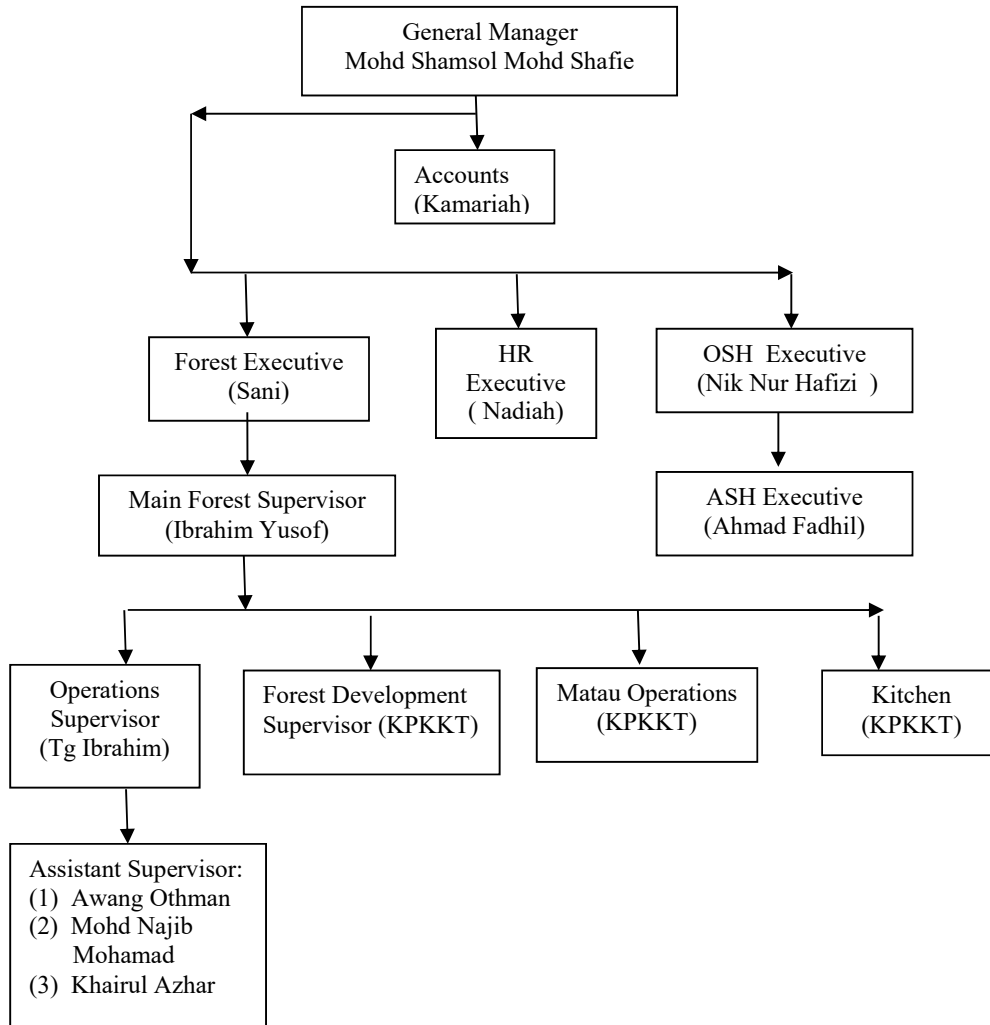


Fig. 4. PESAMA's FSC Task Force

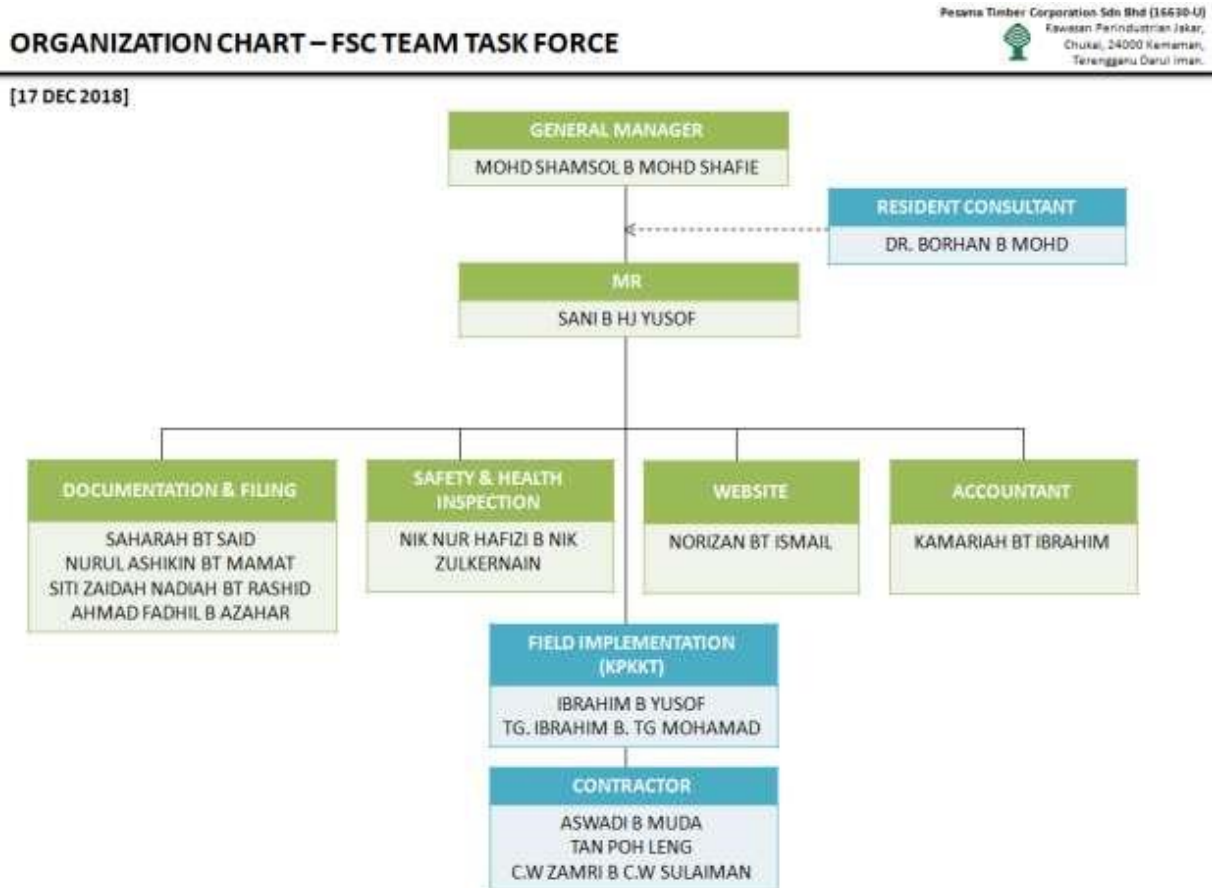
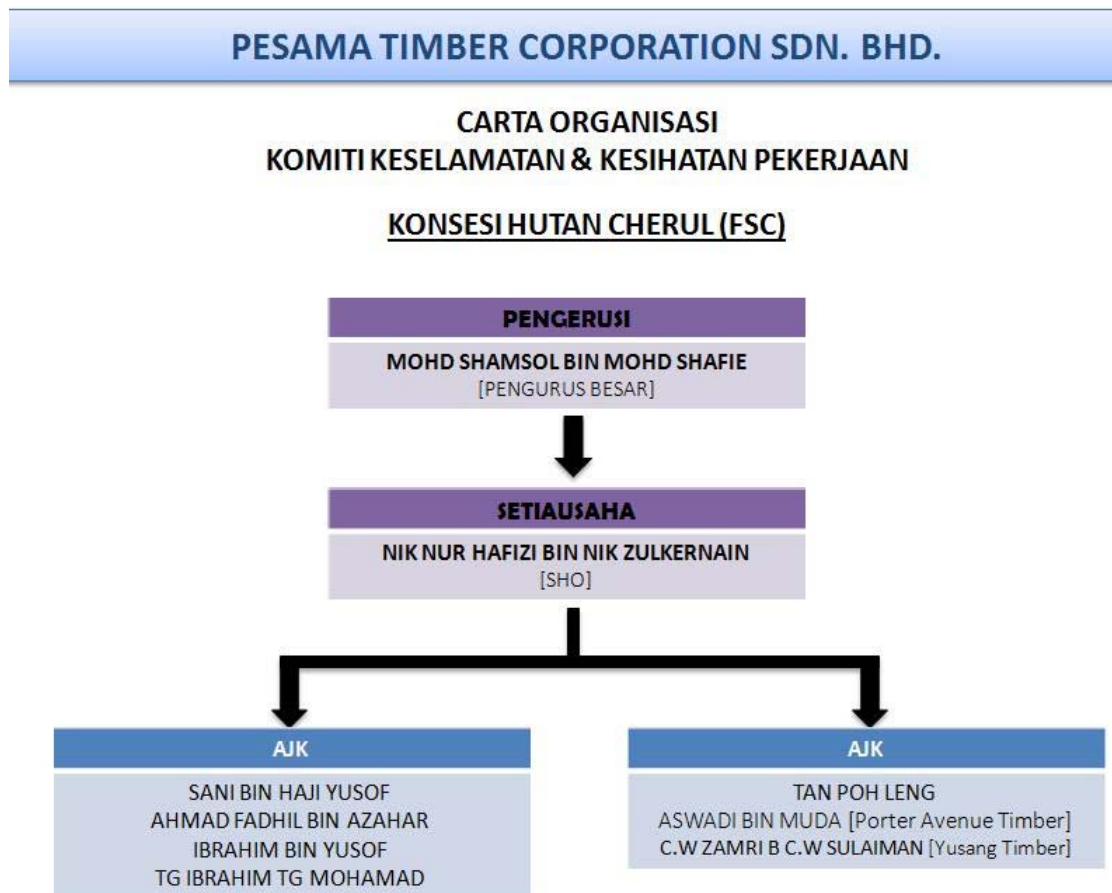


Fig. 5. Occupational Safety and Health Committee



4.0 Yield Regulation

Annual Working Area (AWA)

In managing the production forest category for sustainable timber production Pesama considers several relevant factors, including the following, some of which are largely tentative and subject to revision as new facts come to light:

- 1) That there is a serious lack of reliable data on the growth and yields of the residual trees and stands from permanent sample plots (PSPs) on which to base calculations of annual working area (AWAs) and to support management and silvicultural decisions.
- 2) Based on the analysis of data from nearby Dungun Timber Complex, the dbh m.a.i.'s of trees larger than 30.0cm dbh under the Selective Management System, were found to be in the range of 0.80cm – 1.00cm/tree/yr for both Dipterocarps and Non-Dipterocarp species,
- 3) It follows from the above, the rate of volume m.a.i. for all trees above 15.0 cm dbh was conservatively assumed to be 2.62m³/ha/yr.
- 4) Net Timber production area: 16,200ha
- 5) The estimated available gross standing volume of trees of >60.0cm dbh was found to be 904,446m³ (based on estimated standing volume of 45.0m³/ha).
- 6) The sustainable cut for timber production stands at approx. 30,148m³/year from approx. total AWA allocation of around 540.0ha.
- 7) A tending and open area planting & rehabilitation programme to enhance the stocking and growth of the dipterocarp component.
- 8) Volume m.a.i.s are assumed to be 2.618m³/ha/yr for all species; 2.09m³/ha/yr for the dipterocarps; and 1.453m³/ha/yr for the non-dipterocarp tree species.
- 9) The cutting cycle adopted will be 30 years as recommended by the Terengganu State Forestry Department (TSFD).

Methods of Selective Harvesting of Timber Trees through the Reduced Impact

Logging (RIL) Approach

Mature, large-sized trees are selectively-marked for felling based on a pre-calculated set of minimum diameter-at-breast-height (DBH) cutting/felling limits. The minimum cutting limit combinations are arrived at upon analysis of the pre-felling inventory data which were collected during an earlier pre-felling inventory exercise conducted on the said forest compartment. The minimum DBH cutting limits usually call for a higher minimum DBH cutting limit for Dipterocarp trees species as compared to the Non-Dipterocarps, i.e. in an effort to keep more of the Dipterocarp species in the residual standing stock and hence retaining the Dipterocarp identity/ character of the TRF. Under a normal circumstance the total number of Dipterocarp and Non-Dipterocarp trees marked for felling rarely exceeds 10 trees per ha.

Marked trees are tagged at the tree bottom using plastic tags which bear the species name, DBH, serial numbers as well as an indication of the number of logs that could be extracted from a single tree. The placement of the tags also signifies the recommended direction of fall for the tree. The most appropriate felling direction seeks to avoid from inflicting excessive impact and damage to nearby residual potential crop trees (PCTs), other smaller regeneration as well as the ecosystem as a whole. Under no circumstance shall a tree be felled into any buffer zones and riparian reserves. Felled trees are lopped off and the timber skidded by tractor along pre-determined skid trails to the log landing (“matau”). Skid trails are carefully constructed along pre-determined alignments, using excavator or bulldozer without blading or compacting the soil surface. This skidder-crawler tractor logging technique which incorporates the RIL approach has been found to be most appropriate for the type of forest found within CFC and managed by Pesama. An unbladed and uncompacted skid trail serves as natural seed bed for new regeneration thereby allowing the ecology to recover in the shortest possible time.

Fig. 6. The Malaysian Selective Management System (SMS) in Cherul Forest Concession (CFC).



a. Logging Road Network clearly shown on map of working area.



b. A well-constructed forest road



c. Opening of skid trail



d. Bulldozer skidding tree-length timber along skid trail towards nearest matau



e. Permanent Sample Plot (PSP) for growth & yield monitoring

f. A future tree Potential Crop Tree (PCT) Within for 3rd rotation harvest under SMS



Production Performance

The progress with timber production from CFC for the past 3 years (2014 – 2017) is summarised as in **Table 2** below.

Table 2. Round Timber Production from CFC, 2014 – 2017.

Year	Compartment No.	Area,ha		M ³	Volume produced, M ³	Yield	Cost/ha
		Area, ha	Total Area, ha		Productivity, M ³ Total Production In year, m ³	m ³ /ha	
2014	42	385.0	793.0	12,168.00	27,387.00	31.61	22,476.24
	49	408.0		15,219.00		37.30	26,526.35
2015	41	343.0	343.0	17,544.00	17,544.00	51.15	34,316.85
2016	44	132.0	565.0	4,662.98	17,078.66	35.33	23,703.45
	36	433.0		12,415.88		28.67	20,692.43
2017	62	419.0	677.0	11,732.00	18,924.00	28.00	10,816.78*
	48	248.0		7192.00		29.00	11,203.09*
Average					20,233.41	34.44	

*Note:

For compartment 62 & 48 cost/ha decrease due to all activities in logging and harvesting Were outsourced to KPKKT starting from 1 Feb 2018. In this context we have successfully achieved our target to reduce our forest operation costs.

Based on the production data presented in **Table 2**, as well as the performance over the past 7 years (since 2010) the following points can be deduced:

- That the average yearly timber production over the past 7 years (2010 – 2016) was 24,475.67m³/year which is well below the targeted 30,148m³/year limit.
- The main explanation lies in the extreme variability in the stocking levels of the original stands.
- This shows that an area-based yield control is less reliable than a volume-based yield control.
- Volume - based yield control therefore should be preferred and recommended.

- That the stocking levels of the second growth stands were extremely varied, ranging from a high 51.15m³/ha for Compartment 41 to as low as 28.00m³/ha for Compartment no. 62, giving an average yield of 34.44m³/ha.

5.0 Management Prescriptions for Stand Management and Conservation

Management decisions within CFC take into consideration of the following:

- 1) The concept of forest zonation by function in which different major groups of activities and uses of the forest should be conducted within the areas zoned up for that particular activities/ uses. The idea is to minimise conflict of land uses as well as to maintain resource integrity.
- 2) The concept of High Conservation Value Forest (HCVF) covering aspects on delineation, census, documentation, planning, future development, formal assessment and monitoring of measurable effectiveness indicators, etc.
- 3) Management and protection policies on totally protected areas (TPAs).
- 4) Standard and guidelines on the control of erosion, minimisation of forest damage during harvesting, road construction, and all other mechanical disturbances, and to protect water resources, as well as the relevant mitigation measures to minimise the negative impacts of those operations.
- 5) Selective and conservation-oriented harvesting of mature trees under the Malaysian Selective Management System whereby tree are carefully marked and felled based on directional felling with the view to minimise damage to residual PCTs and regeneration, much in line with the reduced impact logging (RIL) methodology. Timbers are extracted by using the crawler tractor – skidder methods.
- 6) Logged areas, poor patches and exposed forest floors, etc are rehabilitated under the Open-Area Planting Tanaman Kawasan Lapang TKL programme.

- 7) Continuous trainings and mentoring programmes are given to staff and contractors as a measure to keep them up-to-date and enhance their skills and competence.
- 8) The interest of local stakeholders are well taken care off in accordance with Pesama's policy on "corporate social responsibility".
- 9) Monitoring activities are conducted regularly, both in-house as well as with the cooperation from the state forest department (JPNT) as well as other competent authorities.

Ecosystem health and vitality

Ecosystem health is defined as a condition wherein an ecosystem has the capacity across the landscape for renewal, for recovery from a wide range of disturbances, and for retention of its ecological resiliency while meeting current and future needs of people for desired levels of values, uses, products, and services. Ecosystem health in CFC will be monitored throughout the planning period.

Management and control of exotic plants, especially those designated as noxious weed is essential to maintain ecosystem health, particularly within selectively-logged and secondary forests as well as riparian areas. The management and control of exotic plants are, and will continue to be never-ending processes. Obnoxious weed infestations will be identified and mapped. Risk assessments are performed and used as a baseline for monitoring. Management areas are designed to treat infested ecosystems regardless of jurisdictional boundaries.

The likelihood of the damage incurred to soils from the use of heavy machinery in wet soil conditions is reduced by the introduction of controls on operational measures to limit soil damage from erosion. Water quality maintenance measures are through the buffering of all streams.

High Conservation Value Forests (HCVFs)

The three HCVF areas within Compartment no. 35 of CFC are still being maintained and in good functioning condition. They are:

1. The Orang Asli (Aborigine) Durian tree orchard, covering a total area of approx..5 ha.
2. The Wildlife Saltlick
3. The Keruing Neram riparian stream.

For each of these HCVFs, a set of Measurable Effectiveness Indicators (MEIs) had been developed for the purpose of monitoring as part of the management process of the HCVFs concerned. So far a total of three (3) sets of MEI observations had been made in the field; one for each of the three HCVFs. Relevant data are being summarized and appropriate training sessions were also given to the staff in charge. Efforts will continually be made to identify new areas as possible candidates for future HCVF sites for CFC.

Although there is no indication of *Orang Asli* actually permanently living within the FMU (concession area), provision is made by Pesama management to addressing *Orang Asli* heritage requirements through consultation and working with the *Orang Asli* community living at Kg Sg Pergam, which is located some 10km from CFC, in order to enable them to benefit from the standing Durian tree orchard within Compartment 35, and where appropriate, practice their culture and livelihood within CFC. This Orang Asli's Durian Tree Orchard is being treated as one of our HCVFs along with two other sites, namely the Wildlife Salt-lick as well as the Keruing Neram (*Dipterocarpus oblongifolius*) Stream, all of them are located within Compartment 35.

The management of non-Aboriginal heritage is enhanced by instituting improvements to existing databases and the processes used to identify and protect identified sites of significance. Pesama continuously encourages its staff to acknowledge the needs of the *Orang Asli* and non-Aboriginal and local heritage in relation to CFC.

Fig. 7. High Conservation Value Forests (HCVF) within CFC

Neram Stream



Wildlife Saltlick



Orang Asli Durian Fruit Orchard



Socio-economics

Apart from the main function of Pesama to manage and harvest timber produce in a sustainable manner, the company also encourages and promotes local employment, recreation and tourism, visual landscape management, basic raw materials extraction, and bio-prospecting within the concession area.

A study on the social impact assessment (SIA) of our SFM forestry operation within CFC has been conducted and the report completed in April 2017.

Implementation and Monitoring

Considerable emphasis is put on mechanisms for checking implementation and improving performance as well as monitoring on major aspects of operations such as timber production, forest road and bridge construction, buffer zones, boundaries, tree felling, reduced-impact logging (RIL), logging camps, etc. Systematic and informal monitoring are expanded to cover key performance and measurable effectiveness indicators (MEI) for assessing HCVFs.

Training & Stakeholder Consultation

The latest training programme conducted by Pesama for its staff was the FSC Mentoring session held in August 2016, in tandem with a Stakeholder Consultation attended by various relevant government agencies, contractors and local communities. Training sessions on HCVF and the “Measurable Effectiveness Indicators” were also held on-site during the same month.

Pesama also establishes coordination and consultation with the public, industry and other government agencies (such as the Wildlife Dept. (Perhilitan), Dept. of Environment, State Forestry Dept., FRIM, universities, etc.) as well as NGOs (such as WWF-Malaysia and GFTN) on a continuous basis while at the same time reviewing and developing appropriate guidance documents and standard operating procedures (S.O.P.).

Fig. 8 (a & b).Stakeholder Consultation and FSC Mentoring Programme for staff of PESAMA and KPKKT

8a.



8b.



Fig. 9.Field Training on HCVF Monitoring



Fig. 10. Field Training on Nursery Technology

6.0 Changes in Species Composition

Forest logging whereby only about 10 – 12 trees/ha of mature timber trees are selectively identified and felled, is a form of intervention which affects the stand and ecosystem under a controlled environment in the form of the “reduced impact logging (RIL)”. The changes that take place in the stand subsequent to selective logging can be positive or negative on the remaining flora and fauna, depending on the direction of intervention and its extent, as well as the precautionary and protection measures being instituted. At CFC changes in species composition are being monitored through a series of 25 permanent sample plots (PSPs) established for this purpose in strategic locations within the concession. The main objectives of the PSPs are to monitor the impacts of selective logging onto the forest stands in terms of changes in species composition as well as their growth and yields through time.

Changes in Tree Species Composition (Based on the Result of Inventory of Two Permanent Sample Plots (PSPs) in CFC

Numbers of trees per hectares

A total enumeration was conducted in 2017 within the PSPs located in Compartments 40 and 43 and the data was compared with those from the enumeration conducted in 2013. Based on the inventory, the numbers of Dipterocarpaceae and Non-dipterocarpaceae families of tree species were recorded and grouped into diameter at breast height (DBH) classes, i.e. 5 – 14.9 cm; 15 – 29.9 cm and those having DBHs of more than 30 cm DBH.

In terms of the distribution of Dipterocarp and Non-dipterocarp tree species, the PSP within Compartment 43 registered a higher number of Dipterocarps species compared to the PSP within Compartment 40. But the reverse was true for the case of the PSP within Comp. 40. Within both compartments; trees with DBH of more than 30 cm showed the most numbers

of trees recorded. It could be due to the sampling technique where DBH <30 cm was assessed within plot 100 m x 100 m. A total of 132 trees / ha were identified in Compartment 40 and 101 trees/ha for Compartment 43 respectively. In addition, compared to 2013 data; number of Dipterocarp species in Compartment 40 had decreased from 33 to 14 trees/ha. However for the Non-Dipterocarp species; the numbers increased from 86 to 118 trees/ha. For Compartment 43; numbers of Dipterocarp species were found to have decreased slightly (35 to 33 trees/ha) while the numbers for Non-Dipterocarp tree species decreased from 107 to 68 trees/ha. In conclusion, the number of trees that had been assessed in 2017 had increased for the case of Compartment 40, but decreased for the case of Compt. 43 (see Table 3).

Compartment 40

SPECIES GP

Dipterocarps	14	(33)
Non-Dipter.	118	(87)
Total	132	(120)

Compartment 43

SPECIES GP

Dipterocarps	33	(35)
Non-Dipter.	68	(107)
Total	101	(142)

Table 3:

Numbers of trees of >30.0cm DBH based on major species groupings in Compart. 40 and 43 in 2017 and 2013 (in brackets).

Total basal area per hectares

Based on Table 4; Compartment 40 recorded higher number of basal area per ha basis at 14.963 m²/ha compared to Compartment 43 (8.921 m²/ha). DBH class more than 30 cm recorded higher BA compared to Class 5-14.9 cm and 15-29.9 cm for both compartments.

Table 4: Total Basal Area m² per ha for Dipterocarp and Non-Dipterocarp at Compartment 40 and 43.

(Note: Numbers in parenthesis showed numbers of basal area of Dipterocarp and Non-Dipterocarp species in 2013.)

<u>Compartment 40</u>	5-14.9	15-29.9 cm	<30 cm	Total
DBH				
Dipt	0.021 (0.04)	0.061 (0.13)	1.985 (1.57)	2.067
Non-Dipt	0.185 (0.31)	1.405 (1.06)	11.305 (7.29)	12.896
Total	0.206 (0.35)	1.466 (1.19)	13.290 (8.855)	14.963 (10.387)
<u>Compartment 43</u>				
DBH	5-14. cm	15-29.9 cm	<30 cm	Total
Dipt	0.028 (0.08)	0.434 (0.47)	2.682 (3.38)	3.145 (3.93)
Non-Dipt	0.156 (0.38)	0.450 (0.69)	5.169 (5.41)	5.776 (6.48)
Total	0.184 (0.460)	0.884 (1.154)	7.852 (8.791)	8.921 (10.406)

Based on the previous data (2013); Compartment 40 showed a slight increase in BA per ha basis compared to Compartment 43. This might due to less number of trees were assessed for Compartment 43 in 2017 compared to 2013.

Total Standing Tree Volume per Hectares

Total standing volumes of trees per hectares basis showed that both compartments produced similar results in which Non-Dipterocarp species overwhelmed the Dipterocarp species. After the last inventory in 2013, a number of trees in the higher DBH groups were found dead which had in turn affectively reduced the total volume per hectares for both compartments.

Table 5:
Total tree volume (m3) per ha for Dipterocarp and Non-Dipterocarp at C40 and C43.
Note: Numbers in parenthesis showed numbers of total volume of Dipterocarp and Dipterocarp species in 2013.

Compartment 40

DBH	5-14.9 cm	15-29.9 cm	<30 cm	Total
Dipt	0.082 (0.10)	0.317 (0.65)	12.902 (28.55)	13.301(29.29)
Non-Dipt	0.602 (0.81)	6.391(6.41)	66.136 (114.39)	73.130 (121.61)
Total	0.684 (0.91)	6.709 (7.06)	<u>79.038 (142.94)</u>	86.432 (150.91)

Compartment 43

DBH	5-14.9 cm	15-29.9 cm	<30 cm	Total
Dipt	0.110 (0.21)	2.258 (2.43)	8.719 (41.49)	11.088 (44.13)
Non-Dipt	0.712 (0.99)	2.634 (3.57)	30.239 (60.76)	33.586 (65.32)
Total	0.823 (1.194)	4.892 (5.99)	38.959 (102.26)	44.674 (109.45)

Changes in Fauna

New data and information on the fauna population have emerged as a result of years of observations by our staff as well as consultation with key stakeholders such as the Department of Wildlife and National Parks (PERHILITAN), the Malaysian nature Society (MNS), the Terengganu State Forest Department. These are summarised in Tables 6 & 7 below. Monitoring of these wildlife is still continuing.

Table 6. Results from Wildlife Monitoring During 2015 - 2018

Date	Wildlife Species
10/2/2015	Oriental pied hornbill, Elephant, Tapir
13.4.2015	Barking deer, Otter, Jungle fowl
5/6/2015	White-handed gibbon, Helmeted hornbill
22/8/2015	Racket-tailed drongo, Brahminy kite, White-collared kingfisher
07/2/2016	Elephant,
11/2/2016	Tapir, Mousedeer, Tiger
15/5/2016	Elephant
15/8/2016	Gibbon, Wild boar,
15/12/2016	Wild boar, Malayan sun bear, Elephant, Porcupine, Birds, Tapir
15/2/2017	Wild boar, Elephant, Sambar deer, Barking deer, Mousedeer, Tapir, Civet cat
4/3/2017	Civet cat
23/7/2017	Mousedeer, Tapir
11/10/2017	Wild boar, Elephant, Barking deer, Varanus
15/3/2018	Kingfisher, Wild boar, Sambar deer
28/6/2018	Mousedeer
15/8/2018	Kingfisher, Wildboar
14/10/2018	Wild boar, Tapir

Table 7. Record of Presence of Wildlife in Compartments within CFC

Records Of Freshwater Fishes In River In Cherul Forest Concession (CFC)

WILDLIFE SPECIES	COMPARTMENT NO.
Elephant	35,36,37,42,62,43,48,40,50
Porcupine	30,35,36,37,42,43,48,50
Tapir	30,35,36,37,42,43,48,50
Tiger	30,35,37,42,50,48,62,
Otter	30,35,42,48,50,62,
Hornbill	30,35,36,37,42,43,40,50,
Gibbon	35,36,37,42,43,49,40,50,62
Mouse Deer, & Barking Deer	35,36,37,42,43,49,40,50,62
Mountain Goat	48
Malayan Sun Bear	30,31,42,43,48,35,40

- Kelah
- Peras
- Haruan
- Bujuk
- Baung
- Lampam
- Tapah
- Kawan

7.0 The Way Forward

Pesama faces tremendous challenge during the years ahead in its effort to continue to sustainably manage the TRF resources within CFC in perpetuity, and for its business to remain viable and profitable. Under the circumstance, Pesama needs to urgently look into and judiciously handle the following matters:

- 1) Continue to build up Pesama's own database on pertinent information which will be useful for future decision making process.
- 2) Develop appropriate strategy to remain financially strong and viable in order to ensure sustainability and growth of the operation, protection of the forest, conservation of the resource as well as demonstrating good CSR to relevant stakeholders.
- 3) Give a high priority towards capacity building and education of its staff as well as a strong programme on R & D, particularly on growth and yields and re-forestation/ rehabilitation activities.
- 4) Strive to continuously improve Pesama's management of the CFC forest and to get it continuously accredited and committed to the standards of established certification bodies such as MTCS and FSC.
- 5) Continue to enhance the quality of its management of CFC by incorporating the relevant provisions needed for a sound management and protection of the environment and monitoring.

Review FMP document from time to time with the purpose of updating it based on latest findings from the latest information and field experiences.