

# Bahau-Kahei FMU (T/3236)

## Summary of Monitoring Results on Timber Harvesting Activities (July 2017 – June 2018)

Item	Particulars	Data Source(s)	Interim Results/Remarks
1	Yield of Forest Products	- Royalty Volume	<ul style="list-style-type: none"> <li>- Net log production for the period was 9,509 m<sup>3</sup>.</li> <li>- Some level of disruption occurred to production schedule during transition; <i>i.e.</i> from conventional to sustainable forest management system.</li> <li>- Only timber was produced. There is no commercial production of other forest products during the period.</li> </ul>
2	Forest Regeneration	<p>The total number of PSP for FMU T/3236 is forty (40) plots.</p> <p>Out of this number, a total of 16 PSP have been established, where the analyzed data to-date has been derived from 10 PSP.</p> <p>The data analysis for the 6 PSP is still on-going; including the progressive data collection for the remaining PSP.</p>	<ul style="list-style-type: none"> <li>- Regeneration of seedlings and saplings conforms to the <i>Reverse J-curve</i> (Whitmore and Burnham, 1984).</li> </ul>
3a	Condition of the Forest	The analyzed data to-date has been derived from 10 PSP (see Item #2 for details).	<ul style="list-style-type: none"> <li>- The analysis has indicated that the stand density in the harvestable range is lower than the primary forest, but comparable with other logged-over forest in Peninsular Malaysia (Heng, 2000) and Sarawak (Heng, 2013).</li> <li>- There is also significantly more Non-Dipterocarp than Dipterocarp especially for trees in the lower diameter classes.</li> <li>- Continuous good RIL practice is pertinent to sustain timber resource into the future.</li> </ul>
3b	Condition of the Forest	- Twenty four (24) Post-Harvesting Diagnostic Sampling plots, with a total plot area of 2.4 ha	<ul style="list-style-type: none"> <li>- The analysis has indicated that the stand density in the harvestable range is lower than the primary forest, but comparable with other logged-over forest in Peninsular Malaysia (Heng, 2000) and Sarawak (Heng, 2013).</li> <li>- There is also significantly more Non-Dipterocarp than Dipterocarp especially for trees in the lower diameter classes.</li> </ul>

			<ul style="list-style-type: none"> <li>- Continuous good RIL practice is pertinent to sustain timber resource into the future.</li> <li>- The FMU shall consider reassessment of Post-Harvesting Diagnostic Sampling Plots for projecting yield from the production area.</li> </ul>
4	Growth Rate	The analyzed data to-date has been derived from the reassessed 3 PSP out of 10 PSP (see Item #2 for details).	<ul style="list-style-type: none"> <li>- In relating to the regeneration and the state of the forest, MAI of 1.06 m<sup>3</sup>/ha/year was derived at this stage.</li> </ul>
5	Composition and Observed Changes of Flora and Fauna	<p><b>Flora:</b> Sourced from 10 PSP and 24 Post-Harvesting Diagnostic Sampling Plots</p> <p><b>Fauna:</b> HCVRNS (2018)</p>	<ul style="list-style-type: none"> <li>- Information on the composition of flora and fauna shall form the baseline at this stage paving way for future monitoring.</li> </ul> <p><b>Flora:</b></p> <ul style="list-style-type: none"> <li>- 255 species were initially identified at species level from the 10 PSP (during the first establishment) and 173 species were identified during the reassessment of 3 PSP.</li> <li>- 90 species were identified at genus level from the Post-Harvesting Diagnostic Sampling Plots.</li> <li>- The total number of species present in the FMU is lower, comparing to primary forest (2.25 ha) and other logged-over forest (2.4 ha) of similar Hill Mixed Dipterocarp Forest.</li> <li>- Analysis from PSP and Post-Harvesting Diagnostic Sampling has indicated that light-demanding Non-Dipterocarp dominates amongst other light-demanding Dipterocarp and shade-tolerant Dipterocarp and Non-Dipterocarp families.</li> </ul> <p><b>Fauna:</b></p> <ul style="list-style-type: none"> <li>- Fauna - comprise mammals, avifauna and herpetofauna – was measured using four indices at the highest level.</li> <li>- Based on the findings by rapid assessment, the current forest condition is still providing a reasonable habitat for the well diverse and rich fauna species present in the FMU.</li> </ul>

			<table border="1"> <thead> <tr> <th>Indicators</th> <th>Fauna Type/Method</th> <th>2018 Baseline</th> </tr> </thead> <tbody> <tr> <td rowspan="4"><b>Shannon - Weiner Diversity (H')</b> <i>(Normally range from 1-4)</i></td> <td>Mammals (Line Transect)</td> <td>2.12</td> </tr> <tr> <td>Mammals (Camera Trapping)</td> <td>2.15</td> </tr> <tr> <td>Avifauna</td> <td>4.03</td> </tr> <tr> <td>Herpetofauna</td> <td>2.74</td> </tr> <tr> <td rowspan="4"><b>Shannon's equitability index (Evenness, E<sub>q</sub>)</b> <i>(Range 0-1, with 1 being complete evenness)</i></td> <td>Mammals (Line Transect)</td> <td>0.45</td> </tr> <tr> <td>Mammals (Camera Trapping)</td> <td>0.37</td> </tr> <tr> <td>Avifauna</td> <td>0.68</td> </tr> <tr> <td>Herpetofauna</td> <td>0.55</td> </tr> <tr> <td rowspan="4"><b>Simpson's Diversity Index (D<sub>s</sub>)</b> <i>(Range 0-1, with 1 means no diversity)</i></td> <td>Mammals (Line Transect)</td> <td>0.16</td> </tr> <tr> <td>Mammals (Camera Trapping)</td> <td>0.14</td> </tr> <tr> <td>Avifauna</td> <td>0.02</td> </tr> <tr> <td>Herpetofauna</td> <td>0.07</td> </tr> <tr> <td rowspan="4"><b>Margalef Species Richness Index</b> <i>(higher value means higher count of number of different species)</i></td> <td>Mammals (Line Transect)</td> <td>2.52</td> </tr> <tr> <td>Mammals (Camera Trapping)</td> <td>2.56</td> </tr> <tr> <td>Avifauna</td> <td>12.01</td> </tr> <tr> <td>Herpetofauna</td> <td>3.83</td> </tr> </tbody> </table> <p>- In terms of relative density and species composition at the group level:</p> <ul style="list-style-type: none"> <li>• Mammal - Bearded Pig (<i>Sus barbatus</i>) has the highest relative density of 0.84 individual/Km and composition of 20.5%.</li> <li>• Avifauna - Black-headed Bulbul (<i>Pycnonotus atriceps</i>) has the highest species composition of 5.95%, with 22 individuals have been detected out of the 370 total individuals;</li> <li>• Herpetofauna - Rock Skipper (<i>Staurois latopalmtatus</i>) has the highest relative density of 7.33 individual/Km with 22 individuals been recorded.</li> </ul>	Indicators	Fauna Type/Method	2018 Baseline	<b>Shannon - Weiner Diversity (H')</b> <i>(Normally range from 1-4)</i>	Mammals (Line Transect)	2.12	Mammals (Camera Trapping)	2.15	Avifauna	4.03	Herpetofauna	2.74	<b>Shannon's equitability index (Evenness, E<sub>q</sub>)</b> <i>(Range 0-1, with 1 being complete evenness)</i>	Mammals (Line Transect)	0.45	Mammals (Camera Trapping)	0.37	Avifauna	0.68	Herpetofauna	0.55	<b>Simpson's Diversity Index (D<sub>s</sub>)</b> <i>(Range 0-1, with 1 means no diversity)</i>	Mammals (Line Transect)	0.16	Mammals (Camera Trapping)	0.14	Avifauna	0.02	Herpetofauna	0.07	<b>Margalef Species Richness Index</b> <i>(higher value means higher count of number of different species)</i>	Mammals (Line Transect)	2.52	Mammals (Camera Trapping)	2.56	Avifauna	12.01	Herpetofauna	3.83
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6	Environmental Impacts of Forest Operations	<p>At FMU level → <i>HCVF Assessment Report</i>;</p> <p>At Operational level → <i>Environmental Compliance Audit (ECA) Report</i>, made under the NRE (Audit) Rules, 2008 covering on:</p> <ul style="list-style-type: none"> <li>• Biodiversity Conservation;</li> <li>• Forest Harvesting Operations;</li> <li>• Control of Soil Erosion and Sedimentation;</li> <li>• Protection of Water Quality;</li> <li>• Waste Disposal</li> </ul>	<p>- HCV attributes 1 – 4 identifying the environmental aspects complete with appropriate mitigation measures and their level of implementation are described in the HCV monitoring report.</p> <p>- HCV will be assessed on biennial basis, <i>i.e.</i> once in every 2 years.</p> <p>- In addition, ECA has indicated that most of the mitigation measures listed under the <i>General and Specific Terms and Conditions</i> in the Environmental Impact Assessment approved by the NREB were implemented, with very minimum work is still in progress.</p> <p>- ECA will be conducted 2 – 3 times annually, subject to NREB direction based on the level of compliance.</p> <p>- In general, road density and skid trail density are</p>																																							

		<p>Management; and</p> <ul style="list-style-type: none"> <li>• Abandonment Plan</li> </ul>	<p>well within the permissible limit. Stream river reserve has been being demarcated; training of forest workers has also been conducted.</p> <p>- The water quality test results at two sampling points collected during the ECA have indicated as follow:</p> <ul style="list-style-type: none"> <li>• AKR 1 is in the active timber harvesting area that has conformed to Class IIB of NWQS;</li> <li>• AKR 2 is located within the SA area of Long Unai has indicated higher turbidity, BOD and COD. The result is inconclusive, as it did not measure the direct impact from timber harvesting by the FMU.</li> </ul>
7	Social Impacts of Forest Operations	<p>At the FMU level:</p> <ul style="list-style-type: none"> <li>- HCVF Assessment Report;</li> <li>- Social Impact Assessment (SIA) Report</li> </ul> <p>At the operational level:</p> <ul style="list-style-type: none"> <li>• Environmental Compliance Audit (ECA) report under NRE (Audit) Rules, 2008; covering locals and forest workers on: <ul style="list-style-type: none"> <li>○ Occupational Safety and Health (OSH);</li> <li>○ Road and River Traffic Safety; and</li> <li>○ Socio-Economic Consideration.</li> </ul> </li> </ul>	<p>HCV attributes 5 – 6 identifying the basic needs and cultural values of the locals in Long Unai, the mere local community in and near the FMU.</p> <p>In SIA, four key impacts comprising water supply and qualities, livelihood, air and noise pollution and social cultural life were studied:</p> <ul style="list-style-type: none"> <li>• Out of the 4 key impacts, water supply and qualities and livelihood (forest resources) were identified as major impacts;</li> <li>• Despite the negative impact on river quality from previous harvesting, the locals are less dependent on water supply from river for daily usages. Instead, they rely on gravity feed water supply;</li> <li>• Some degree of siltation has also occurred from previous harvesting activities, but it has not caused disruption to the river transportation by locals for conducting farming mostly along the river;</li> <li>• A higher degree of difficulty in obtaining some of the forest resources nearby the village, such as rattan, fish, wild fruits and construction material;</li> <li>• FMU shall monitor the major impacts annually.</li> </ul> <p>- To-date, SA areas, cultural sites and water catchment area have been jointly demarcated by the FMU and the locals.</p> <p>- To safeguard the basic needs of the locals, the FMU has already put the RIL practices in place.</p> <p>- The CRC has been established; with the 3 meetings to-date; acting as the channel for FPIC process. There is no major issue been recorded to-date.</p> <p>- The FMU has strived to prioritize the employment for locals from Long Unai. To-date, more than 10 workers are engaged by the FMU, mostly as forest surveyors.</p>

			<ul style="list-style-type: none"> <li>- On the subject of CSR, FMU has also regularly maintained the road leading to Long Unai and made other contributions to benefit the community.</li> <li>- The FMU has met all of the OSH as stipulated under OSHA (1994); however, a structured health check program is required for both workers and locals.</li> <li>- On socio-economic considerations, there is no NCR or land claim been reported in the ECA.</li> </ul>								
8	Forest Protection		<ul style="list-style-type: none"> <li>- One case of encroachment into the FMU has been recorded to-date.</li> <li>- It is related to trading activity but not directly involved in harvesting of forest products.</li> <li>- The case has been reported to Forest Department Sarawak (FDS), Sarawak Forestry Corporation (SFC) and Polis DiRaja Malaysia (PDRM) with periodical updating on the latest status.</li> <li>- Pending on the outcome by the government agencies.</li> <li>- At the meantime, the FMU has established a security post to monitor the movement.</li> </ul>								
9	Productivity and Efficiency of Forest Management		<ul style="list-style-type: none"> <li>- To-date, the FMU has started monitoring the productivity and efficiency of pre-harvesting and harvesting teams. The results are as follow:</li> </ul> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Work Type</th> <th style="text-align: center;">Productivity</th> <th style="text-align: center;">Efficiency</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Pre-Harvesting</td> <td style="text-align: center;">6 trees/day/man</td> <td rowspan="2" style="text-align: center; vertical-align: middle;">To be closely monitored for better efficiency</td> </tr> <tr> <td style="text-align: center;">Harvesting by Tractor</td> <td style="text-align: center;">396 m<sup>3</sup>/team/month</td> </tr> </tbody> </table> <ul style="list-style-type: none"> <li>- The FMU shall extend similar study into other area like PSP establishment &amp; assessment, Post-F activities, boundary demarcation/monitoring and produce useful figures for more accurate cost control.</li> </ul>	Work Type	Productivity	Efficiency	Pre-Harvesting	6 trees/day/man	To be closely monitored for better efficiency	Harvesting by Tractor	396 m <sup>3</sup> /team/month
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10	Cost of Forest Management		<ul style="list-style-type: none"> <li>- Production cost comprising direct and indirect costs for the period of July 2017 to June 2018 has amounted to RM563.88/m<sup>3</sup>.</li> <li>- In addition to the harvesting and transport cost, the total production cost has also factored in the cost of R&amp;D, RIL, training, protection, monitoring and other key activities.</li> <li>- Bottom line is slim with tighter budget on more prudent spending;</li> <li>- Measures to improve log production are pertinent, coupled with better productivity and efficiency.</li> </ul>								

## References

- HCVRNS. 2018. *Baseline Information of Status and Population Dynamics of Mammal, Avifauna and Herpetofauna Species in Timber License No. T/3236, Bahau-Kahei FMU, Kapit Division, Sarawak*. May 2018. High Conservation Value Resource Network, Sarawak. 55 p.
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