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DYNAMICS AND PRODUCTION OF A FOREST UNDER SUSTAINABLE MANAGEMENT IN CENTRAL AMAZON

AUTHOR

MARCOS ANTÔNIO SILVA DE SOUZA, MIL MADEREIRAS PRECIOSAS LTDA. marcos.souza@preciouswoods.com.br

Brazil is home to the world's largest extension of continuous tropical forests (FAO, 2010). Moreover, sustainable forest management is recognized as one of the best options for economic growth without environmental degradation for regions with extensive forest cover. However, to achieve sustainability in wood production, effective planning is needed to ensure a continuous supply of wood, in addition to economic, social, and environmental benefits. The polycyclic management system is best adapted to the structure of the Amazon forest, inducing a good regeneration. The negative aspect of this method is the selective exploitation of species, where only the rarest and most valuable are exploited, causing pressure on the populations of these species and allowing others, less economically desirable, to establish themselves in the stand after extraction (SOUZA, 2012). To maintain the sustainability of this system, De Graaf (1986) suggests expanding the list of commercial species and extracting only mature individuals of these species. In addition, he proposes to apply silvicultural treatments that induce improved regeneration and growth of commercially valuable species, reducing the selective pressure on their populations.

Scope and objectives

- This study was performed with data from 41 permanent plots located inside the Sustainable Forest Management area of Precious Woods – MIL Madeirs Preciosas, in the Brazilian State of Amazonas (Figure 1).
- Precious Woods currently has over 275'000 hectares of forest under sustainable management in Brazil, 100% PEFC and FSC certified.
- This study had the main objective of analyzing the short and medium-term effects of the polycyclic silvicultural system on the dynamics and production in a dense forest in the Amazonas.

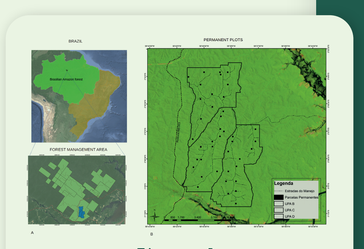

Figure 1

Figure 1. (A) Geographic location of Forest Management Area. Precious Woods company. (B) Location of 41 permanent plots in APU (Annual Production Unit) B, C, and D

Conclusions

18 years after logging, the forest in the study area showed stocks in basal area and volume of the total stand and commercial species, equivalent to those recorded before harvesting.

The high mortality rates observed soon after exploitation is being offset by the increase in the number of entries, both for the total population and for commercial species.

Environmental factors such as exposure to light and good canopy distribution directly influence the speed of tree growth, so it is essential to consider them in the planning and execution of forest management.

The sustainable forest management system applied, using low-impact techniques, proved to be efficient in promoting the recovery of the remaining forest stand and its long-term preservation.

Findings

- In 2014, 18 years after harvesting, all management units showed a significant increase in the three variables (number of trees, basal area, and volume), with statistically equal values observed before harvesting.
- The distribution of the mean volume between the diameter classes throughout the follow-up period, considering the three APUs (Annual Production unit), can be seen in Figure 2.
- Comparing the period between the first survey (before harvesting) and the last carried out in 2014 (18 years after harvesting), changes in the dynamics between the diameter classes were observed.
- Volume recovery occurred more effectively in the first classes (15-35 cm). This was expected since these classes were not harvested, although reduced due to the damage caused by the harvesting (Figure 2).
- In the diameter classes above 45 cm, the increase in volume observed was still not enough to reach the values present before the extraction of the trees. However, a tendency to return to levels found before harvesting was observed, mainly for the volume of commercial species between 55 and 75 cm in diameter.
- It can be noted that the mortality rate was higher than that of entries only in the period immediately after harvesting for all species (Figure 3). In addition to the natural mortality, this high rate was caused by extracting commercial trees, which caused damage to the remaining trees, mainly to smaller trees (DBH ≤ 30 cm), due to felling and skidding. Oliveira (2005) and Lopes (1993) found that the high mortality rate of trees shortly after logging is mainly caused by damage from felling and skidding operations.
- In average values (Table 2), the rate of increase in BHD (0.27 cm.year-1 and 0.30 cm.year-1 for total and commercial species, respectively) was lower than the 0.36 cm.year-1 found by Carvalho et al. (2004), in the Flona do Tapajós region 8 years after harvesting and the one of 0.5 cm.year-1 found by Silva (2004), in low impact harvesting, in the region of Paragominas-PA. Oliveira (2005) observed a rate of 0.34 cm.year-1 for commercial species in an experimental management area in th Eastern Amazon.
- The average increase in volume (4.63 m3.ha-1.year-1, of which 1.69 m3.ha-1.year-1 of commercial species) was similar to that of 4.67 m3.ha-1 .year-1 observed by Nascimento (2012), 21 years after harvesting. Oliveira and Braz (2006) observed an increase of 1.06 m3.ha-1.year-1 only for commercial species. Both studies were carried out in managed forests in the Western Amazon.

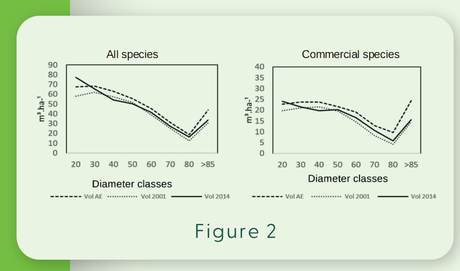

Figure 2

Figure 2. Average volume in diameter classes, of total and commercial species, before logging (Vol AE), 2001 and 2014 (18 years after logging) in 41 hectares sampled in the Forest Management Area of Precious Woods-MIL Madeiras Preciosas.

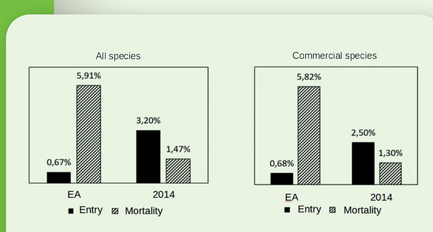

Figure 3

Figure 3. Balance between entry (DBH ≥ 15) and mortality of total and commercial species, with amounts recorded between 2-4 years after the logging (AE) and in 2014 (18 years after logging) in 41 hectares sampled a forest under management system of the company Mil Madeiras, Itacoatiara-AM.

UPA	Period	All species IPADAP (cm.year-1)	All species Basal Area IPA (m².ha-1.year-1)	All species IPA Volume (m3.ha-1.year-1)	Commercial species IPADAP (cm.year-1)	Commercial species Basal Area IPA (m².ha-1.year-1)	Commercial species IPA Volume (m3.ha-1.year-1)
B	1996-1998	0.2727	0.3595	5.3536	0.2714	0.1213	1.8067
	1998-2001	0.2591	0.2976	4.4317	0.2725	0.1049	1.5620
	2001-2014	0.2850	0.3227	4.8058	0.2898	0.1199	1.7849
Ç	1997-2001	0.1931	0.2392	3.5639	0.3835	0.0944	1.4062
	2001-2014	0.2592	0.2911	4,335	0.2810	0.1191	1.7742
D	1998-2001	0.2981	0.3468	5.1645	0.3036	0.1170	1.7425
	2001-2014	0.3045	0.3206	4.7746	0.3192	0.1182	1.7603
Average		0.2673	0.3110	4.6327	0.3029	0.1135	1.6909

Table 2

Table 2. Periodic annual increment of DBH, from basal area and volume, in the sample area of 41 hectares of Forest Management Area of the company Mil Madeiras, Itacoatiara - AM.

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