

Historical forestry for charcoal trade in Matang Mangrove Forest Reserve, Malaysia

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Matang Mangrove Forest Reserve (MMFR) in Peninsular Malaysia is known as the longest-managed mangrove forests, as the 'working plans' can be traced back to as early as 1902. The production of Rhizophora poles and charcoal through intermediate thinning and clear-felling operations has been the main objective of this management. For this purpose, the mangrove silviculture yield was first reviewed in the 1950s. After decades of revision, the mangroves are now being harvested under a 30-year rotation in the productive zones. In this context, the 10-year working plans released by the Forestry Department are helping the local authorities to enforce efficient management for forestry purposes.

Despite the century-old management, the mangrove biomass and yield were found to decrease in recent years. Therefore, we are aiming at analysing all the available working plans between 1904 and 2019, together with relevant literature, for identifying changes in the mangrove management and the yields over 117 years. Specifically, we will summarise both qualitative and quantitative data from ecological and socio-ecological viewpoints. First, the qualitative assessment by making a summary of the mangrove management practices (e.g., forest type, zoning, silviculture, exploitation, etc.) mentioned in each working plan will be prepared as shown in Table 3. This will provide a general view of the existing information and data in the working plans (qualitative and quantitative).

Second, the quantitative analysis will be carried out in detail based on the text data, numbers given in Tables and Figures. Whereas text data will be extracted manually in combination with the software NVivo, which is a qualitative data analysis computer software that could help researchers to organise and find insights to un-structured data in the text. The numbers in Tables and Figures will be extracted manually. All the data will be incorporated into the Excel worksheets to produce graphs (e.g., trend lines) and statistical comparisons will be made to identify changes in the subgroups quantitative data between 1930 and 2019.

Third, the results will be compared and interpreted with relevant literature on the MMFR studies to evaluate changes in the management. In other words, the data will be checked if the growth and recruitment rate of mangroves meets the exploitation speed and is sustainable. This research is yet to begin, and we have two hypotheses. First, mangrove resource utilisation and exploitation in the MMFR are growing over time. Second, mangrove management practices are solely responsible for vegetation growth, biomass, and yield-related variations in the MMFR. This study will enable us to understand the history that led to the current practices of the management, the deficiencies in yield, etc., and help the managers to take appropriate decisions on the future monitoring and sustainable management of the MMFR.

Keywords: Matang Mangrove Forest Reserve (MMFR); Silviculture; Management; Mangrove; Social ecology