

Ponthep Meunpong 2012: Nutrient and Carbon Storage in Forest Plantation, Prachuap Khiri Khan Province, Thailand. Doctor of Philosophy (Forestry), Major Field: Forestry, Faculty of Forestry. Thesis Advisor: Mr. Chongrak Wachrinrat, Ph.D. 188 pages.

This research aims to determine the appropriated tree species for forest rehabilitation in Prachuap Khiri Khan Province, Thailand by analyzing the tree growth, above- and belowground biomass in term of carbon sequestration into the biomass, and soil carbon pool; and to emphasize the nutrient dynamics of the forest plantation by identifying structure characteristics of plantation stands and distinguishing the nutrient dynamics in each part of plantation.

Survivals of tree species were varied from species to species from less than 10 % to more than 90%. The six selected species included both native- and exotic tree species i.e. *Acacia crassicarpa*, *Azadirachta indica* (exotic), *Pterocarpus macrocarpus*, *Shorea roxburghii*, *Tectona grandis* and *Xylia xylocarpa* (native). The exotic tree species showed greater growth rate than native tree species. Approximately two times differences in D_0 , DBH and Ht were found when compared between the best and the worst species. Monthly amount of litter fall was fluctuated that depended and strongly related to climatic conditions. In addition, total amounts of litter fall depended on their leaf mass. All species showed the rapid decomposition in the first four months after fall down. On the other hand, slow decomposition rate appeared in the dry season. There were very few differences in soil nutrient concentration both through soil depth and among species plots. However, soil nutrient concentration trended to slightly decrease with increasing soil depth. The carbon pool in a plantation ecosystem depended on the relative biomass of components. Fast growing species, i.e. *A. crassicarpa* and *A. indica*, could store more carbon than slow growing species. The results revealed that the major factors affecting nutrient return to forest ecosystem were the amount of litter fall and nutrient concentration in litter. However, only slight difference of nutrient concentration was found. Therefore, litter mass was the main factor that played an important role on the nutrient return rate. According to the result of the study, massive stock of nutrient was remained in tree biomass. Hence, forest logging programme caused nutrient loss and nutrient deficiency. Plantation management should be intensively done for nutrient conservation aspect. Residuals included some parts of remained trunk, branches and leaf should be leave on the ground after logging. In conclusion, two exotic i.e. *A. crassicarpa* and *A. indica*, appeared to be the appropriate species for commercial forest plantation programs while, *T. grandis* and *X. xylocarpa* were the alternative choices for rehabilitation in degraded forest land.

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Thesis Advisor's signature

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