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SURVIVAL AND GROWTH PERFORMANCE OF NATIVE TREE SPECIES PLANTED IN HIGHLAND PINE PLANTATIONS IN SRI LANKA

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Pinus has been introduced to the country more than sixty years ago with the purpose of restoring degraded lands in the highlands and low country wet zone of the country. Despite various benefits provided by the pine plantations, there has been a growing resistance against those plantations due to some negative impacts on the environment, e.g. undesirable changes in the physical, chemical and biological conditions of the soil; impeding natural regeneration of indigenous tree species. Due to those negative environmental impacts, certain studies have been conducted to convert pine plantation into more environmental friendly mixed species forests. Previous studies have indicated that pine plantations can support the regeneration of indigenous tree species under their canopy and catalyze the natural regeneration processes. In the Wet Zone of Sri Lanka, plantation management techniques, such as thinning operations, have been found to create suitable micro climatic conditions for the growth of native tree species. Most of the attempts on conversion of highland pine have failed due to reasons such as fire, infertile soil, root competition and heavy shade inside the mature pine plantations. The objective of the present study was to identify the suitable tree species and management techniques to convert a mature pine plantation into a native, broad-leaved forest in the highlands of Sri Lanka. This study was carried out in an old pine plantation adjoining the town of Ella in the Badulla Forest Range. To provide different shade levels, rows of pine trees were removed to create 5m, 10m, 15m wide open belts within the study area. In one block, all pine trees were removed to receive full sunlight. The study tested fourteen tree species. Planting was done in November 2010 during the monsoonal rains. Seedlings of 1 ½ years were planted at 2.5m x 2.5m grid arrangement. Fire belts were opened and fallen pine needles were removed twice a year from the study area to reduce the fire hazard. Measurements were recorded biannually to study the growth performance of planted tree species in different shade levels.

Survival and growth data of tree seedlings were analyzed four years after planting separately for different thinning densities. The results revealed that high density thinning of pine trees (15m wide pine tree removal) tended to have positive effect on the growth and survival of planted tree seedlings than low density thinning (5m and 10m wide pine tree removal).

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Both survival and height growth of tree species revealed that *Calophyllum Inophyllum* (domba), *Madhuca longifolia* (mee), *Pericopsismooniana* (nadun), *Michelia champaca* (sapu) and *Calamus ovoideus* (rattan) were the most suitable tree species for conversion of pine plantation into indigenous tree forest. Those seedlings showed higher survival and seedling growth in 15m wide opening of pine, *Chloroxylon swietenia* (burutha), *Durio zibethinus* (duriyan), *Caryota urens* (kithul) and *Artocarpus heterophyllus* (kos) failed to grow under any shade treatments. Browsing of porcupine and barking deer are the major causal factors for failures of above.

It can be concluded that the overall performance of the planted tree species were greater in 15m wide pine tree removal treatment. The study revealed that that *Calophyllum inophyllum*, *Madhuca longifolia*, *Pericopsis mooniana*, *Michelia champaca* and *Calamus ovoideus* are the most suitable indegenous species for conversion of pine plantation into indigenous tree forest in highlands of the country. Proper species selection and their size at planting are the most important factors to be considered. A thorough approach to managing uncontrolled fires should also be established to mitigate the risk to the growth and survival of the trees.