Environmental impact of understorey managementin teak tree *(Tectona grandis L.)* plantations:A case study from Luang Prabang, Lao PDR

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Abstract: The extent of teak tree plantations in Laos is still modest, but current demand by farmers to establish new teak plantations is very high. Many teak plantations have replaced upland crops managed by traditional slash and burn techniques. Farmers do not have extensive experience with tree plantations and they use different techniques, including weeding and burning to control the understorey vegetation, i.e. the vegetation layer that grows spontaneously under the trees. The large-scale expansion of teak plantations might eventually affect biodiversity and soil conservation in this region. To document farmer's practices, we conducted interviews with farmers and made field measurements in 43 plantations in the Luang Prabang province. Our preliminary results indicate that current teak management techniques influence plant biodiversity in the understorey. Understorey suppression through burning does not have a positive effect on teak tree growth while it increases the occurrence of soil erosion indicators. Our results also indicate that maintaining the understorey is a simple practice that is likely to reduce soil erosion without reducing the growth rate of teak trees. This simple practice is also a great time saver for farmers.

Key words: teak-growth, understorey management, teak plantations, Laos.

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Introduction

While the extent of teak tree plantation in Laos is still modest, with an estimated area of just more than10,000 ha (TFT, 2010), 80% of which are located in the province of Luang Prabang (MAF, 2001), current demand by farmers to establish new teak plantations is very high (FAO, 2010). Many of the teak plantations have replaced upland crops managed by traditional slash and burn techniques.

Farmers do not have extensive experience with tree plantations compare to some recommendations (Midgley et al., 2007). They use different techniques, including weeding and burning to control the understorey vegetation, i.e. the vegetation layer that grows spontaneously under the trees.

Objectives

The aim of this survey was to understand if the management of teak plantations has an effect on the species composition of teak understorey. We also tried to assess the effect of observed management practices on teak growth and soil erosion using simple indicators.

Materials and Methods

To collect information on farmers' practices, we conducted interviews with farmers and made field measurements in 43 plantations. In each plantation, major understorey plant species were identified, photographs of the understorey and canopy taken and indicators of soil erosion recorded. (**Figure 1**) We used the ImageJ (http://rsbweb.nih.gov/ij/) open source software to calculate the projected area of both understorey and canopy.

Results and Discussion

Seventy percentages of the interviewed farmers declared that they regularly slash and burn the vegetation under teak trees to limit competition between understorey species and teak trees, hence to maintain optimal tree growth. It was observed that when the understorey vegetation was allowed to grow spontaneously and was not slashed and burned at regular intervals, a notable degree of plant diversity occurred under teak trees (**Figure 2**).Weed management was found to influence the annual radial growth of teak trees: improved growth was measured in plots where farmers do not practice slash and burn of the understorey (**Figure 3**). It could also be observed that the slashing and burning of understorey vegetation often had a negative impact on the soil as evidenced by the greater occurrence of soil erosion indicators in plantations regularly submitted to slash and burn (**Figure 4**).

Conclusions

The preliminary results of this survey indicate that current teak management techniques influence the plant biodiversity in the understorey of teak trees. Understorey suppression through burning does not have a positive effect on teak tree growth while it increases the occurrence of soil erosion indicators. Our results indicate that maintaining the understorey is a simple practice that is likely to reduce soil erosion without reducing the growth rate of teak trees. This simple practice is also a great time saver for farmers.

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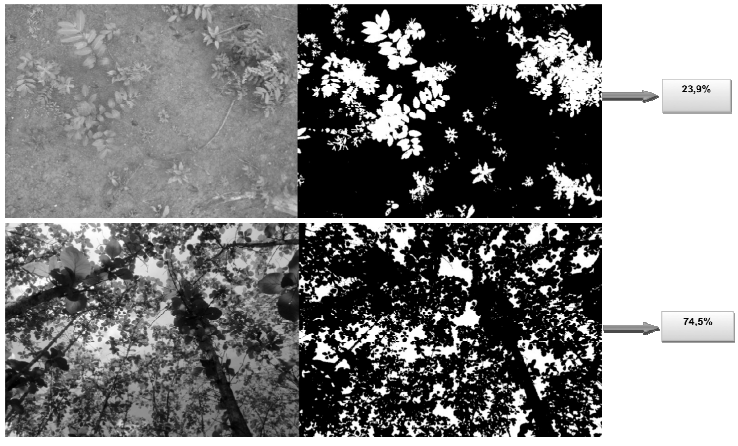

Figure 1 Example for understorey and canopy

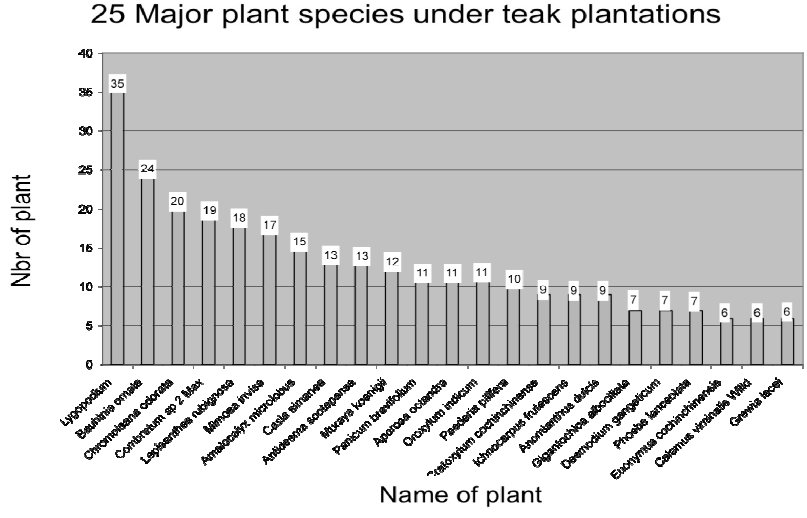

Figure 2 Plant species under teak plantations

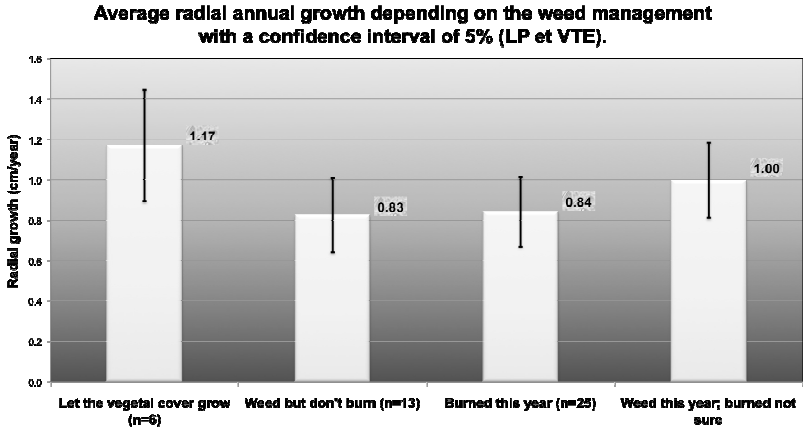

Figure 3 Annual teak growth

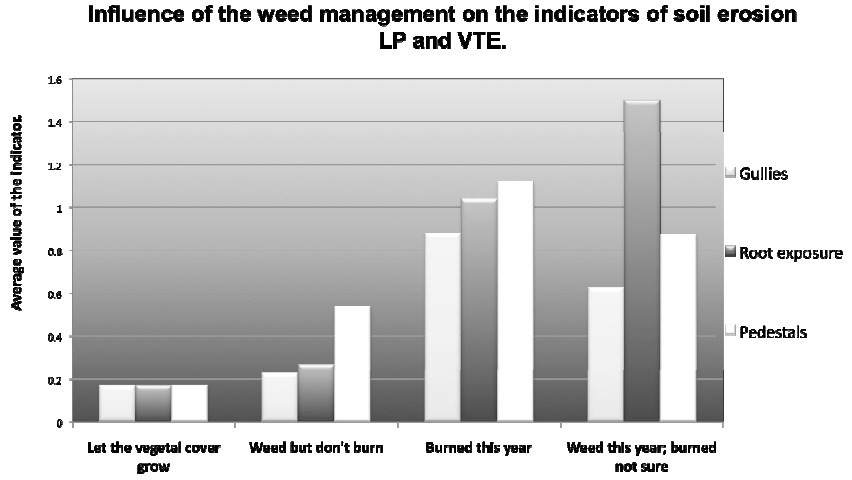

Figure 4 Impact of weed management on soil erosion.