Introduction

- Rubber agroforests in Sumatra (Indonesia) are managed by farmers under a range of management intensities. For trees other than Rubber farmers usually rely on natural regeneration, selecting useful trees (fruits, fire wood, spices, dye and timber) among many.
- With depletion of natural forests, the main source of timber, farmers are now interested in growing timber trees inside Rubber gardens (called Kelonan Karet) both for domestic use and household income.
- Meranti, trade name for Shorea spp. (Dipterocarpaceae), is a high economic value timber, that can be inter-planted with Rubber. Some Shorea species, e.g., S. fallax, are shade tolerant, while others, like S. jepunfolia, S. selanica and S. lamellata, are light demanding.
- To support on-farm experimentation, we used the Spatially Explicit Individual-based Forest Simulator (SExI-FS) to explore options and planting strategies.

On-farm experiment (Tata, 2008)

- A researcher-led on-farm experiment of planting Meranti with Rubber to test the necessity of mycorrhiza inoculants for Meranti in Bungo and Tebo regency, Jambi (Indonesia).
- Shorea selanica and Shorea lamellata were transplanted at 5 sites with different history and age of Rubber tree
- Mixed dipterocarp forest (MDF) plots were used as control. Meranti growth responded well to light; ectomycorrhiza formation did not critically depend on inoculation.
- A network of on-farm demonstration trials has now been initiated, within the CIFOR-ICRAF Landscape Mosaics project.

Growth prediction using SExI-FS model

Growth rate of S. selanica (Hiratsuka et al., 2007) were used to calibrate the model. Strong effects of tree spacing on growth emerge after 4-8 years.

Mixed Regular Plantation

- Tree spacings of 3x3 m, 3x6 m and 6x6 m were tested for both Meranti and Rubber monoculture, and for 50-50 mixtures, with Meranti and Rubber planted at the same time.
- In a dense plantation (3x3 m), Meranti grew better when mixed with Rubber than in monoculture, but Rubber was significantly suppressed.
- In a 3x6 m spacing, Meranti still dominated Rubber; however, the competitiveness of Meranti was much less than in a 3x3 m spacing.
- Competition effect of Meranti on Rubber almost disappeared at 6x6 spacing.
- According to growth simulation, despite its higher potential growth rate, Rubber is less efficient than Meranti in the use of space.

Mixed Random Plantation

Number in Scenario (0, 1, 2, 3, 4, 5) refers to the years after planting Rubber when Meranti is inter-planted. Total tree density is 555 trees/ha, random distribution. Rubber:Meranti = 50:50, Rubber trees tapped regularly, assumed no mortality of trees.

Summary of simulation results:
1. Meranti is too aggressive for Rubber under Scenario 0.
2. Meranti growth very slow under Scenario 5.
3. In the 30-year simulation, Rubber is affected under Scenarios 0 to 2; and Meranti suffers from competition under Scenarios 3 and above.
4. Planting gap refilling: Meranti around 2 years after Rubber may provide both Rubber and Meranti reasonable growth.

Conclusion

- Faster growth rate does not make Rubber more competitive than Meranti, other properties such the space use efficiency (diameter-crown width relation) and diameter-height allometry are important in the model and probably in the field.
- Meranti grows well in gaps, but may be too competitive for Rubber if planted at the same time as Rubber at standard density.
- Allowing Rubber about 2 years to establish before planting Meranti offers a good compromise for the growth of both Rubber and Meranti.
- Inter-planting of Rubber gardens (e.g. after damage by white-root-rot disease) with Meranti may be more promising than mixtures at too high a tree density.

References


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