

**TREE COLONIZATION OF
ABANDONED AGRICULTURAL CLEARINGS IN
SEASONAL TROPICAL MONTANE FOREST IN
NORTHERN THAILAND**

by

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ABSTRACT

The Thai Government has recently embarked upon a nationwide project to restore degraded forests. One approach could be to assist natural regeneration (ANR) by counteracting particular limiting factors, such as insufficient dispersal of tree seeds into cleared areas, lack of beneficial shade or excessive competition from weeds. This thesis describes a two year project in northern Thailand which analysed, stage by stage, the colonization from seed of a range of tree species in old abandoned agricultural clearings to identify limiting factors to enable appropriate ANR techniques to be developed to overcome them. Fruit production, seed dispersal, seed germination and seedling survival were monitored in the field. Experiments on selected species were carried out in the field and nursery to determine the effects of seed predation, high light and low moisture on seed germination and the effect of the clearing environment and above-ground weed interference on seedling performance in the first year.

Success at each stage of the colonization process was found to be strongly influenced by seed size. Colonization was largely restricted to species with medium sized seeds of between 2 and 14 mm. Tree species were divided into three seed-sized based functional groups characterized by different critical stages (where colonization was likely to be blocked) and inhibiting stages (where the probability of colonization was much reduced).

The critical stage of small-seeded species is recruitment: seeds were dispersed prolifically to the clearings but failed to develop into seedlings. Colonization may be restricted to immediately after disturbance, before competing herbs and shrubs take over, and to isolated patches of bare soil within shrubby areas. Medium-seeded species have no consistent critical stage. Recruitment was an inhibiting stage for wind dispersed species, while dispersal and recruitment were inhibiting stages for animal dispersed species. Colonization by species with medium sized seeds was heavily dependent on the presence of fruiting trees at the clearing edge. For large-seeded species the critical stage is dispersal. The fruit production stage may also inhibit colonization as many large-seeded species fruited supra-annually. Scatter-hoarding of large seeds by small mammals was mostly restricted to the edges of the clearings.

The clearing environment was more severe than the forest in terms of temperature and soil moisture deficit although high levels of direct solar radiation were not found at ground level. Seed predation and exposure of seeds to direct solar radiation generally reduced colonization across all functional groups. The weed canopy generally inhibited seedling survival and growth during the rainy season and facilitated survival during the hot dry season.

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