

# DOI PUI CUPRESSUS PLANTATION THINNING TRIAL 2005

## Introduction

In 1999, the Chief of Doi Suthep-Pui National Park, Kuhn Prawat Wohandee requested the Forest Restoration Research Unit (FORRU), a joint initiative between Chiang Mai University and Doi Suthep-Pui National Park HQ, to assist with a project to rehabilitate an aging plantation of *Cupressus tosulosa* D.Don (Cupressaceae) in line with the park's policy of gradually replacing previously planted tree exotic species with indigenous tree species characteristic of the local ecosystem.

Located at the summit of Doi Pui, this plantation was established in 1963 with a spacing of 2 x 2 m and was characterized by a very dense canopy and a very dense root mat visible at the soil surface. The dense canopy allowed less than 1% of sunlight to filter down to ground level and the soil surface was covered in a dense layer of leaf litter, coming from the *C. tosulosa* trees. Consequently, there was an almost total absence of herbaceous ground cover and no seedlings of native forest trees were establishing in the site, due to root competition and lack of light.

From the previous project in 1999, considering that these conditions would inhibit the growth of any planted trees, FORRU recommended that the plantation should be thinned by about 30% to reduce competition for light, soil moisture and nutrients between the planted trees and the established *C. tosulosa* trees. This 2005 project studied comparing treatments between thinning and non-thinning before tree planting. The planting tree performance were monitoring in both treatments.

## Methods

A total of labeled 400 trees (11 species) were selected from FORRU's nursery at Doi Suthep-Pui National Park HQ for planting at Doi Pui over an area of approximately 2 rai. The numbers of trees of each species planted are listed in table 1. There were 2 treatments: i) thinning (200 trees, 11 species) and control (200 trees, 11 species), all the same species in both treatments. The trees were hardened off in May 2005 and planted in June 2005 during a collaborative effort between FORRU and RFD officers. The thinning treatment was removal of 10 *C. tosulosa* trees within a 1 rai area.

The site was staked out with bamboo poles, using a spacing of approximately 1.8 m between trees. Planting holes, twice the size of the containers (9 x 2½-inch plastic bags), were dug and 100 gm of NPK fertilizer was mixed with soil in the bottom of each planting hole. These planted trees were monitored 4 times for growth and survival over three years after planting since 2005 until January 2008.

Table 1 - Trees planted at Doi Pui *C. tosulosa* plantation in June 2005

S.no	Species	Family	Thai name	Amount
7	<i>Manglietia garrettii</i>	Magnoliaceae	มณฑาแดง	40
19	<i>Rhus rhesoides</i>	Anacardiaceae	กอกกั้น	30
29	<i>Ficus benjamina</i>	Moraceae	ไทรช้อย	40
62	<i>Quercus semiserrata</i>	Fagaceae	ก้อตาทมูหลวง	40
165	<i>Magnolia liliifera</i>	Magnoliaceae	มณฑาขาว	20
269	<i>Castanopsis tribuloides</i>	Fagaceae	ก้อใบเลื่อม	40
275	<i>Lithocarpus lindleyanus</i>	Fagaceae	ก้อด่าง	40
276	<i>Quercus lanata</i>	Fagaceae	ก้อแอบ	40
280	<i>Lithocarpus elegans</i>	Fagaceae	ก้อหม่น	30
293	<i>Podocarpus neriifolius</i>	Podocarpaceae	พญาไม้	40
377	<i>Carallia brachiata</i>	Rhizophoraceae	เถียงพริ้านางแ	40

## Results

Results are derived from monitoring all planted trees in July 2006 and January 2008 (2 ½ years after planting). Diameter, height, width of canopy and health score of all surviving labeled trees that could be found were measured and recorded.

Performance of planted trees at this site was low compared with open weedy sites usually planted by FORRU.

The overall percent mortality of the planted trees after 2 ½ years was 35-100%, whilst growth of surviving trees was slow. Mean relative growth rates were only 20.3 % per year for RCD and 20.5 % per year for height increment. Mean root collar diameter of surviving trees had increased since the previous monitoring (July 2006) from 7.66 mm to only 11.22 mm, whilst height averaged only 96.33 cm.

The monitoring data of planted trees were compared between 2 treatments, thinning and control (Table 2). Thinning produced better results than did the control (no thinning). The total number of surviving trees with thinning was 68 (35.61%), while in control site it was 33 (17.27%). Survival percentage of most tree species was lower in the control than with thinning. However, survival percentage of *Rhus rhesoides* and *Podocarpus neriifolius* in thinning (33.33% and 40%) were slightly lower than in control (40% and 45%). All planted trees of *Lithocarpus lindleyanus* and *Quercus lanata* died in control sites. Percentage survival of *Manglietia garrettii* (50%), *Magnolia liliifera* (50%) and *Lithocarpus elegans* (73%) with thinning was reasonably high.

Most of the planted trees species in the thinning treatment performed better than in the control plot. RCD and height growth of all tree species were higher with thinning than in the control plot (except *Quercus semiserrata*). RGR of root collar diameter of *Manglietia garrettii*, *Magnolia liliifera*, *Lithocarpus lindleyanus*, *Quercus lanata*, *Lithocarpus elegans* were higher in with thinning than in the control plot, whilst *Rhus rhesoides*, *Ficus benjamina*, *Quercus semiserrata*, *Castanopsis tribuloides*, *Podocarpus neriifolius* and

*Carallia brachiata* grew better in control treatment. Height RGR of all planted species, excluding *Ficus benjamina*, *Magnolia liliifera* and *Podocarpus neriifolius*, was much higher with thinning than in the control plot.

*Manglietia garrettii*, *Rhus rhesoides*, *Quercus semiserrata*, *Castanopsis tribuloides* and *Lithocarpus elegans*, their average height was taller than 100 cm in both treatments.

## **Conclusion**

Thinning of *C. tosulosa* trees at this site (at least 30% or higher) is highly recommended before any further enrichment planting is implemented. However, although thinning would very likely improve the performance of planted framework tree species at this site, their performance would most likely remain low compared with other FORRU field trials.

Table 2 Relative performance of various indigenous forest tree species in a *C. tosulosa* plantation with and without thinning

Species	Percent of survival		RCD		Height		RGR of Root collar diameter		RGR of height	
	Thinning	Control	Thinning	control	Thinning	control	Thinning	Control	Thinning	Control
<i>Manglietia garrettii</i>	50.00	10.00	26.20	17.50	170.00	120.00	22.51±9.3	16.85±3.1	24.17±5.8	18.93±2.2
<i>Rhus rhesoides</i>	33.33	40.00	14.00	12.17	182.20	124.33	6.35±19.2	22.14±2.1	15.74±11.9	13.33±5.9
<i>Ficus benamina</i>	25.00	15.00	9.60	7.67	88.20	64.00	10.72±8.3	38.26±53.7	2.96±19.1	10.49±8.5
<i>Quercus semiserrata</i>	15.00	15.00	17.33	17.33	133.33	150.33	20.81±16.1	47.73±56.6	13.32±4.5	11.43±7.3
<i>Magnolia liliifera</i>	50.00	20.00	13.20	9.00	71.60	42.50	12.49±7.9	1.89±2.7	1.37±27.6	3.97±11.1
<i>Castanopsis tribuloides</i>	45.00	20.00	14.44	14.75	151.89	138.40	28.90±15.3	46.93±41.9	26.32±13.6	20.64±9.4
<i>Lithocarpus lindleyanus</i>	25.00	0.00	8.20	0.00	59.40	0.00	17.78±11.3	0.00	1.29±10.6	0.00
<i>Quercus lanata</i>	15.00	0.00	8.67	0.00	95.00	0.00	22.09±2.5	0.00	15.88±11.3	0.00
<i>Lithocarpus elegans</i>	73.33	20.00	11.55	10.33	137.73	113.33	19.71±7.6	18.24±14.1	28.54±6.6	24.32±7.4
<i>Podocarpus neriifolius</i>	40.00	45.00	13.13	8.67	81.50	64.44	8.42±23.1	29.35±45.6	0.15±32.6	2.12±5.7
<i>Carallia brachiata</i>	20.00	5.00	8.00	5.00	76.00	55.00	2.77±3.9	56.52±79.9	21.72±12.4	7.69±2.9