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SURVIVAL RATES OF THREE TREE SPECIES IN A FOUR-YEAR-OLD ALLEY CROPPING TRIAL

An alley cropping experiment in West Sumatra, Indonesia, is now in its fifth year. This report covers the results of an assessment of tree survival rates which were used to determine the feasibility of replacing or replanting one or more of the tree species.

Representative soil (Typic Paleudult) analyses of the top 15 cm are: 2.21 Al+H, 0.76 Ca, and 0.28 Mg cmol/kg (1 N KCl); 0.07 cmol/kg K and 0.9 ppm P (Mehlich I), (Evensen and Yost, 1986).

The experiment is laid out in a split plot design with four replications. The treatments are as follows (Evensen and Yost, 1986):

Main plots - Tree species
1/ *Paraserianthes falcataria* (L.) Nielsen
2/ *Calliandra calothyrsus* Meissn.
3/ *Gliricidia sepium* (Jacq.) Walp.
4/ No trees (control)
Subplot - Liming levels
1/ No lime
2/ Low lime (750 kg lime/ha)
3/ High lime (to reduce Al+H saturation to 25%, 2-4 T lime/ha)

Each tree plot is 12 m x 5.5 m. Three 5.5 m tree rows are included in each plot. Tree rows are at 2, 6, and 10 m from the edge of the plot.

The trial was initiated in December 1984 and has been through four successive upland rice (*Oryza sativa*)-cowpea (*Vigna unguiculata*) rotations. Beginning nine months after planting the trees were pruned four times per year.

Prior to pruning in September 1988, the total number of trees standing in each plot, survival, and mortality were tabulated. Trees which had any evidence of life, irrespective of productivity level, were considered living.

The most appropriate way to report the results would be to show the percentage of surviving trees. However, the results are presented in terms of trees still located within each respective plot, as the original planting densities were variable (2 seeds per hill every 12.56 cm for *Calliandra* and *Paraserianthes*, and one cutting every 25 cm for *Gliricidia*), and actual plant density, after initial establishment, was not known.

C. calothyrsus has performed well. It continues to grow back quickly after pruning. Both the number of living trees and survival rates were high (Table 1).

P. falcataria experienced a sharp increase in mortality over *C. calothyrsus*. A comparison of total trees in the calliandra plots vs. the paraserianthes plots reveals there are much fewer trees in the latter (Table 1). Additionally, Table 1 shows that many *P. falcataria* still present in the plots had died. Gaps occurred in many of the rows. Many surviving trees were borderline. The species initially did well, as evidenced by the large trunks of many of the dead trees. Species mortality, which was first reported in 1988, has been on a steady increase since then. *P. falcataria* was very

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slow to recover from pruning and is currently under nutrient, insect, and possibly disease stress.

The reported *G. sepium* survival data is accurate. There is no aboveground evidence of any trees in many parts of the gliricidia plots. Increased dry matter production of *G. sepium* was obtained with higher lime rates, whereas the other two species did not respond to higher lime rates (Evensen and Yost, 1986). *G. sepium* response to lime is also evident from the increased survival rate at higher lime rates.

C. calothyrsus had an overall survival rate of 97% and averaged 63 live trees per plot. *P. falcataria* had an overall 61% survival rate and averaged 45 live trees per plot. Undoubtedly the survival rate for *P. falcataria* would be somewhat lower if the missing trees were taken into account as well. *G. sepium* averaged a total of 10 live trees per plot. Gliricidia survival rates are misleading as most of the trees initially planted are now missing.

The gliricidia has been replaced with *Flemingia macrophylla* (Willd.) Merr. Dead trees were removed from plots of *P. falcataria* and replanted in both the tree row gaps as well as immediately adjacent and parallel to the established tree rows. A very small number of *C. calothyrsus* was directly sown in areas of poorer growth.

Table 1. Number of trees and percentage of trees (in parenthesis) still surviving (16.5 m tree row/plot).

Tree species	Lime rate	REP I	REP II	REP III	REP IV	MEAN	STD DEV.
		——Number and (%) of trees——					
Calliandra	None	68(94)	63(95)	46 (92)	70(100)	61.8(95.2)	9.4 (2.9)
	Low	68(96)	60(97)	52 (98)	67(100)	61.8(97.7)	6.4 (1.5)
	High	73(97)	66(99)	54 (98)	63 (90)	64.0(98.0)	6.8 (0.7)
Paraserianthes	None	62(64)	48(65)	40 (65)	50 (70)	50.5(66.0)	7.9 (2.3)
	Low	42(48)	50(64)	26 (41)	38 (67)	39.0(55.0)	8.7(10.8)
	High	67(63)	43(65)	39 (63)	36 (61)	46.3(63.0)	12.2 (1.4)
	None	12(57)	28(88)	1(100)	7 (78)	12.0(80.7)	10.0(15.7)
	Low	29(83)	15(52)	8 (40)	6 (25)	14.5(50.0)	9.0(21.3)
	High	25(78)	42(95)	41(100)	31 (89)	34.0(90.5)	7.1 (8.2)

References:

Evensen, C., and R. Yost. 1985. Alley cropping trial - tree establishment phase. Field Research Brief No. 20. Tropsoils/Indonesia.

Evensen, C., and R. Yost. 1986. Alley cropping experiment - 1985/86 growing season. Field Research Brief No. 33. Tropsoils/Indonesia.

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