FERTILIZATION OF EUC-ALYPTUS TERETICORNIS IN SOUTHERN GUAM

Timothy J. Krohn
Former Head, Forest Nursery and Management Section, Forestry and Soils Resources Division, Guam Department of Agriculture, Agana

Fertilization of eucalyptus seedlings planted in Guam resulted in better tree growth and survival. Development of mycorrhizal fungi appeared to be stimulated and grass competition was successfully overcome.

The Forestry and Soils Resources Division of the Department of Agriculture, Government of Guam, has been trying for the past 6 years to reforest the southern part of Guam. This work has been relatively unsuccessful due to one or more of the following causes: planting of the wrong species, lack of fertilizers, lack of site preparation, lack of maintenance, or improper planting procedures.

A fertilization trial using *Eucalyptus tereticornis* Sm. was established to help determine what is needed to establish outplantings successfully.

Location and Site Conditions

Guam is located at 13° 25' N latitude and 144° 45' E longitude in the western Pacific Ocean. Its climate is humid tropical with distinct rainy and dry seasons of nearly equal lengths. It receives 60 to 100 inches (1,500 to 2,500 mm) of rain per year, most of which falls between June and December. Tropical storms with winds up to 90 miles per hour (145 kph) occur annually; super typhoons, 200 or more miles per hour (322+ kph), pass over Guam on the average of once every 13 years. The temperature ranges from 75° F to 95° F (24° C to 35° C).

Grasses are the predominant vegetation. Natural soil slumping and motorcycles affect the micro-environment by causing bare soil and erosion. *Dicranopteris linearis* (Burm.) Underwood (Savannah fern) is often the first soil-binding species to cover bare ground. The grasses *Dimeria chloridiformis (Gaud*.) K. Schum. & Lauterb., *Miscanthus floridulus* (Labill.) Warb. (swordgrass), and *Pennisetum polystachyon (L*.) Schult. (foxtail), along with D. linearis, are the savannah community plant indicators and will grow in pure or mixed stands. All of the typical savannah indicators were found on the planting sites. It has been noticed over the past few years that foxtail has progressively covered more land (*1*). At the end of the first year of the trial, foxtail was the predominant vegetation, other than the planted trees, on the trial sites.

The terrain of southern Guam is hilly, but the sites are located on slopes gradual enough to drive a tractor and plow. The sites' soils are acidic (pH 4.70 to 5.45) and low in nutrients (table 1).

One site is exposed to the winds coming off of the ocean, but the other is somewhat protected from the wind. Both sites are located next to and north of Cross Island Road within the Cotal Conservation Area in the middle of southern Guam. The site elevation is 450 to 500 feet (137 to 152 m).

Table 1.—*Soil analysis*

	Exposed site	Protected site
pH	4.70	5.55
P ppm	.78	.65
K ppm	65.00	240.00
Ca ppm	570.00	800.00
Mg ppm	500.00	360.00
Na ppm	60.76	45.08
% 0. M.	1.04	5.21

Methods

The fertilization trial using *E. tereticornis* was established in July 1978. The experiment was set up in a randomized block design of five replications (blocks), each with two plots. Each plot contained 12 plants spaced 4 by 9 feet (1.2 by 2.7 m) in three four-tree rows. Three plots were placed on the exposed site, and two plots were placed on the protected site.

Each site was mowed, burned, plowed, and disced for site preparation. At the time of planting, 30 grams of 14-14-14 Osmocote were added to each planting hole of one plot in each replication; the second plot was left as a control.

The seedlings were all grown in number 8 Styroblocks.

Total tree heights were measured to the nearest centimeter every month for 1 year.

Results

There is a statistically significant difference between fertilized and unfertilized *E. tereticornis* 1 year after planting (table 2). Fertilized trees averaged 256 centimeters tall versus 87 centimeters for the unfertilized trees (figs. 1 and 2). Net height growth was determined by subtracting the height at time of planting from total tree height 1 year later. Net height growth was 219 and 48 centimeters for the fertilized and unfertilized trees respectively.

No statistically significant difference exists between replications.

Discussion

Fertilizer, applied at planting, is beneficial for the establishment of *E. tereticornis* in southern Guam.

The unfertilized trees, besides showing limited growth, suffered from obvious nutrient deficiency. The leaves were few in number and bronze in color;

Table 2.—*Analysis of variance*

Source	S.S.	df	M.S.	f
Replication	2,320	4	580	
Treatment	71,533	1	71,533	**
Error	10,705	4	2,676	
Total	84,558	9		

** .01 level of significance

Figure 1.—*The comparison between fertilized and unfertilized* E. tereticornis *1 year after planting. The fertilized trees are the tall ones. Only one unfertilized tree is shown, just to the left of the meter stick. It is only 60 centimeters tall.*

new juvenile leaves were, for the most part, missing. However, due to favorable conditions, unfertilized trees were occasionally able to increase in height, have green leaves, and have juvenile leaves.

Overall, the fertilized trees showed healthy growth characteristics: good height growth,

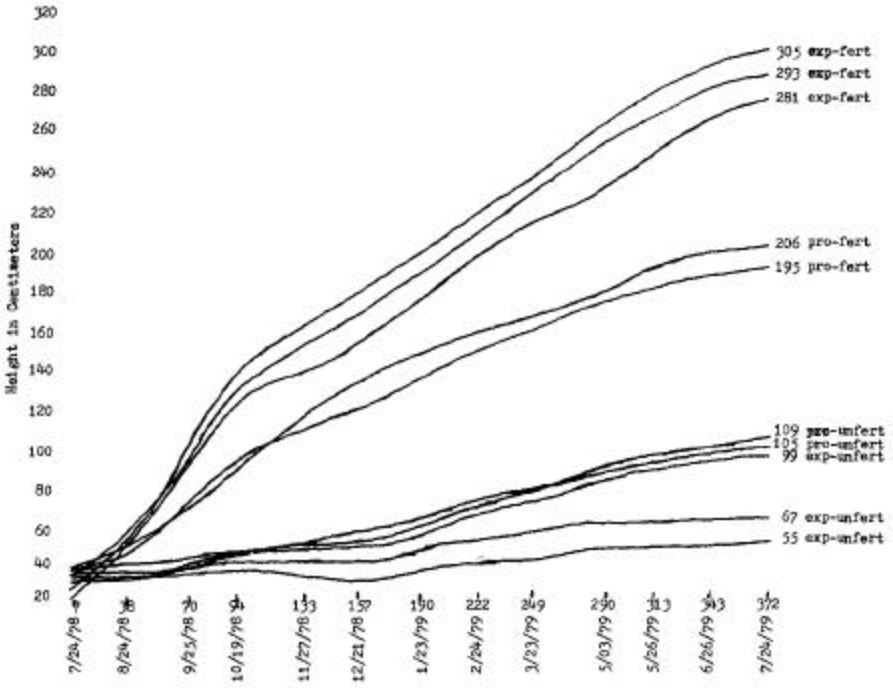

Figure 2.—*Tree height growth for 1 year (each line is a plot).*

green leaves, and juvenile leaves. A fungus of the genus *Thelophora (*either *T. congesta* Berkeley or *T. ramariodes* Reid) produced fruiting bodies under the fertilized trees, but not under the unfertilized trees. Because this fungus is known to have a mycorrhizal relationship with *Casuarina equisetifolia* L. and is often seen under the crown canopy of many of the fertilized *E. tereticornis* during the 1st year after planting, it is possible that the fungus is also forming a mycorrhizal relationship with this eucalypt.

Conclusion

Fertilization of *E. tereticornis* under the existing growing conditions of southern Guam is beneficial for tree establishment and growth. Without the fertilization at time of planting this species will have a very limited chance of survival and growth needed to successfully compete with the grasses. Further study will determine the optimum levels of fertilization, nutritionally and economically, at the time of planting and 5 to 10 years later.

Literature Cited

1. Moore, P. H., and McMakin, P. D., 1979. Plants of Guam. 186 p. Coll. of Agric. and Life Sci., univ. of Guam.