

PASTURE WITH *Erythrina poeppigiana*

The Farm of Don Francisco Callejas

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INTRODUCTION

Erythrina spp. are found in association with pasture in various parts of Costa Rica. Frequently this association originates when old plantations of coffee, with *Erythrina* as a shade tree, are turned into pasture with the trees of *Erythrina* being left standing. The situation on the farm of Don Francisco Callejas is unusual in that he has made an effort to establish and maintain *E. poeppigiana* in association with *Pennisetum clandestinum*. Don Francisco considers that the *Erythrina* play an important role in providing nitrogen to the pasture and consequently there is less need to fertilize with chemicals.

PRELIMINARY DATA ON THE FARM

Table 1: *Erythrina poeppigiana* and *Pennisetum clandestinum*

THE FARM OF DON FRANCISCO CALLEJAS

Location: Santa Cruz de Turrialba

Elevation: 1200-1600 masl

Pasture with *Erythrina* spp.: 200 ha of the 300 ha in the farm

Date of establishment: a) The system: since 1930

b) Experimental plot area 1970.

Erythrina poeppigiana

Initial spacing: 9.2 X 9.25 m

Initial density: 114 trees/ha

Provenance: Aquiares/Juan Viñas (nearly without spines)

Mean height (29 trees): 2.3 m

Mean diameter (29 trees): 30 cm

Commercial volume: 0.111 m³/ tree (commercial hgt. = height - 0.4 m)

12.65 m³/ha (density of 114 trees/ha with no rot)

Value: £75/m³ or £95/ha/yr, assuming above data and £8.54 = \$1.00

Rotational plots

Size: 0.7 ha (average: estimated by owner)

Rotation: 80 cows/day/30 days (approx. 3.8 animals/ha)

Fertilization: 100 lbs/pasture each rotation (May-Nov.: 18-10-6-2/Dec.-April: urea (42% N) or Nutran (32% N))

Production: 20 lbs/animal/day (owner's estimate)

In addition to the data in Table 1 the following observations were recorded from the farmer:

1. The growth of P. clandestinum and its response to the addition of fertilizers is reduced under conditions of shade, and consequently a very wide spacing of the trees is recommended. An advantage that E. poeppigiana has over Alnus acuminata, another pasture tree found in the same zone, is that its shade may be controlled by regular pruning.
2. In paddocks that are not used intensively Don Francisco depends solely upon the E. poeppigiana to maintain soil fertility: that is he applies no chemical fertilizers.
3. The Erythrina is traditionally established by planting large stakes, usually about two meters in height. Newly planted stakes and established trees are protected from damage by cattle by the regular application of cow manure, since the cattle, once acquiring a taste for the bark of Erythrina will chew on the trunks. The animals generally acquire a taste for Erythrina after feeding upon the remains of pruned branches. The fact that they like to eat the bark and leaves of this species is not an advantage since the final result is bark damage to both small and large trees with subsequent rot problems in the trunks. Because of the rot he does not believe that the Erythrina trunks have commercial value.
4. The trees are pollarded more or less every 3 years. This operation is not made in coordination with the rotation of pasture, but more according to the availability of labour. The branches that are pruned may be used to replace dead trees. Cattle may be seen feeding upon the pruning residues up to 15 days after the branches were cut.

DISCUSSION

It is interesting to compare the two different associations of P. clandestinum with trees in the high altitude dairy zones. The dairymen of "Las Nubes", where only Alnus acuminata is used, give the provision of shade during the summer, as their main reason for having the tree in their pastures. In the case of Don Francisco Callejas, his justification is that the Erythrina provides nitrogen to the soil and thus lowers his fertilization costs. In both cases the disadvantage of reduced growth of P. clandestinum is cited. At Santa Cruz they also mention the additional problem that the concentration of animals below the shade trees, particularly when conditions are humid, causes destruction of the ground cover and of the soil structure. It is obvious that the reasons for the perceived success of these two systems are complicated. However, by giving some attention to the differences in precipitation (see Table 2) between Santa Cruz and Las Nubes we can see better why different systems of management and different species of shade trees were chosen.

Table 2: Precipitation (mm) in the zones of Santa Cruz and Las Nubes de Coronado

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Santa Cruz*	289	197	160	249	230	322	367	318	291	315	357	427	3522
Las Nubes**	062	026	027	230	327	274	200	324	369	358	263	139	2422

* Mean 1966-1979, Estacion Meteorologica San Antonio (073074), elevation 1190masl

** Mean 1972-1979, Estacion Meteorologica Las Nubes (084073), elevation 147 masl

In Santa Cruz, where there is no dry month, the farmer wants to maintain the fertility of the soil but, with as little shade as possible in order that the ground has a chance to dry out and the animals don't concentrate in one spot, thus providing localized soil compaction and erosion. He also wants to reduce to a minimum the adverse effects of shade on grass growth. E. poeppigiana, which fixes nitrogen, provides abundant organic matter and tolerates regular pruning, offers obvious advantages for this area.

In Las Nubes, where more than anything else they want shade during the dry, hot months but at the same time do not want to cause over-shading during the wet months. They have chosen a species that does not develop a dense canopy (which is not the case for E. poeppigiana). The value of the timber from Alnus acuminata is another reason that this species is used.

The possibility of selling trees of Erythrina to "Celulosa de Turrialba"* for the production of pulp is an advantage that Don Francisco Callejas has not considered. Some indication of the potential value of his trees is given in Table 1. The actual value of trees is undoubtedly much lower due to rot following damage caused by the cattle. The growth is also presumably affected by the bark damage and subsequent rot. It is for this reason that Don Francisco is looking for other N fixing tree species that will tolerate pruning but are not attractive to the cattle.

* Subsidiary of Scott Paper, U.S.A.