GROWTH OF LAUREL (Cordia alliodora) IN COFFEE AND CACAO PLANTATIONS AND PASTURES IN THE ATLANTIC REGION OF COSTA RICA

P. Rosero, N. Gewald, CATIE

BACKGROUND

Laurel (Cordia alliodora) is native to Costa Rica. It is found in the Atlantic region from elevations of sea level to approximately 800 m. The species of the same name found in the Pacific region is considered a different variety. The quality of the wood is good, so the natural regeneration of this species is often protected by the farmer.

There are few man-made laurel plantations in the country, nor does the growth data from these plantations offer exact information yield. Besides, the laurel yield in pure plantations would not be the same as the growth of the species in combination with pasture and perennial crops. Therefore, in 1977 plots were established in areas where the natural regeneration of laurel grows in such combinations. This is on private land. The owners agreed to have the trees measured but declined any responsibility for maintaining the plots.

One major problem was to determine the age of the laurel stands. Under conditions of natural regeneration, it is quite unlikely that all trees in the same stand be the same age. Even an approximate estimate of the age range was difficult. Stem analysis is a simple, practical method, but it requires cutting of at least some trees. The result of the analysis of samples extracted with the Pressler increment borer were negative.

The results of the 1977 measurements are given in Table 1.

Table 1. Measurements of stands of laurel (Cordia alliodora) in combination with crops and pastures at four sites on the Atlantic slopes of Costa Rica.

SITE	ELEVATION	Plots No.	N (tree/ha)	G (m^2/ha)	d (cm)	h (m)	Crop combined in area
Siquirres	80 masl	1	130	17.6	35.3	35.0	RN + cacao
Cahuita	5 "	2	200	22.1	32.5	34.5	RN + past.
Home Creek (Bribrí)	10 "	3	120	15.9	41.1	34.0	RN + cacao
Bajo Chino (Turrialba)	550 "	4	228	14.7	28.9	22.5	RN + coffee

A stem analysis was made on an average tree in Bajo Chino. The age was calculated at 14 years. This was much younger that the age of the trees in the other plots according to the estimates of their respective owners. The trees were measured a second time in 1979. The results are given on the following pages.

Cordia alliodora in combination with cacao, Siquirres

Cacao is commonly combined with laurel in the Siquirres area. Well-developed stands are found some 15 km east of the town, near the Madre de Dios and Hondo Rivers. A 0.15 ha plot with laurel was established in a cacao plantation in 1977. The objective was to get more information on then increment of laurel. The trees were measured again in 1979. The first data are given below:

Table 2. Laurel measurements (Cordia alliodora) in combination with cacao in Siquirres.

Date	N	m^2/ha	(cm)	m	m^3/ha	Estimated age in years
4/1977	180	176	35.3	35.0	308.0	15-20
3/1979	167*	17.9	37.0	36.0	322.2	17-22
Annual increment**		1.22	1.3	0.7	20.8	

* The figure decreased because the largest trees were harvested.

** Based on the same trees in 1977 and 1979.

Observations

Apparently the laurel/cacao combination is a production system accepted by many farmers in the Atlantic part of Costa Rica. The management applied to the forestry component is a gradual lowering of density by harvesting the trees reaching commercial size (45 cm DBH). The laurel increment is rather good; height as well as diameter. It appears that the relatively high density of 167 trees/ha at this age does not have a negative effect on increment. It is assumed that good soil conditions are what make possible such good development at densities of 167 trees/ha.

A sprout of a stump of laurel was observed. The sprout was less than two years old and had a DBH of 10.3 cm.

It is notewhorthy that very little damage is caused to the cacao trees by the cutting of the laurel trees. The major laurel management problem arising out of natural regeneration appears to be the proper timing and spacing of the trees. It would therefore be a good idea to study the development of Cordia alliodora trees established on manmade basis with cacao.

Cordia alliodora established in combination with pasture (Cahuita)

Laurel with pasture is a frequent combination on the northern region of the Atlantic slope of Costa Rica near Guácimo-Guápiles and north of Ciudad Quesada. It is well known that laurel growth is slowed when it competes with an herbaceous vegetation (Melinis minutiflora).

A permanent plot was established near Cahuita in a stand of laurel in pasture. The laurels were concentrated in the marginal parts of the pasture on clayey soils with poor drainage. Two years later the trees were measured again and another plot was established in the same pasture with a lower laurel density (Table 3).

Table 3. Measurements of natural regeneration of Cordia alliodora in combination with pasture in Cahuita, Costa Rica: 1977 and 1979.

DATE	N trees/ha	G m^2/ha	d (cm)	h (m)	V m^3/ha	Estimated age in years
Plot (a)						
15/4/77	200	22.1	37.5	34.5	38.04	25-30
16/3/79	190*	22.35	38.6	35.0	38.91	27-32
Annual increment**		1.25	0.55	0.25	13.5	
Plot (b)						
16/3/79	150	11.43	31.2	27.5	154	20-25 (?)

* Number decreased by harvesting of trees.

** Calculations based on same trees 1977 and 1979.

Observations

Diameter increment is low, mostly because of the high tree density/ha. For this reason plot "B" was established with a better distribution of trees and at lower densities. The current annual increment of the volume is as much as 13.5 m^3/ha/year -- an acceptable figure considering the poor soil conditions.

Thirty percent of the trees grew no more than 0.3 cm in diameter in the last two years, indicating the need to thin the number of trees down to 110-130 trees per hectare with a corresponding basal area of 13 - 15 m^3/ha, approximately.

In the northern part of the Atlantic slope laurel often suffers from Loranthacea attacks. Although there are some trees with these pests near the site, the laurel have not been heavily attacked.

Cordia alliodora in combination with cacao. Home Creek, Bribri

The combination of laurel with cacao is very common in the lower part of the Atlantic side of Costa Rica. The laurel trees are the product of natural regeneration and their age is therefore unknown. Nonetheless, a tree ring count of felled trees indicated diameter increments of 1.6 - 2.2 cm/year.

Considering that the sampling of the felled trees was not representative since only the larger trees were felled, a 0.1 ha plot was established in Home Creek, on a cacao plantation. The objective was to measure the laurel increment. The trees were measured again two years later (Table 4).

Table 4. Measurements of natural regeneration of Cordia alliodora (laurel) combined in a plantation of cacao in Home Creek/Bribri. 1977 and 1979.

DATE	N trees/ha	G m^2/ha	d (cm)	h (m)	V m^3/ha	Estimated age in years
15/4/77	120	15.95	41.1	34.0	271.1	20 - 25
16/3/79	100*	14.6	43.1	35.2	257.0	22 - 27
Annual increment**		1.5	1.0	0.6	14.8	

* Number decreased due to haversting and natural loss of trees

** Calculation based on same trees in 1977 and 1979.

Observations

The laurel trees are showing good increments except for a larges tree in an area with high tree densities. Management of the forest stand can be a simple annual clearing, cutting undesirable trees and climbers. The larger trees which are not growing in volume can be harvested in coordination with pruning or renewal of the cacao plantation to prevent damages to the cacao trees.

Cordia alliodora in combination with coffee. Bajo Chino, CATIE, Turrialba

Coffee grows in combination with Cordia alliodora at three sites on CATIE land: Bajo Chino, Florencia Sur and behind the "109" houses. The natural regeneration of the laurel was protected when the weeding of the coffee plantations was still being done by hand without herbicides. The laurel is now the third layer above the layer of Poró (Erythrina poeppigiana), which in turn regulates shade over the coffee plants.

In 1977 at the Bajo Chino site a plot of 0.25 ha was established. The density of the laurel is considered high. The objective of establishing the plot was to study the behaviour of the laurel. The trees on the plot were measured again two years later (Table 5).

Table 5. Measurements of natural regeneration of Cordia alliodora (laurel) in combination with coffee in Bajo Chino, CATIE, Turrialba. 1977 and 1979.

DATE	N trees/ha	G m^2/ha	d (cm)	h (m)	V m^3/ha	Age in years
11/3/77	228	14.72	28.9	22.5	162.3	15
15/3/79	228	16.84	30.7	22.9	189.0	17
Annual increment		1.06	0.9	0.2	13.3	

Observations

Thirty percent of the trees measured had an annual diameter increment lower than 0.5 cm. They were almost all concentrated in the lower diametral categories. It is expected that this supression can be remedied by thinning the dying, thin and malformed trees and a few of commercial size. The objective is the same one of providing the best possible developmental conditions for the remaining trees. After thinning, the number of trees/ha will be 150, aged 17, corresponding to a basal area of approximately 12.5 m^2/ha,

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