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Farmers' Production of Timber Trees in the Cacao-Coffee Region of Coastal Ecuador

By

Michael Mussack and Jan G. Laarman

Working Paper No. 36

School of Forest Resources
North Carolina State University

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FARMERS' PRODUCTION OF TIMBER TREES IN THE CACAO-COFFEE REGION OF COASTAL ECUADOR

by

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KEY WORDS: Ecuador, industrial wood, farm income, farm survey, shade trees, trees and land use

ABSTRACT

The coastal region of Ecuador is an important producer of cacao and coffee. Increasingly, farms and ranches in the region also provide industrial wood for sawmills and other wood processing plants. Most of this wood derives from shade trees and pasture trees. Because little is known of wood supply from farm sources in coastal Ecuador, a survey was conducted of 122 farmers in the subregions of Ventanas, La Troncal, and Babahoyo. The survey indicates an abundance of land for the growing of farm trees, and excellent regeneration of many species on the majority of farms. However, current stocking of farm trees seems well below potential, and fewer than half of interviewed owners deliberately manage farm trees for eventual sale as timber. Only 2.2 percent of gross farm revenue derives from tree sales, even though over half of surveyed farmers have sold trees to industrial buyers at least once. Constraints on production and sales of farm trees for timber include risks of damage to coffee and cacao; perceived incompatibilities with current farming practices; inadequate methods of classification and pricing of farm trees; and insufficient knowledge of the industrial uses of farm trees by agricultural extensionists. These limitations need to be addressed through a strategy of research, development, and information diffusion on selected demonstration farms.

Resúmen

La región costera del Ecuador es una productora importante de cacao y café. Cada vez más, las fincas de la región proveen madera industrial para asseraderos y otros procesores madereros. La mayoría de esta madera viene de árboles de sombra. Dado que se sabe poco de la cantidad de madera provieniente de fincas en la costa del Ecuador se hizo una encuesta a 122 agricultores en las subregiones de Ventanas, La Troncal, y Babahoyo. La encuesta indica que existe una abundancia de terreno disponible para la producción de árboles de sombra y una regeneración excelente de muchas especies en la mayoría de las fincas. Sin embargo, densidades de los árboles de sombra parece bastante debajo de su nivel potencial, y menos de la mitad de los agricultores entrevistados cultivan sus árboles con el fin de venderlos eventualmente. De los entrevistados, un promedio de 2,2 porciento de ingresos brutos anuales provienen de ventas de árboles, a pesar de que más de la mitad de los agricultores han vendido árboles a compradores industriales por lo menos una vez. Limitaciones a la producción y a la venta de estos árboles incluyen el riesgo de daños a las plantas de cacao y cafe; la percibida incompatibilidad con las prácticas agrícolas usuales, métodos inadecuados de clasificar y poner precio a los árboles, y el poco conocimiento de los usos industriales de árboles de sombra por parte de los extensionistas agrícolas. Se necesita enfocar atención a estas limitaciones a través de una estrategia de investigación, desarrollo, y difusión de información en seleccionadas fincas demostrativas.

INTRODUCTION

Various inefficiencies characterize the production and consumption of industrial timber in Ecuador. With the steady advance of forest clearing for agriculture, log supply from remaining natural forests in northwestern Ecuador is increasingly distant and expensive. Current production and transport of logs and wood products from the Amazon side of the Andes mountains is made costly by inadequate highways. Most forest plantations in both the highlands and lowlands are below harvestable age; many plantations suffer problems of disease and poor growth. These various factors explain why a considerable number of wood-processing plants experience high costs and irregular deliveries of roundwood.

In response to these problems, sawmills and furniture plants are obtaining a substantial and apparently increasing volume of roundwood from nontraditional (mainly nonforest) sources. A principal source includes trees from farms and ranches in the coastal region, particularly east and northeast of Guayaquil. This region is the heart of the country's cacao and coffee production. Shade trees in the cacao and coffee plantations, as well as pasture trees in non-plantation areas of the farms, comprise the principal stock of trees important to timber buyers.

To date, no studies have been conducted on timber supply in Ecuador's cacao-coffee region. The region supports many good roads, considerable areas of relatively productive soils, relatively flat topography, and well-established networks of

technical assistance and credit. The area is close to the large Guayaquil markets.

Applying a diagnostic approach {6,7}, these favorable factors suggested that purposeful agroforestry development might be an attractive strategy to augment timber supply. An exploratory pilot survey of 122 cacao and coffee farmers was conducted in late 1987 to help test and possibly reformulate this hypothesis. Objectives of the survey were to determine: (1) the uses and management of shade trees and timber trees on the farms; (2) the economic significance of sales of these trees for industrial purposes; and (3) opportunities and constraints for possible agroforestry development. While some of the survey findings are specific to the particular region studied, others are informative for a wider range of contexts.

SURVEY METHODS AND DESCRIPTION OF THE FARMS

During October through December 1987, 122 farmers were interviewed in and around Ventanas (42 farms), Babahoyo (42 farms), and La Troncal (38 farms). These towns are located in the delta region of the Guayas River (Map 1). Ecuador's area under coffee and cacao is more than 740 thousand hectares, most of which is found in the region covered by the survey. Other but less important regional agricultural products include bananas, oranges, sugar cane, and beef. Altitude ranges from sea level to about 1,000 meters. Annual rainfall varies with elevation, with a distinct wet season occuring from December to March. Weather stations at low elevations indicate mean annual precipitation of 1500 to 2100 millimeters per year.

Farmers were identified for interviews on the basis of large-scale topographic maps. Only farms along good roads within 40 kilometers of the base towns were considered for the sample. These are farms most likely to be among the earliest and best targets for any commercially-oriented agroforestry program. Farm owners were interviewed on-farm or at their residences in towns, often in the company of personnel from DINAF (the national forestry agency), PNCafe (the national coffee program), PNCacao (the national cacao program), or DRI (the program for integrated rural development).

Mean size of farms included in the survey is 34 hectares (Table 1). No farm is larger than 230 hectares. Most farms are located on soils described as mainly clay loams. Two-thirds of farm owners live on their farms, and a slightly higher proportion are full-time farmers (i.e., with no supplementary sources of income). Tenant farming is not practiced. Only one of 122 farms is operated by someone other than the owner. Land titles are clear in all cases except Babahoyo, where some farmers still await their titles after making application many years ago.

In year 1987, some 22 percent of the farmers belonged to one or more agricultural cooperatives; 23 percent received agricultural credit; and 29 percent received some form of technical assistance. Use of hired labor is high; in 1987 the cost of hired labor averaged the equivalent of almost US$1,400.

USE AND MANAGEMENT OF FARM TREES

Survey Findings

The numbers and uses of farm trees vary with the types and intensities of agricultural production. Figure 1 illustrates the differences in principal agricultural land uses across the three subregions. Minor land uses--e.g., soybeans, oranges, and sugar--are omitted. Together, cacao and coffee occupy 60 percent of the remaining land area on the 122 farms covered by the survey. While coffee accounts for more area than cacao on farms surveyed in Ventanas, the opposite is true for farms surveyed in La Troncal and Babahoyo. Subtracting land currently under rice, corn, and bananas, approximately 82 percent of the remaining total area of the surveyed farms is theoretically available for timber trees in combination with cacao, coffee, and pastures.

As indicated in Table 2, the principal use of farm trees is for shade over cacao and coffee. This response was given by 80 percent of the interviewed farm owners. Another 15 percent regarded farm trees primarily as an investment {3}. Only a very few individuals defined primary use in terms of fuelwood, soil improvement, or on-farm construction. As expected, primary use of farm trees varies both by subregion and by farm size.

The use of farm trees for fuel has diminished considerably now that gas has become the principal source of energy for cooking. Of the 122 farms surveyed, 54 percent cook with gas and 45 percent with wood. Gas is available everywhere in the region, meaning that the choice between alternative fuels is one of comparative costs, convenience, and other factors.

Table 3 shows the principal combinations of farm production in the surveyed subregions. Cacao and coffee were present on almost all farms visited, and one or both of these crops forms the central economic base of the eight variations presented in Table 3. Farm trees are not explicitly recognized. This is because until 2-5 years ago, farm trees were not considered a crop with income potential.

Increasingly, however, farmers are paying attention to the farm trees indicated in Table 4. Four different species groups can be distinguished, depending on subregion and farm type. Throughout the region, laurel and fernan sanchez are the principal farm trees with commercial value to sawmills and furniture plants. The other species in Table 4 are principally shade trees, even though many of them are finding increasing acceptance for industrial purposes.

Of the farm owners interviewed, 35 percent had deliberately promoted and protected farm trees for commercial purposes. Most of these efforts depended on natural regeneration, while the rest consisted of obtaining tree seed or seedlings from a nursery operated by the Ministry of Agriculture. Those who planted seeds or seedlings did so on a small and experimental scale (typically less than 50 plants). Only two farm owners had used the government's credit plan for reforestation ("Plan Bosque").

The level of natural regeneration varies with soil fertility, drainage, plant competition, and many other factors. Some 61 percent of farm owners reported that natural regeneration

is excellent (Table 5). While based on rough and subjective evaluations rather than sample plots, the response suggests that regeneration is not usually a problem. Moreover, 60 percent of farm owners reported unutilized or underutilized open areas and fence rows suitable for tree growing. As indicated in Table 5, the mean size of such "blank areas" is about 10 hectares per farm. This finding suggests that farm forestry in coastal Ecuador is limited neither by regeneration problems nor by land shortages, although this simplifies from a highly complex set of considerations {8}.

The current stocking of shade trees appears to be well below a stocking that would compete with the growth and development of cacao and coffee. The mean stocking was 21 shade trees per hectare of plantation, with as few as 12 shade trees per hectare in Ventanas. In the Amazonian region of Ecuador, 100 shade trees per hectare (10m x 10m) is appropriate both to provide shade and to produce utilizable wood (R Peck and J Bishop, personal communication). While systems of plantation management in the two regions cannot be directly compared, there seems little doubt that plantation shade trees in the coastal region are understocked in a biological sense if not also an economic one.

Farm trees presently receive little deliberate management. As indicated in Table 6, 52 of 113 farm owners reported no management of farm trees. With the exception of species like laurel which grow in pastures and other open areas, the management of many farm trees is usually a direct reflection of

the management of cacao and coffee. The most common practice in cacao and coffee plantations of coastal Ecuador is two cleanings per year to remove weeds, add organic matter, and maintain soil moisture. This same treatment extends to the shade trees later sold as timber trees. In a very few cases, these shade trees receive fertilizer and irrigation.

Sales and Income

The total estimated volume of roundwood from farm trees sold during 1982-87 was between 4-10 thousand cubic meters. Precise volume estimations are not possible. The available information indicates an average annual sale of between 5-14 cubic meters of wood per farm. This output is low per unit area when considering that the 122 farms comprise more than 4,000 ha.

Aggregating over the 122 surveyed farms, gross farm revenue in year 1987 was the equivalent of US$769 thousand. Of this total, more than 90 percent derived from sales of cacao, coffee, and cattle. The sale of farm trees amounted to US$17 thousand, or only 2.2 percent, of gross revenue (Figure 2). About 20 percent of the surveyed farms are smaller than 10 ha., but they accounted for only 7 percent of the revenue from sales of farm trees.

Table 7 shows that 57 percent of surveyed farm owners have sold farm trees at least once. Just over one-fourth of all surveyed owners made a sale of farm trees in 1987. Those farms which sold trees in 1987 averaged the equivalent of US$210 from the transactions, with a maximum of US$1,810. Most purchases are

made by independent loggers and truckers, although a few sawmills and other processing industries purchase directly from the farmers. Laurel and fernan sanchez comprise the bulk of sales (Figure 3).

Farm owners give two principal reasons for sales of farm trees: (1) periods of depressed farm income, and a consequent need to generate cash flow from additional sources such as tree sales, and (2) cutting cycles to replace mature and overmature shade trees in the cacao and coffee plantations. These two motivations are difficult to separate, since the liquidation of mature shade trees often coincides with special needs for income. Other, less frequent, reasons for sales of farm trees include conversion to pastures and to short-cycle crops.

Constraints on Production and Sales

A number of technical, market, and managerial constraints must be overcome if farm trees are to be rationally produced and sold for industrial purposes. Through the present, growers of cacao and coffee in coastal Ecuador regard the harvest of shade trees and other farm trees as a windfall opportunity which arises only infrequently over long intervals of time. Little thought or planning has gone into making this a sustainable component of the farm enterprise. The long period required to grow farm trees to maturity is a familiar constraint in farm forestry, and one frequently mentioned in coastal Ecuador.

Perhaps the primary concern of most surveyed farmers is potential damage to cacao and coffee bushes caused by the felling

and skidding of shade trees and timber trees near their plantations. The combination of plantation damage and replanting costs easily can exceed the revenue from selling a few trees to sawmills and other buyers.

Also, many farmers believe that certain tree species are incompatible with farming. For example, although laurel is a species currently in strong market demand, several farmers maintain that laurel dries the soil. For this reason they do not permit laurel to regenerate on their farms. Here scientific validity is less important than farmers' perceptions, at least until research and extension clarify the issues at a level understandable and acceptable to the farmers.

Another class of problems concerns the classification and pricing of the farm trees to be sold. Currently, trees are classified as soft, semi-hard, or hard. The soft woods are sawn for concrete forms; the semi-hard woods are used for furniture and light construction; and the hard woods are used for other classes of furniture and construction.

Most trees are sold standing, unscaled for volume or quality. In 1987 only 15 percent of the roundwood sold by the surveyed farmers was transacted in logs, and only 8 percent was scaled in cubic meters. All the rest was sold as standing trees, at a fixed price per tree. Typically this price ranged from the equivalent of US$2-3 per tree for the soft species to about US$8 per tree for the hard species. Tree diameters, trunk straightness, log length, etc., are not directly factored into

selling price. While this greatly simplifies transactions, it does not properly reward the seller of high-quality timber. Moreover, because farmers lack experience in selling trees, they are almost always price-takers rather than price-setters.

Trees of species in highest demand often are sold too small and too young, causing later difficulty at the sawmills and furniture plants. The opposite problem occurs for overmature shade trees of species not in demand, which occupy space in the plantations and pastures, but which cannot be sold even at very low prices. The survey revealed numerous examples of both extremes.

A critical area of constraints concerns the limited and generally insufficient knowledge of farm trees by the agricultural extensionists who serve the region. This is not an unusual occurrence (5). Most extensionists in coastal Ecuador are highly specialized in a particular crop, e.g., cacao or coffee. They may recommend a single type of shade tree which has little or no current potential as an eventual timber tree. A broader knowledge of species useful to the wood industry might lead to alternative choices, and hence to increased farm income in the long run.

SUMMARY AND CONCLUSIONS

The preceding analysis of the current and potential industrial status of farm trees in coastal Ecuador fits a pattern in agroforestry more generally. The diagnostic survey indicates a capacity for greatly enhanced production, but current

deficiencies in management techniques and especially in institutions (i.e., technical assistance, extension, and marketing). Because so few farm trees are deliberately managed for eventual sale as timber, under current practices it is misleading to refer to these trees as part of the farm "system." More accurately, the farmers manage cacao and coffee plantations, and all other saleable goods and services (including trees in demand by the wood-processing industry) are merely by-products of that principal activity.

Policy prescriptions to enhance the supply of farm timber in coastal Ecuador depend in the first instance on the desires of individual farmers to work towards that objective. Table 7 suggests that willingness to become more active in growing trees varies by subregion. Only slightly over half of surveyed farmers want to continue to sell farm trees for timber, and a roughly similar proportion indicate willingness to participate in tree-growing experiments. Especially in Babahoyo, farmers are reluctant to enter tree-growing agreements with private industry. These results cannot be accepted at face value without further inquiries {4}, but they tentatively indicate a population of farmers only moderately interested in growing trees for timber.

Not surprisingly, the relatively larger farmers might be the best targets of opportunity as innovators and early adopters of managing farm trees for timber. This would conform with the usual structure of agroforestry investments {5}. On the question of continuing to participate in sales of farm trees, only 36 percent of farm owners with less than 10 ha. replied

affirmatively. This compared with 58 percent of owners with 11-50 ha., and 70 percent of owners with more than 50 ha. Will future production and sales of shade trees and pastures trees therefore concentrate in the hands of the large farmers? The question holds considerable interest from perspectives of efficiency, equity, and therefore social policy {1}.

In conclusion, farmers in the coffee-cacao region of coastal Ecuador generally appear to have the land, labor, technical ability, and market outlets to grow and manage farm trees much more intensively than at present. But they generally appear to lack: (1) understanding and enthusiasm for the idea that shade trees and pasture trees can be managed as a crop on a regular basis; (2) evidence that coffee and cacao will not be damaged; and (3) a market which fairly prices sales of farm trees according to scaled volume, species, and timber quality.

An action program should aim to overcome these interrelated constraints by generally adhering to a set of three time-tested principles {2}. First, most rural development experts contend that farmers usually are impressed more by visual evidence than by written or verbal information. This suggests on-farm demonstrations to intensify tree growing by a carefully selected set of receptive farm owners (the "innovators"), including some identified through this survey. These chosen farms become the focal points for most research, development, education, and training.

Secondly, initiatives to promote new farm practices are most effective when they strive to overcome the farmer's most serious objection. In this case, the most frequently cited objection is the risk of damage to cacao and coffee production. Hence techniques to grow and harvest shade trees so as not to interfere with cacao and coffee are a very high priority.

Lastly, it is widely observed that most farmers apply a gradual step-by-step process in changing their practices. Few risk radical innovations. The main implication here is to remain largely with the mix of tree species already found in the cacao-coffee region. Since the commercial value of a sufficient number of these species is clearly established, this should present no problem to either the farmers or the buyers.

With intelligent intervention which quickly leads to practical field demonstrations, the cacao-coffee region of Ecuador has the potential to substantially increase its production of roundwood for the wood-processing industries. Achieving that potential is less a matter of technological breakthroughs than definition of clear objectives, establishment of simple demonstrations, and wide diffusion of information. Improvements will both promote and demand cooperation among farm owners, government agencies responsible for technical assistance, and private wood buyers.

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APPENDIX I:

SCIENTIFIC NAMES OF FARM TREE SPECIES IN COASTAL ECUADOR

Common Name	Family	Genus and Species
amarillo	Lauraceae	Persea rigens
balsa	Bombacaceae	Ochroma pyramidele
cedro	Meliaceae	Cedrela odorata
fernán sánchez	Polygonaceae	Triplaris cumingiana
guachapelí	Leguminosae Mimosoideae	Albizzia guachapele
guayacán	Bignoniaceae	Tabebuya chrysanta
jigua	Laruaceae	Beilshmieda alliophyla
laurel	Boraginaceae	Cordia alliodora
marañon	Anacardiaceae	Anacardium excelsum
moral fino	Moraceae	Chlorophora tinctoria
pachaco	Leguminosae Caesalpinioideae	Schizolobium parahybum
palo prieto	Leguminosae Papilionoideae	Erythrina fusca
pechiche	Verbenaceae	Vitex sp.
saman	Leguminosae Mimosoideae	Pithecellobium saman
tambor	Leguminosae Papilionaideae	Erythrina poeppigiana
teca	Verbenaceae	Tectona grandis

MAP 1. Subregions of Ventanas, Babahoyo, and La Troncal in the Cacao-Coffee Region of Ecuador.

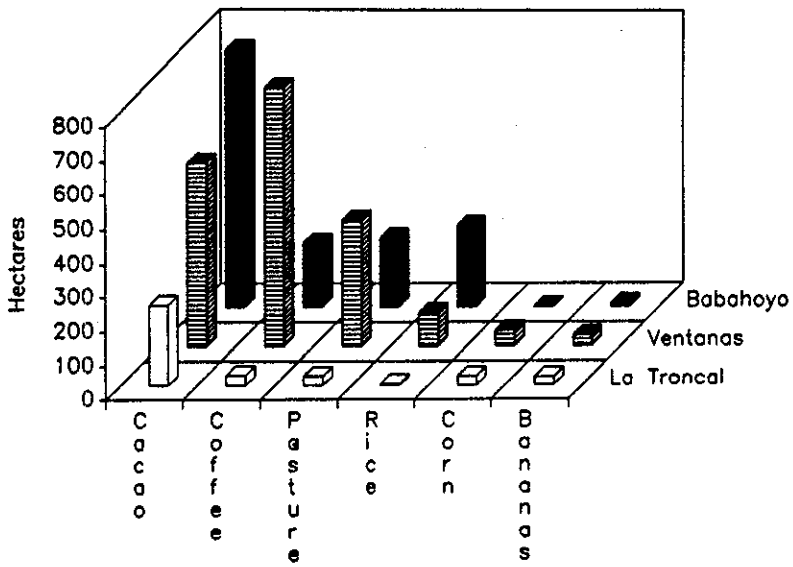

FIGURE 1. Principal Agricultural Land Uses on the 122 Surveyed Farms.

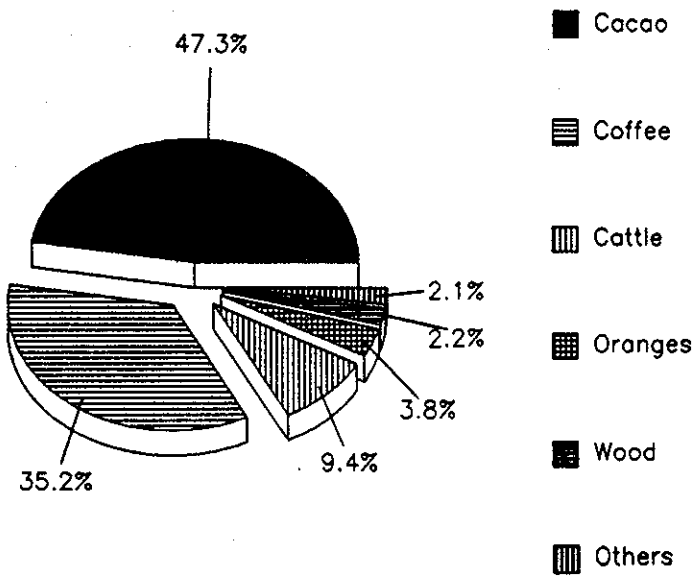

FIGURE 2. Composition of Gross Revenue on the 122 Surveyed Farms, 1987.

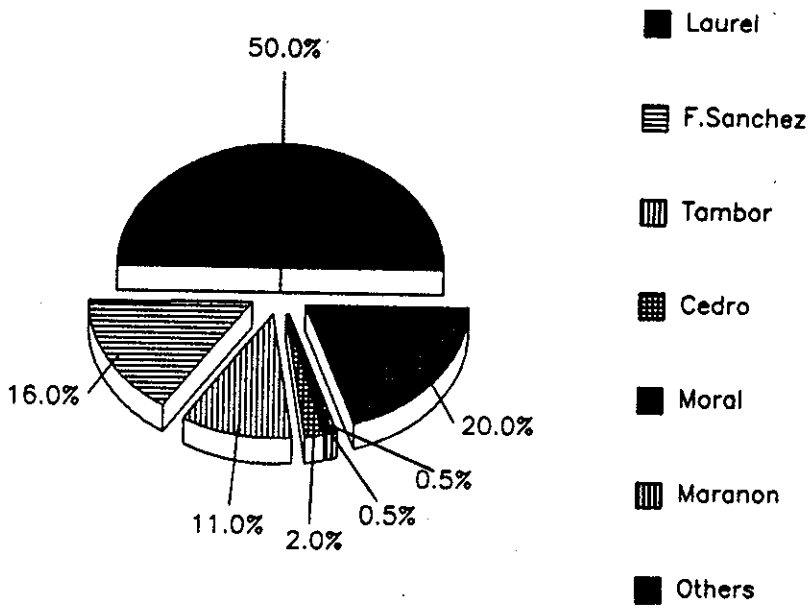

FIGURE 3. Volume of Roundwood Sold from the 122 Surveyed Farms, By Species, 1982-87.

TABLE 1. Selected Characteristics of Farms Surveyed in the Cacao-Coffee Region of Coastal Ecuador, 1987.

Characteristic	Subregion			Total
	Ventanas	La Troncal	Babahoyo	
No. of Farms Surveyed	n=42	n=38	n=42	n=122
Size of Farms (ha.)				
Mean	42	22	36	34
Minimum	4	1	2	1
Maximum	230	184	140	230
Proportion of Farms on Clay Loam Soils (%)	95	81	93	90
Proportion of Farm Owners Who:				
Live on Their Farms (%)	62	76	64	67
Are Full-Time Farmers (%)	64	76	79	73
Proportion of Farm Owners Who in Year 1987:				
Belonged to Cooperatives (%)[a]	23	30	10	22
Received Ag. Credit (%)[b]	29	18	21	23
Received Tech. Assistance (%)[c]	21	18	45	29
Use of Hired Farm Labor in Year 1987:				
Permanent (Workers/Farm)	1.5	0.4	0.4	0.8
Part-Time (Workers/Farm)	6.7	2.1	5.9	5.0

[a] Agricultural Cooperatives: Coop. Cacao, Coop. Café, Coop. Banano, Coop. Agropecuaria, Coop. Crédito y Ahorro.

[b] Agricultural Credit: BNF, PNCacao, PNCafé, PNCiclo Corto, PNGanado, Plan Bosque.

[c] Agricultural Technical Assistance: BNF, PNCacao, PNCafé, PNBanano, PROTECA.

TABLE 2. Principal Uses of Farm Trees, by Subregion and Size of Farm.

Principal Use [a]	Subregion			Farm Size (Ha.)		
	Ventanas	La Troncal	Babahoyo	<10	11-50	>50
	(% of Farms)			(% of Farms)		
Shade	85	68	86	73	80	88
Investment	15	20	12	20	14	12
Fuelwood	0	8	3	7	3	0
Soil Improvement	0	3	0	0	2	0
On-Farm Construction	0	3	0	0	2	0
Totals	100	100	100	100	100	100

[a] Farm owners were asked for the single most important use, even though multiple uses are implicit in the majority of responses.

TABLE 3. Principal Agricultural Combinations, by Subregion.

Type of System	Subregion			Total
	Ventanas	La Troncal	Babahoyo	
	(No. of Farms)			
1. Cacao/Coffee/Oranges	26	4	7	37
2. Cacao/Coffee	6	2	21	29
3. Cacao/Coffee/Bananas	3	12	4	19
4. Cacao/Coffee/Fruit Trees	2	10	5	17
5. Cacao	0	5	3	8
6. Coffee	1	1	1	3
7. Cacao/Coffee/Pasture	1	2	0	3
8. Cacao/Coffee/Sugar	0	2	1	3
Totals	39	38	42	119

TABLE 4. Most Frequent Groups of Farm Tree Species, by Subregion.

Species Group[a]	Subregion			Total
	Ventanas	La Troncal	Babahoyo	
	(% of Farms)			
Laurel, fernán sánchez, saman, moral, marañon, palo prieto, tambor	50	21	68	47
Guabo, laurel, fernán sánchez, saman, palo prieto, marañon	36	60	21	39
Laurel	3	11	11	8
Tambor, palo prieto, teca, marañon	11	8	0	6
Totals	100	100	100	100

[a] Scientific names of species are given in Appendix I.

TABLE 5. Regeneration and Stocking of Farm Trees, by Subregion.

Characteristic	Subregion			Total
	Ventanas	La Troncal	Babahoyo	
Level of Natural Regeneration (no. farms)				
Poor (<100 trees/ha.)	2	12	12	26
Medium (100-500 trees/ha.)	10	6	0	16
Excellent (>500 trees/ha.)	26	11	29	66
Area Which Could be Allocated to Tree Production (ha./farm)				
Mean	12	8	9	10
Minimum	1	1	1	1
Maximum	150	60	80	150
Stocking of Shade Trees in Cacao and Coffee Plantations (trees/ha.)				
Mean	12	16	27	21
Maximum	65	75	100	100

TABLE 6. Management Practices for Farm Trees.

Management Practice	Management Priority	
	Primary	Secondary
	-----(No. of Farms)---	
None	52	--
Cleaning	48	5
Pruning	9	15
Irrigation	3	2
Fertilization	1	1
Totals	113	23

TABLE 7. Sales of Farm Trees 1982-87, by Subregion.

Characteristic	Subregion			Total
	Ventanas	La Troncal	Babahoyo	
Proportion of Farms Which Sold Trees, by Period of Last Sale				
In 1987 (%)	10	30	38	26
In 1982-86 (%)	39	19	12	23
Before 1982 (%)	19	3	2	8
Never (%)	32	48	48	43
Roundwood Distribution by Subregion (%)	64	13	23	100
Gross Income per Farm from Tree Sales in 1987				
Mean (US$ equiv.)	257	95	255	210
Maximum (US$ equiv.)	1760	600	1810	1810
Principal Wood Buyers				
Logger/trucker (%)	89	63	67	75
Sawmill/industry (%)	11	27	21	18
Other (%)	0	10	12	7

TABLE 8. Willingness of Farm Owners to Participate in Tree Growing in the Future, by Subregion.

Characteristic	Subregion			Total
	Ventanas	La Troncal	Babahoyo	
	(% of Farm Owners)			
Proportion of Owners Disposed to Continue Selling Farm Trees	65	43	55	54
Proportion of Owners Willing to Permit Tree Growing Experiments on Their Lands	65	68	44	56
Proportion of Owners Who Would Participate in Tree Growing Agreement With Private Industry	45	27	10	27