COSTA RICAN FARMERS' EXPERIENCE WITH THE INTRODUCTION OF TIMBER TREES IN THEIR COFFEE PLANTATIONS

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Resumen
Los agricultores de Pérez Zeledón, Costa Rica tienen una clara preferencia por *Eucalyptus deglupta*, *Terminalia amazonia* y *T. ivorensis* como maderables para sombra en sus plantaciones de café. *Gmelina arborea* fue identificado como la especie con más desventajas. Sus preferencias se basan principalmente en la facilidad de manejo de los árboles y sus efectos sobre el café. Los productores consideran que el programa de reforestación en cafetales con árboles maderables, utilizando incentivos, tiene un enfoque forestal el cual no llena completamente sus espectativas, ya que para ellos el café constituye el principal componente del sistema agroforestal.

Palabras claves: coffee producers, shade trees, surveys, timber trees

Introduction

Coffee production represents 17% of the gross income from Costa Rican agricultural production (Galloway & Beer, 1997). Producers are gradually replacing traditional leguminous shade trees, which have low or no commercial value, with fast-growing timber species. The basic assumption is that this change will lead to higher incomes due to the timber production and/or will reduce the economic risk under the conditions of fluctuating coffee prices (Ríos, 1997). The use of some of these species, which are probably very competitive, may cause a severe decrease in yields of coffee plants located around the trees, due to competition for light, water and nutrients (Sánchez, 1994).

Documentation of the knowledge and experiences of the farmers with traditional and non-traditional shade species, such as *Erythrina poeppigiana* and *Eucalyptus deglupta* respectively, is important as the foundation for a new research program for any given zone. This study was designed to gather information from the farmers of Pérez Zeledón, Costa Rica on their experiences with the introduction and management of timber species in their coffee plantations. A critical evaluation of the existing coffee-shade tree systems was made in order to rapidly disseminate favourable experiences, to avoid repeating mistakes and to clearly define research priorities according to the reality and the needs of the producers.

Methodology

A survey was conducted from July to November 1998 in ten communities located in Pérez Zeledón. Annual average rainfall is 3853mm, with a dry season from December to March; average temperature is 25.7°C. Altitude ranges from 300 to 1000masl. Soils are classified as Ustoxic Palehumult. Based on lists of coffee producers in the zone, supplied by a cooperative, 30 farmers who had planted timber species in their coffee plantations were

selected. Through informal interviews, information was gathered on coffee production area, shade species used, characteristics of these species, reasons for planting timber species and techniques-strategies to control problems related to specific shade species. Interviews, using a previously prepared and tested list of open ended questions, were complemented with visits to the farmers' plantations.

Results

Most farms have a total area less than 20 ha. The areas devoted to coffee production and to the coffee-timber tree association were less than 10 and 5 ha, respectively (Table 1). All the surveyed producers received an incentive of about US$200 ha^{-1} for the establishment and management of timber species in their coffee plantations, as well as training on tree planting and management provided by technical personnel from the cooperatives. Technical recommendations were based on experience with pure tree plantations due to limited knowledge about optimum tree planting densities in coffee-timber agroforestry systems. Most farmers (93%) had applied fertilizers to the trees, mainly during the first three years after establishment but there was a high variability in terms of quantities and sources of fertilizers used. All producers had pruned the lower branches of the trees after the first year to provide more light to the coffee.

Table 1. Distribution of coffee farms in Pérez Zeledón, Costa Rica according to size.

Size classes	Farm size (number/class)	Coffee plantations (number/class)	Coffee-timber association (number/class)
<5 ha	11	19	29
5-10 ha	10	8	1
11-20 ha	5	2	0
>20 ha	4	1	0
Total	30	30	30

The timber species most frequently found in the coffee plantations were *E. deglupta*, *Terminalia ivorensis* and *T. amazonia*. These species were planted but some native species, mainly *Aspidoperma megalocarpon*, *Lafoensia punicifolia* and *Ocotea tonduzii*, were established through natural regeneration (Table 2.). *E. deglupta* was the most common species planted due to its fast-growth, adequate shade density for coffee, little lateral crown growth and small leaves that do not promote coalescence of rain drops which can damage the coffee plants (Table 3). However, some producers indicated that this species was susceptible to wind damage, had a very superficial root system that made replanting of coffee difficult and that it was attacked by termites when reaching greater diameters. In the case of *Terminalia* spp, the disadvantages reported by the producers included dense shade, the need for early thinning, a crown with a wide lateral extension and wind damage (breakage) of *T. ivorensis*. *Gmelina arborea*, despite being planted by six producers was considered an undesirable tree for association with coffee due to its dense crown which limited the transmission of solar radiation to coffee and increased rainfall impact on coffee (due to coalescence of drops on large leaves) which caused coffee flower and fruit drop and increased incidence of coffee diseases such as *Cercospora coffeicola* (chasparria) and ojo de gallo *(Mycena citricolor)*. Some contradictions were found in the opinions of the producers with respect to the effect of the introduction of timber species on coffee disease

incidence. One farmer, for instance, indicated that *T. ivorensis* favoured the incidence of *M. citricolor* and *C. coffeicola* while others had not observed any effect, possibly due to an intensive use of fungicides.

Table 2. Timber trees found in coffee plantations in Perez Zeledón, Costa Rica. 1998.

Scientific name	Common name	Number of farms	Establishment method	Location in the coffee plantation
Eucalyptus deglupta	Eucalipto	23	Plantation	Inside and borders
Terminalia ivorensis	Terminalia	13	Plantation	Inside and borders
Terminalia amazonia	Amarillón	19	Plantation	Inside and borders
Gmelina arborea	Gmelina	6	Plantation	Inside and borders
Pinus spp.	Pino	6	Plantation	Inside and borders
Cedrela odorata	Cedro	6	Plantation	Inside and borders
Meliosma spp.	María	6	Plantation	Inside
Schizolobium parahybum	Gallinazo	4	Plantation	Inside
Bombacopsis quinatum	Pochote	2	Plantation	Inside
Aspidosperma megalocarpon	Manglillo	6	Natural regeneration	Inside
Ocotea tonduzii	Ira	5	Natural regeneration	Inside
Lafoensia punicifolia	Cascarillo	4	Natural regeneration	Inside
Astronium graveolens	Ron Ron	2	Natural regeneration	Inside
Cordia alliodora	Laurel	2	Natural regeneration	Inside

Most farmers (73%) were hoping to sell the wood and/or use it for household consumption. In the near future, 43% of the farmers will continue planting timber trees in their coffee plantations, mainly eucalyptus, but they will not continue planting *G. arborea.* 33% of the farmers surveyed knew that the market for *E. deglupta* timber is poorly developed. However, they claimed that *Pinus spp., T. ivorensis, T. amazonia, C. odorata, G. arborea* and *S. parahybum* are easily marketable. Amongst these species, *E. deglupta* wood was considered to be of the lowest quality. Only 17% of the farmers knew the timber prices. Half of the farmers surveyed did not have a clear idea on how to manage trees on a long-term basis, which indicated a lack of training. Most of them would change from the forestry approach of the incentive scheme (1,111 trees ha^{-1}) to an agroforestry approach (coffee-timber species) with a timber tree density not greater than 200 trees ha^{-1}.

Table 3. Characteristics of the main timber species planted in coffee plantations in Pérez Zeledón, Costa Rica.1998.

Tree characteristics	*Eucalyptus deglupta*	*Terminalia amazonia*	*T. ivorensis*	*Gmelina arborea*
Growth	Fast (17)*	Slow (1), fast (1)	Fast (3)	-
Shade intensity	Adequate (13)	Too much (6)	Too much (4)	Very dense (5)
Increased coffee disease incidence	No (3)	No (2)	No (2)	Yes (3)
Competition for water and nutrients	For nutrients after 8 years (2)	For nutrients (1)	For nutrients (1) For water (1)	For nutrients (1) For water (3)
Caused drip damage	No (5)	No (3)	No (1)	Yes (4)
Labor costs	No (natural pruning) (1)	Yes (pruning) (3)	Yes (pruning) (3)	-
Wind resistance	Low (4)	Yes (2)	No (4)	Sometimes fragile (1)
Crown growth	Little lateral expansion (6)	Lateral and vertical expansion (3)	Lateral expansion (1)	-
Deciduous	Mainly in summer (1)	Total leaf fall in summer (1)	-	-
Reduced soil erosion	-	No (1)	Yes (1)	No (1)
Susceptibility to pests and diseases	Low: higher after 10 years (5)	High: mainly between 20 and 30 years (1)	Low (3)	-
Roots	"A lot" (superficial) (4)	"A lot" (3)	"A lot" (2)	-

* Number of farmers that commented on this characteristic
- : No opinions were given on this characteristic

Conclusions

The farmers had a clear preference for *E. deglupta* and *Terminalia* spp. as timber shade trees in their coffee plantations, but many of their reasons had more to do with facilitating coffee management than because of the potential value of the timber these species could produce. The producers reported that the project promoting reforestation in coffee plantations with timber species, using incentives, had a forestry approach which did not fulfil their expectations since coffee is the most important component of the agroforestry system for them. In this regard, it is recommended that the institutions involved with coffee production (e.g. ICAFE) and the reforestation projects (e.g. cooperatives) develop feasible and realistic agroforestry systems by actively incorporating the producers in the process of designing and implementing future programmes.

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