THE IMPORTANCE OF AGROFORESTRY IN COLOMBIA’S COCOA ECONOMY

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Colombia’s National Chocolate Company

ABIDJAN
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Nuestro compromiso
SOSTENIBLE
con el sector cacaotero
The importance of agroforestry in Colombia’s cocoa economy
Colombia’s position

10th in world cocoa production

Internal consumption 280 to 300 cups per capita per year
Colombia’s context:

- **Cocoa production in Colombia:** 69,040 t. (Fedecacao, 2021)
- **Cocoa farming families:** 65,000
- **Planted hectares:** 180,000
- **Average area/producer:** 1.8 to 2.7 ha
- **Cocoa departments:** 29 of 32 dep. in the country
- **Total population:** 51,270,000 inhabitants
- **Previous cocoa area:** 25,000 ha
Originally from the Amazon basin, cocoa is an understory crop.

In Colombia, cocoa is grown under agroforestry systems that mimic the natural conditions that gave rise to this species in the Amazon tropical rainforest.
The importance of agroforestry systems (AFS) in cocoa farming is not only to provide shade in its initial and productive stages, but also the ability to mitigate climate change and improve soil productivity (Beenhouwer, 2013). Besides diversity AFS promote conservation of native flora and fauna, contributing to an ecosystem balance that boosts various patches of forest and link them together.

Benefits of agroforestry systems

1. **Carbon sequestration**
2. **Biodiversity conservation**
3. **Retention of humidity**
4. **Increase of soil nutrients**
What agroforestry system is mostly used in Colombia?

1. Cocoa without shade
2. Cocoa with a species used exclusively for shade
3. Cocoa associated with other crops
4. Cocoa with various shadings
5. Rustic cocoa field
6. Agroforests

Source: The shadow of cocoa, Central American Cocoa Project - CATIE.
Why have agroforestry systems?

- Food security
- Payment for environmental services (PES)
- Agritourism and conservation tourism
- Conservation of water and soil resources
- Income from other crops when not growing cocoa
- In some dry areas of the country, avoid using the irrigation system
AVERAGE SIZE AND USE OF COCOA PLOTS

15.88
AVERAGE FARM AREA (HA)

2.66
AVERAGE COCOA AREA (HA)

AREA DISTRIBUTION OF COCOA PLOTS (HA)

- 4.58 (28.84%)
- 2.66 (16.73%)
- 2.78 (17.49%)
- 4.21 (26.47%)
- 1.66 (10.47%)

DISTRIBUTION:
- COCOA AREA
- FOREST AREA
- SHRUBLAND AREA
- OTHER CROPS AREA
- LIVESTOCK FARMING AREA
SPECIES ASSOCIATED WITH COCOA AND OTHER CROPS IN THE FARM

**DEPARTMENTS**
- ANTIOQUIA
- ARAUCA
- BOLÍVAR
- BOYACÁ
- CALDAS
- CAQUETÁ
- CASANARE
- CAUCA
- CESAR
- CHOCÓ
- CORDOBA
- CUNDINAMARCA

**MUNICIPALITY**
- ABREÑEGO
- ACACIAS
- ACANDÍ
- ACEVEDO
- AGRADO
- AGUSTÍN CODAZZI
- AIPE
- ALBANIA
- ACLALÁ
- ALGECIRAS
- ALPUJARRA
- ALTAMIRA

**Note 1:** Crops within the cocoa fields

**Note 2:** Other crops in the farm but not within the cocoa fields
The special cocoa farming model combined with fine tropical timber includes an agroforestry system that integrates more than one species in the same area. In this case, permanent shade species are integrated (abarco, cedar, salmwood, beechwood, choibá, mahogany) accompanied by other transient crops. It is important not to have one single model, but design each one according to the agroclimatic conditions of the area, native species, light and nutrient competition among others.
AFS provide productive, health, environmental and economic benefits, improve cash flow while cocoa farming begins its productive stage through transient species and, in the long term, provide benefits in terms of forestry timber.

- Regulates fruit species’ flowering, pollination and maturation and, therefore, the harvests.
- Regulates soil moisture, increases absorption and infiltration capacity and reduces evaporation.
- Increases humus and availability of nutrients for cocoa due to the biomass provided by each of the species involved in the system.
- Extends the lifecycle of cocoa plantations, mitigating stress (drought, frost, hailstorms etc.).
- Reduces physiological disorders in cocoa fruits caused by different types of stress and maintains physicochemical and sensory characteristics of cocoa beans according to its genetic profile.
- Preserves the soil by reducing solar radiation and erosion caused by raindrops.
- Reduces losses due to diseases, especially monilinia, and facilitates integrated control.
- Optimal use of solar energy by means of geographical location of plants in such a way that all species benefit.
- Allows for multi-strata cropping systems that lead to better use of energy and land.
- Facilitates benefiting permanent shades.
Success factors of high tree density models (shade species and planting distances).

Guacamayas Farm
Gulf of Urabá, Colombia
Abarco (Cariniana pyriformis M)

In Colombia, there are populations in medium and lower Atrato regions in the department of Chocó, Córdoba, Norte de Santander, Santander, Bolívar, Sierra de Perijá and Magdalena Medio.

Seedbed:
• Pregermation
• Aspergillus, Fusarium, Penicillium and Spicaria
• 2 to 3 months in nursery

Planting distance:
• From 16 m between rows and 16 m between plants

Pruning:
• Important formative pruning- Do not exceed 30%

Pests and diseases:
• Natural enemies

Economic relevance:
• Highly valued, used for interior and exterior construction, furniture, flooring, triplexes, boats, car bodies and structural lumber
Abarco (Cariniana pyriformis M)
Salmwood (Cordia alliodora)

It is native to Central and South America.

Seedbed: germination varies between 10 and 35 days. In the nursery the seedlings remain for 3 to 4 months. Stakes: 12-cm long

Planting distance: from 16 m between rows and 16 m between plants

Pruning: This is a species that only requires 10% pruning because it self-prunes.

Economic relevance: construction of furniture and boats. It is a very commercial wood

Pests and diseases: especially up to 2 years of age exposed to defoliating insects such as the atta ant (Atta sp) - lace bug (Dictyla monontropidia). In flooded areas trunk cancer can occur due to fungus infection (Puccinia cordiae) and in dry areas it is susceptible to boring and girdling insects.
Red cedar (*Cedrela odorata*)

Deciduous tree 20 to 40 meters tall and 60 to 90 cm in diameter at breast height.

**Seedbed:** germination occurs from 6 to 10 days. Time spent in nursery is 3 to 4 months.

**Planting distance:** from 24 meters between rows and 16 meters between plants

**Pests and diseases:** during the first few years it is occasionally attacked by stem borers.

**Pruning:** formative and maintenance pruning during the first 4 years.

**Economic relevance:** timber used to manufacture furniture, boats, musical instruments and crafts.
**Mahogany (Swietenia macrophylla King)**

Known as broadleaf mahogany or palo santo. Native to tropical America.

<table>
<thead>
<tr>
<th>Seedbed:</th>
<th>Planting distance:</th>
<th>Pruning:</th>
<th>Pests and diseases:</th>
<th>Economic relevance:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germination (10 to 20 days)</td>
<td>From 20 m between rows and 16 between plants</td>
<td>Important formative pruning (crucial up to 3-4 years)</td>
<td><strong>Lepidoptera</strong> Hypsipyla grandella, known as &quot;mahogany shoot borer&quot;</td>
<td>Highly prized woof for its finish and commercial properties.</td>
</tr>
</tbody>
</table>

**Pests and diseases:**
- **Lepidoptera** Hypsipyla grandella, known as "mahogany shoot borer"
Choibá (*Dipteryx oleifera*)

Almond or palo de piedra. It is distributed from Central to South America. In Colombia it is found on the Pacific slope, Urabá region, part of the Atlantic coast and foothills of the central mountain range where the lower Cauca is located in Antioquia.

**Seedbed:** The fruits are washed and dried in the open air. 4 to 5 months in a nursery reaching about 40 cm

**Planting distance:** 16 m between plants by 24 meters between rows.

**Pruning:** formative pruning during the first years

**Pests and diseases:** Substrate disinfection and use of fungicides and insecticides to prevent adverse conditions

**Economic relevance:** It is a heavy and hard wood used for construction in general. The mesocarp is used to extract oil for toilet soaps and hair products.
Some recommended species

<table>
<thead>
<tr>
<th>Short cycle</th>
<th>Transient</th>
<th>Permanent</th>
<th>Live fence, boundary, windbreaks, live barriers and double furrow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn</td>
<td>Plantain</td>
<td>Abarco</td>
<td>Teak</td>
</tr>
<tr>
<td>Bean</td>
<td>Quickstick</td>
<td>Mahogany cedar</td>
<td>Oak</td>
</tr>
<tr>
<td>Pigeon pea</td>
<td>Pigeon pea</td>
<td>Red cedar</td>
<td>Acacia</td>
</tr>
<tr>
<td></td>
<td>Leucaena</td>
<td>Yellow cedar, nauno or igua</td>
<td>Avocado</td>
</tr>
<tr>
<td></td>
<td>Passion fruit</td>
<td>Salmwood</td>
<td>Sapote</td>
</tr>
<tr>
<td></td>
<td>Papaya</td>
<td>Black cedar</td>
<td>Yellow guayacán</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Beechwood</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Citrus</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Red cedar</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mango</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Guava</td>
</tr>
</tbody>
</table>
## Proposed agroforestry model

### Short cycle – Transient – Cocoa – Timber

<table>
<thead>
<tr>
<th>Species</th>
<th>Transient</th>
<th>Permanent</th>
<th>Permanent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Plantain</td>
<td>Cocoa</td>
<td>Abarco</td>
</tr>
<tr>
<td>Planting distance</td>
<td>4 x 4 triangle</td>
<td>4 x 4 triangle</td>
<td>16 x 16</td>
</tr>
<tr>
<td></td>
<td>4,3 x 4,3 triangle</td>
<td>4,3 x 4,3 triangle</td>
<td>17,2 x 17,2</td>
</tr>
<tr>
<td></td>
<td>4,5 x 4,5 triangle</td>
<td>4,5 x 4,5 triangle</td>
<td>18 x 18</td>
</tr>
<tr>
<td>Planting density / ha</td>
<td>721</td>
<td>721</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>624</td>
<td>624</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>570</td>
<td>570</td>
<td>31</td>
</tr>
</tbody>
</table>

### Other aspects to take into account

**Planting of short-cycle crops**
- Beans, maize, pigeon peas combine with cocoa the first year

**NOTE**
- Short-cycle species are optional and should not be kept after one year of cocoa growth. The distances for abarcos can be between 16 to 24 meters between furrows depending on the zone.

**Recommendations**
- Furrows must be located 45 degrees in a North-South direction in areas of high luminosity. In areas of low luminosity, they can be positioned in an East-West direction or 45 degrees northeast, avoiding light competition.
Agroforestry model
<table>
<thead>
<tr>
<th>Especie Forestal</th>
<th>Altura sobre el nivel del mar (asnm)</th>
<th>Distancia de siembra recomendada entre plantas (m)</th>
<th>Distancia de siembra recomendada entre surcos (m)</th>
<th>Orientación*</th>
<th>Topografía</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abarco</td>
<td>0-1.000</td>
<td>8 a 10</td>
<td>16 a 20</td>
<td>45°</td>
<td>Plano</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 a 12</td>
<td>16 a 24</td>
<td>Norte-Sur</td>
<td>Ondulado</td>
</tr>
<tr>
<td>Choibá</td>
<td>0-1.000</td>
<td>10 a 12</td>
<td>20 a 24</td>
<td>Norte-Sur</td>
<td>Ondulado</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 a 12</td>
<td>20 a 24</td>
<td>Norte-sur</td>
<td>Plano</td>
</tr>
<tr>
<td>Caoba</td>
<td>0-1.600</td>
<td>8 a 10</td>
<td>20 a 24</td>
<td>45°</td>
<td>Plano</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 a 12</td>
<td>20 a 24</td>
<td>Norte-Sur</td>
<td>Ondulado</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 a 12</td>
<td>24 a 28</td>
<td>Norte-Sur</td>
<td>Plano</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 a 12</td>
<td>24 a 28</td>
<td>Norte-Sur</td>
<td>Ondulado</td>
</tr>
<tr>
<td>Coco</td>
<td>0-400</td>
<td>12</td>
<td>20 a 24</td>
<td>Norte-Sur</td>
<td>Ondulado</td>
</tr>
<tr>
<td>Nogal cafetero</td>
<td>800-1.900</td>
<td>6 a 8</td>
<td>16 a 20</td>
<td>45°</td>
<td>Plano</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 a 8</td>
<td>16 a 20</td>
<td>45°</td>
<td>Ondulado</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 a 12</td>
<td>20 a 24</td>
<td>45°</td>
<td>Plano</td>
</tr>
<tr>
<td>Cedro Rojo</td>
<td>0-1.000</td>
<td>10 a 12</td>
<td>20 a 24</td>
<td>45°</td>
<td>Ondulado</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>24 a 28</td>
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<td></td>
<td></td>
<td>10 a 12</td>
<td>24 a 28</td>
<td>Norte-Sur</td>
<td>Ondulado</td>
</tr>
</tbody>
</table>

* La orientación está sujeta a la zona donde se establezca buscando disminuir la competencia por luz.
Important

Cocoa farming in forest developments promotes conservation of ecosystems and forest restoration. 40% of cocoa grown in Colombia is an alternative to replace illicit crops.

Agroforestry should not replace primary forests, nor can simplified agroforestry replace more diverse agroforestry systems. Instead, agroforestry systems should be used to strengthen the resilience of cocoa-growing regions and restore degraded lands.
Estamos comprometidos con el desarrollo sostenible del sector cacaotero en Colombia
Presence in the country

33 profesionales en territorios
150 colaboradores en Granjas

3 Granjas
(2 experimentales y 1 productora)

2 viveros para la propagación

9 regionales para la compra de cacao
**Sector pillars**

- **Education and training for farmers and technicians**
- **Articulation of sustainable projects**
- **Applied research in cocoa**
- **Dissemination and distribution of plant material**
- **Cocoa bean marketing**

**Technology outreach in cocoa farming**
Dissemination material

QR code to download manuals
Noticias
Más sobre el cacao
Presencia en nuestras regionales
Granjas y Viveros
Próximos eventos del sector cacaotero
Consulta con nuestros expertos agrónomos
Infórmate sobre las mejores prácticas del cultivo de CACAO

Envía gratis un mensaje de texto desde tu celular al

Código 87703
con la palabra CNCH

Infórmate sobre las mejores prácticas del cultivo de CACAO

Agrega el WhatsApp de Mundo Cacao

311 6457408
Estamos comprometidos
con el desarrollo sostenible del sector cacaotero

Alianzas para el Desarrollo Rural
2020: 127
2021: 120

Familias beneficiadas
2020: 17,586
2021: 18,843

Hectáreas impactadas
2020: 27,833
2021: 33,718

Cobertura en departamentos
2020: 23
2021: 22

Número de personas capacitadas
2020: 6,439
2021: 4,533

SMS informativos sobre cultivo del cacao
2020: 2,113,442
2021: 1,372,641

Distribución de material de cacao
2020: 3,560,674
2021: 4,869,868

Divulgación a productores a través de SMS
2020: 14,779
2021: 16,756