Coffee growing and agroforestry systems

An answer to the challenges of sustainable development

Despite the widespread planting of dwarf varieties, coffee farming systems remain extremely diversified in Central America. Three systems predominate: intensive monocultures, coffee intercropped with a mixture of banana, forest tree species and fruit trees, and agroforestry systems where coffee trees are planted under specialized and controlled shade provided by one or two tree species. With a view to promoting sustainable development, CIRAD and its partners are involved in research to characterize agroforestry type crop management systems in order to highlight the economic and ecological merits of such practices.

Economic benefits for farmers

Agroforestry systems offer several economic advantages.

- Fewer inputs and less labour required.
- Shade trees reduce alternate productions, thereby ensuring a more balanced income for coffee farmers.
- Timber and firewood production improves coffee farmer incomes.
- By spreading income over several crops, these systems are economically less risky than coffee monocultures.
- Financial incentives for pilot projects helping to preserve biodiversity, soils and water quality can be applied, as in Costa Rica.
- Bonuses are being considered for carbon sequestration in coffee plantations converted from a monoculture to an agroforestry system.

Partners

ANACAFE (Asociación Nacional del Café, Guatemala)
CATIE (Centro Agronómico Tropical de Investigación y Enseñanza, Costa Rica)
CEH (Centre for Ecology & Hydrology, Scotland)
CICAFE (Centro de Investigaciones del Instituto del Café, Costa Rica)
CIRAD-FORET (CIRAD Forestry Department)
INRA-ECHO (Institut national de la recherche agronomique, unité de recherche écophysiologie et horticulture, France)
UNA (Universidad Nacional Agraria, Nicaragua)
UNICAFE (Unión Nicaragüense de Cafetaleros, Nicaragua).

Coffee cherry harvesting in an Arabica coffee plantation associated with timber trees (Eucalyptus deglupta) in Costa Rica.

Association of coffee trees and timber trees (Eucalyptus deglupta).
Ecological advantages
Agroforestry systems play a role in preserving soils and the environment:
• The erosion of fragile mountain soils is reduced.
• Soil fertility is conserved.
• Exploitation of natural forest reserves is limited.
• Biological and faunistic diversity is safeguarded.

Coffee quality
Agroforestry systems are assets for coffee quality.
• Shade trees create a microclimate propitious to quality coffee production.
• A smaller crop on coffee trees and an extension of the cherry ripening period are propitious to better quality coffee.

Research activities
Given the complexity of interactions between coffee and associated trees, research is focusing on developing models of agroforestry system functioning, with a view to creating decision support tools intended for technicians and producers. They will guide them in their choice of tree species depending on local soil and climatic conditions, but also on coffee farmer interests and practices.
This research is primarily focusing on the know-how and practices of coffee farmers, mineral nutrient cycles, light interception by the tree storey, distribution of water resources between coffee trees and associated trees, but also on how the microclimate affects assimilate production, coffee cherry filling and ripening, and the physical, biochemical and organoleptic properties of coffee.
The purpose of this work is to promote these agroforestry systems by improving coffee farmer incomes through diversification (timber production), quality coffee production, and recognition of their environmental advantages.

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