THE TAKING ROOT SOLUTION

Taking Root believes that sustainable afforestation is more than simply planting trees. For a project to be successful in the long run it requires the support of the local community. It must also address the processes that lead to deforestation and forest degradation: food production, pastureland, fuelwood for cooking and timber. The Taking Root solution acknowledges the dependence of local communities on the forest's resources and works to minimise this dependency through realistic alternatives and careful forest planning. In this process, members of the participating communities are directly involved and take ownership of the renewal of their own ecosystem.

AFFORESTATION

While not a new process, the root causes of deforestation are complex and its effects are felt worldwide. Approximately 17% of global carbon dioxide (CO₂) emissions, the principle contributor to global warming, are caused by deforestation, primarily in tropical regions. Clearly, the reversal of this process will play an important role in addressing the problem. Forests provide an efficient form of carbon sequestration and are essential for the livelihood of local communities, their environment and wildlife habitat. Thus afforestation is at the heart of Taking Root’s mission. However, unless forests are valued by the surrounding communities, there will always be significant pressure for them to be replaced by a more profitable alternative. For this reason, our forest plan engages these communities as active players in the renewal of their own eco-system while taking into account their needs for fuelwood, timber and a descent livelihood.

FUEL-EFFICIENT FIREPLACES

The main energy source in rural Nicaraguan communities is wood. Traditional fireplaces, located within the home, require a high amount of fuel to burn and release harmful smoke into the air. Replacing these with fuel-efficient fireplaces with chimneys lowers the demand on existing forests, reduces CO₂ emissions and has huge health benefits for the entire family.
AGRO-FORESTRY
This method combines forestry and agriculture by planting fruit trees and shade-grown crops at the edge of the permanent forest. Grafted fruit trees are used because they mature at a much faster rate than regular trees, providing a quick source of food as a tangible benefit for participants. This way, forests are seen as a source of food, rather than a hindrance.

2009 PROJECT

Project location: El Morcillo, San Juan de Limay, Esteli, Nicaragua
Annual precipitation: ~1,200 mm
Elevation: ~300 m from sea level
Average temperature: 24.5°C
Planting date: June 2009
Total forest trees: 4,669
Total grafted fruit trees: 150
Fuel efficient fireplaces: 4
Local partner: FEDICAMP (Federation for the Full Development of Peasant Men and Women of Nicaragua)

Local partner's responsibilities:
- Identify project recipients
- Provide technical support for nursery establishment
- Material logistics (fencing, fruit trees, fireplaces, equipment)
- Act as interface and representatives of the project

COST BREAKDOWN OF 1$ = 1 TREE
PLANTATION LIFE CYCLE

SITE SELECTION
A public consultation is held within a chosen community to discuss the project and its components. Willing farmers with suitable land, preferably near a watershed, are invited to participate. A clear understanding of the key role of each project recipient and their responsibilities are established.

NURSERY ESTABLISHMENT
Project recipients are provided with the necessary materials to establish a nursery and receive technical training on nursery establishment. The recipients collect the seeds from the surrounding area and are responsible for tending the seedlings. In some cases, additional seeds are purchased for the project recipient to strengthen endangered populations. The nurseries are established on the project recipient’s property as opposed to a large central location to minimize transportation and seedling disturbance.

SITE PREPARATION
To prepare the site, a fence is built around the entire property to prevent cattle from eating the young seedlings and the surrounding brush is cleared.

PLANTATION ESTABLISHMENT
At the beginning on the rainy season, the seedlings are transported to the site. The planting density varies between species but is generally 2 x 2 or 3 x 3 m to favour straight trees, minimize silvicultural treatments and provide fuel wood and posts from early thinnings. Taking Root volunteers collaborate with local participants to complete this process.

FOREST UPKEEP
For the first few years, a one-meter area is cleared around each tree to prevent competition and encourage growth. The project recipients are paid a small monetary sum based on the survival rate of the forest plantation. 70% of the funds are paid directly to the project recipient and the remainder is redirected to a related community development project. These early incentives ensure the creation of a living forest with long-term benefits, whereas simply planting trees is not effective without proper care.
Maria Elisabeth Senteno Maradiga, Leonardo Adan Talavera Betanco and family

**Previous land use:** cattle pasture

**Species planted**
Mandagüal: 357
Maohogany: 191

**Total trees:** 548

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Don Aurelio Guevara Espinoza, Doña Celia Rico Bravo and family

**Previous land use:** Not utilized

**Species planted**
Mandagūal: 876 (250 of which are outside map boundary)

**Total trees:** 876

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Doña Blanca Azucena Rostegui and family

**Previous land use:** old home area that was destroyed by hurricane Mitch in 1998

**Species planted**
Mandagúal: 298
Mahogany: 154
Tamarindo: 25
Elephant Ear: 4
Carao: 4

**Total trees:** 485

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Don Florencio Perez Matute and Doña Santo

**Previous land use:** Pasture

**Species planted**
- Mandagüal: 777
- Mahogany: 252
- Acetuno: 80
- Neem: 105

**Total trees:** 1,214

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Don Noe Talavara Casco, Doña Luz Aurora Guzman and family

**Previous Land use:** Agriculture and pasture

**Species planted**
- Mahogany: 213
- Mandagüal: 311
- Gliricidia: 137
- Elephant Ear: 21
- Cashew: 8

**Total trees:** 690

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Don Ernesto Cedeño Mendosa, Doña Maria Christina Quintero Olivas and family

**Previous land use:** Pasture

**Species planted**
Mandagual: 650
Mahogany: 180
Glicidcia: 19
Cashew: 7

**Total trees:** 856

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FOREST TREE SPECIES

BOMBACOPSIS QUINATA
Family: Bombacaceae
Common names: Spiny cedar, Pochote
Distribution: From Mexico to South America
Wood Density: 0.428 g/cm³
Shoot to Root ratio: 0.56
Carbon Fraction: 0.49
Biomass Expansion Factor (BEF): 1.55
Mean Annual Increment (MAI): 12
Average CO₂ sequestration (t/ha/year): 29

Notes: Grows well with annual precipitations between 800 to 2,200 mm per year from sea level up to 900 meters. Its wood is highly prized and has been extensively logged.

GLIRICIDIA SEPIUM
Family: Fabaceae
Common names: Madero negro, Gliricidia
Distribution: Honduras to Colombia and Venezuela
Wood Density: 0.67 g/cm³
Shoot to Root ratio: 0.56
Carbon Fraction: 0.49
Biomass Expansion Factor (BEF): 1.55
Mean Annual Increment (MAI): 9
Average CO₂ sequestration (t/ha/year): 26

Notes: Grows very well in a wide range of climates and is commonly used in rural areas of Latin America as living fences. It is a fast growing nitrogen fixing tree (NFT) that produces excellent forage and is very common in agro-forestry systems.
**CAESALPINIA VELUTINA**

Family: Caesalpiniaceae  
Common names: Mandagüal  
Distribution: Southern Mexico and Central America  
Wood Density: 0.722 g/cm³  
Shoot to Root ratio: 0.56  
Carbon Fraction: 0.49  
Biomass Expansion Factor (BEF): 1.55  
Mean Annual Increment (MAI): 14  
Average CO₂ sequestration (t/ha/year): 44

**Notes:** This NFT grows well in dry areas between 50 and 1,000 meters from sea level. Its wood is very dense and makes excellent posts at a very young age.

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**SWIETENIA MACROPHYLLA**

Family: Meliaceae  
Common names: Mahogany, Caoba  
Distribution: Southern Mexico to Brazil  
Wood Density: 0.459 g/cm³  
Shoot to Root ratio: 0.56  
Carbon Fraction: 0.49  
Biomass Expansion Factor (BEF): 1.55  
Mean Annual Increment (MAI): 10  
Average CO₂ sequestration (t/ha/year): 20

**Notes:** One of the most valuable tree species in Latin America that has been excessively harvested. Consequently, it is now an endangered species.
**ENTEROLOBium CYCLOCARPUM**

Family: Mimosaceae
Common names: Elephant ear tree, Guanacaste
Distribution: Mexico to northern South America
Wood Density (D): 0.41 g/cm³
Shoot to Root ratio (R): 0.56
Carbon Fraction (C): 0.49
Biomass Expansion Factor (BEF): 1.55
Mean Annual Increment (MAI): 15
Average CO₂ sequestration (t/ha/year): 27

Notes: The Elephant ear tree is an exceptionally fast growing NFT that can reach by 3 meters in height and 10 cm in diameter in its first year. Older trees reach exceptional size and become emblematic to an area.

**SIMAROUBA GLAUCA**

Family: Simaroubaceae
Common names: Aceituno
Distribution: Mexico to northern South America
Wood Density: 0.46 g/cm³
Shoot to Root ratio: 0.56
Carbon Fraction: 0.49
Biomass Expansion Factor (BEF): 1.55
Mean Annual Increment (MAI): 10
Average CO₂ sequestration (t/ha/year): 20

Notes: Grows well with annual precipitations between 1,000 to 2,000 mm per year from sea level up to 900 meters. It is commonly used in agro-forestry systems because it produces an edible fruit, which can also be used for oil production and used as soap.
GRAFTED FRUIT TREE SPECIES USED IN AGRO-FORESTRY SYSTEMS

Mango
*Mangifera Indica*

Cashew, Marañon
*Anacardium occidentale*

Avocado, Aguacate
*Persea Americana*