ECHO

Technical Note #23

Living Fence

It's Role on the Small Farm

What's Inside:

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Published 1991, Revised 2010

Palisade of Gliricidia *in Honduras. Photo by Larry Yarger.*

There are several reasons for establishing fences on the small farm. Fences are used to:

1. To mark boundary lines between farms or next to roads.
2. To separate adjacent fields used for distinct purposes
3. To protect and keep animals from straying
4. To protect crops from animal damage

A fence represents a major investment on the small farm. Although it carries a cost, it also provides something of benefit, namely protection. It is often a challenge to small farmers to increase farm production, such as crop yield, and the use of fences can facilitate such improvements. Whereas a fence may facilitate yield increase on the farm, a living fence can improve the efficiency of the production as well.

"Major" fences are usually constructed of poles and wire. "Minor" fences, such as those used for fencing small animals or kitchen gardens, may be constructed entirely of wood, or of a combination of materials, such as poles, slats, and woven or welded wire. Both major and minor fences may be constructed of living posts, reducing initial costs of the fence. Additionally, living posts last longer than wooden (dead) ones, thereby reducing maintenance costs as well.

Living fences are commonly used in a wide range of ecological situations, from semi-arid to rain forest conditions. Suitable plant materials are available for almost all ecological regions and conditions.

Benefits of a Living Fence

A living fence shares many of the benefits of a manufactured or "dead" fence. However, for the small farmer a living fence provides additional benefits. For instance, living fences are not bothered by termites, carpenter ants and dry rot, which are a continual battle in maintaining "dead", wooden fence posts.

The economic benefits (mentioned above) along with other benefits of employing living fences on the small farm (outlined below) provide the small farm holder with a resource which, when wisely used, can become a valuable contributing resource to the well-being of the farmer, his family and his community.

Fuel

As a general rule, firewood or charcoal is the primary cooking fuel in developing communities. A living fence post can be trimmed periodically and the branches used as fuel. A convenient source of firewood near the farm home, such as a living fence, is especially beneficial in areas where wood is scarce. Extra firewood may be sold or bartered.

Fertilizer

Living fences provide fertilizer in several ways. First, leaves that fall naturally from the tree, as well as leaves and small branches cut away when the tree is harvested for fuel, can be (1) composted, (2) immediately mixed with the soil as green manure fertilizer, or (3) left on the ground as leaf litter mulch. Second, because trees are deep rooted, they have access to mineral nutrients in soil that may be too deep for shallow-rooted, annual crops to access. After residues from trees decompose, such minerals are released into the soil and become available to crop plants. Third, nitrogen is always difficult and costly to obtain. Leguminous trees are an important source of nitrogen for the small farmer, adding significant amounts of nitrogen to the soil. Finally, pruning of trees results in partial die back of roots, releasing additional nutrients directly into the soil.

Other Uses

Forage

The leaves of many living fence species, such as those of moringa, gumbo limbo and erythrina are nutritious forage for small animals. The suitability of leaves as feed varies not only from species to species but also with age. When living fence posts are used to produce forage, space is conserved on the farm.

Food

Leaves, flowers, fruits and seeds of many living fence species are important for human consumption. Examples such as the flowers of izote or moringa, fruit of cactus, mombin or mulberry, leaves and roots of cassava and seeds of annatto and cashew are useful in producing food for family use and for market.

Fiber

A few living fence plants, such as the sisal plant and some bamboo species yield branches or leaves that can be processed into useful fiber for cloth or rope, or used directly for tying.

Shade

Many living fence posts can grow to become shade trees. Trees such as Inga, Erythrina and Ficus species provide welcome relief from the hot sun for people and livestock.

Construction Materials

Many trees are harvested for their wood. Although the farmer wouldn't be expected to cut down his fence to market the timber, branches from such species as willow can be used for making home craftwork such as woven baskets and carvings.

Medicine

Some living fence plant species are also used in medicinal preparations. Jatropha produces a medicinal oil in the seeds, and gliricidia produces rotenone in the bark which makes an effective rat poison.

Windbreaks

In some areas windbreaks are necessary to protect against the drying and lodging action of winds which can prohibit the growth of crops.

Disadvantages of Living Fences

Some disadvantages of living fences may include the following:

- Added labor costs in pruning species that produce large amounts of biomass.
- Competition of fence species (canopy and roots) with crops for available sunlight, water and soil nutrients.
- Some living fence plants are readily eaten and destroyed by livestock, or may be invasive.

For such reasons, living fences have to be carefully selected, maintained and managed. Whether or not living fences are used on a farm will depend on the balance of the advantages versus the disadvantages.

Establishment and Care of Living Fences:

Traditions and practices related to the use of living fences vary from place to place in the tropics, as does the suitability of the various species used to make them. In an area where you plan to promote living fences, it is advisable to first identify the species of trees already being used as living fences. It might also be appropriate to determine if any of the native species are suitable for living fences.

Any species introduced for use as a living fence ideally should have the following characteristics:

- Resilience to cattle browsing or leaning against it.
- Rapid growth from cuttings or seeds.
- Multiple useful properties.

If suitable materials are not locally available, you might consider importing seeds or cuttings. Many other species of trees (besides the ones listed below) may be well suited as living fence species. However, some of the more commonly recommended species include:

- Bursera simaruba for dry regions.
- Gliricidia sepium for areas of alternating wet and dry.
- Erythrina berteroana or other Erythrina species for wetter areas.

To establish living fences, trees and other plants are typically planted to form one or more of the following: posts, hedges, or a palisade (a fence of closely set stakes). While any tree can be used as a living fence post, many trees would not normally be so used because of size, propagation difficulty, slow growth, adverse characteristics, or inadequate life span. A few large trees used as occasional fence posts are retained for other benefits (e.g. teak as valuable wood; mango for fruit, forage and shade). The majority of species used as living fence posts can be propagated from large woody cuttings, generally the size of the fence post required. However, some exceptionally fast-growing trees are propagated from seed.

Girdling a fence post.

Living fence posts are generally used with conventional barbed wire or wire screen. Take care that wire is not strung around the post. As the post grows, the wire will girdle and kill it. It is better to attach the wire with fence staples or nails. Hedges are established using species that spread to rapidly fill the spaces between plants. Hedges are often comprised of thorny species and may or may not be strung with wire. A palisade includes plants carefully placed as close together as necessary to immediately achieve an animal-proof cage or stockade like fence. Such plants may be propagated from cuttings or offshoots. Some may also be directly seeded in this fashion.

Living fences are seldom fertilized. They are regularly pruned, however to shape and maintain the fences, to obtain new planting material or other products, and to eliminate excess foliage. Pruning is a seasonal task, usually done during the dry season, but may also be done every 4 to 6 months or as needed. Fences can also be shaped by weaving and tying branches as desired. Insects and disease are seldom a problem with living fences.

Species for Living Fences

Exceptional Species

Only a few select and widely-used species are featured here (see Table 1 for a listing of additional species.)

Gliricidia. *Photo by Tim Motis.*

Gliricidia sepium [gliricidia, madre de cacao, madero negro (Nicaragua), mata ratón, quick stick (Jamaica), cacahuate (Philippines), piyon (Haiti)].

This small leguminous tree is well known to farmers pantropically and is so useful that it was given a medal of honor in Honduras. Gliricidia is easily propagated from cuttings or seed, and can be planted as posts, hedges or a palisade. Common at low to medium elevations, the tree prefers medium rainfall and is well adjusted to periodic dry seasons. An older gliricidia fence post will tend to produce large numbers of long, narrow branches, perfect for propagation by cuttings. Branches and trunks root readily, but growth rate is moderate.

When grown as a hedge, gliricidia produces a narrow fence with a broad crown. Its lifetime is almost indefinite. The wood of older trees turns black, very hard and dense, and is used to make many small objects. Animals feed on the foliage, but in fences (posts and hedges) the foliage is often up out of reach. As forage, gliricidia is a useful feed in moderate amounts and should be combined with a variety of other forages. Flowers, buds, and young leaves are often eaten as a cooked vegetable. The

bark and dry seeds contain rotenone and are prepared with small grains as a rat poison. Leaf fall occurs during dry season, and the leaves make valuable mulch. Gliricidia was used in the past as shade for cacao and coffee, but lately farmers have largely used Inga and Erythrina species instead of gliricidia for that purpose. Gliricidia is used as a trellis for black pepper and for orchids. In a living fence, gliricidia may be pruned every three years, yielding a good quantity of firewood. Pruning also results in root dieback and the release of nitrogen into the soil.

Erythrina berteroana [pito (Colombia), poró de cerca (Costa Rica), machete (Jamaica), elequeme (Nicaragua), gallito (Panama), pernilla de casa (Panama), brikal (Haiti)].

This leguminous tree is small to medium in size, and is commonly used as a living fence post for barbed wire, a support tree for vine crops or shade for coffee and cacao. Erythrina species other than E. berteroana may also be used. The tree is covered with dense foliage that is important in building the soil organic and mineral matter. Because the leaves are not lost during the dry season, this tree is best suited for regions with somewhat more rainfall than is required by gliricidia.

In general, Erythrina species are well suited as living fences (posts, hedges and palisades) as they are easily propagated and can withstand regular pruning. Erythrina species are propagated readily from seed or from cuttings (large or small) and usually planted where they will be grown. Growth is moderate to rapid resulting in a narrow fence with a dense crown. After it is pruned, E. berteroana produces a large volume of new growth within 3 to 4 weeks. The foliage is attractive to animals and is used as forage for cattle, goats and sheep. Rabbits that are fed the prunings have sometimes shown adverse side effects.

Erythrina.
Photo by Tim Motis.

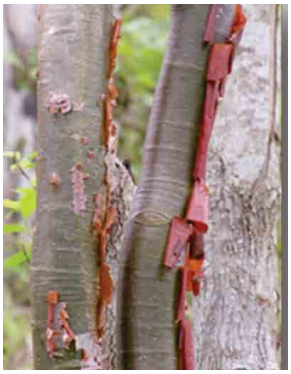
Upon pruning, the tree produces a large amount of useful biomass. A study by CATIE showed that E. berteroana pruned every 12 months produced the most woody biomass, and when pruned every 6 months produced the most edible leafy biomass. Pruned every 4 months it produces 30 t (30,000 kg) of edible dry matter per km of fence; pruned every 6 months it produces 50 t (50,000 kg) per km. The seeds are toxic. Erythrina species are a favorite living fence species in Costa Rica. (Russo, 1993)

Yucca guatemalensis (formerly Y. elephantipes), [spineless yucca, izote (Latin America), bayonet (Haiti)]. This is one of the most common plants used in living fences in Central America.

Large and small cuttings of the straight stem or trunk are planted as a palisade. As they grow, they make a practically impenetrable wall. The tree is easy to propagate, grows slowly and has a long life. The flowers are edible.

Izote.
Photo by Larry Yarger.

Bursera simaruba, [gumbo limbo, indio desnudo, jinote (Latin America), gomye (Haiti)]. Gumbo limbo is especially appropriate for dryer areas where Gliricidia sepium is not well suited. Planted as large posts or smaller palisades, it will root even under dry conditions. The leaves are used as forage. B. simaruba otherwise has few other uses, as the wood is soft and the tree is short lived.



Gumbo Limbo.
Photo by Larry Yarger.

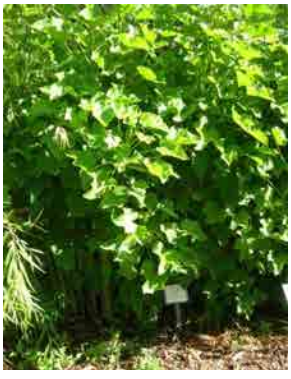
Moringa oleifera [moringa, horseradish or drumstick tree, marango (Nicaragua), benzoliv (Haiti)].

This “perennial vegetable” is one of the most nutritious vegetables in the world. It handles dry seasons well and grows especially quickly the first year. It can be planted as a suitable palisade from both seeds and cuttings (the cuttings tend to be straight), or as a living fence post. The World Vegetable Center (AVRDC) in Taiwan has developed a garden plan which starts with a palisade of moringa grown from closely-spaced seed. Trees are pruned at about head height, and the leaves are used as a nutritious fresh or cooked vegetable or for animal feed.

Moringa.
Photo by Larry Yarger.

Jatropha curcas [jatropha, Barbados nut, physic nut, piñón (Latin America), medsin (Haiti)].

This small tree is known mostly for the medicinal oil produced in its large seeds. The oil is also used to make medicinal soap, and is used for lighting. Recently the oil has been found to have excellent qualities as a biofuel. For the small farm owner, however, the tree is especially important as a living fence (hedge or palisade). Animals will not browse on the leaves, making jatropha an excellent choice for palisade fences around kitchen gardens where goats and cattle may be a problem. Palisades and hedges may be planted either from cuttings or from seed. The wood is soft, but the tree produces large amounts of biomass for mulch and compost.



Jatropha.
Photo by Larry Yarger.

Additional Species Used as Living Fences

Table 1 lists a number of species that can be used as living fences. Seeds for most of these species are not available through ECHO's seed bank. Those we do have are available only in small trial packets – not enough for a living fence. If you would like us to refer you to a commercial source of seed, please mention this in your correspondence. It is a good idea to first try growing a plant in your area before using it as part of a living fence.

Table 1. Plants used as Living Fences

Scientific Name	Common Name	Adaptation *		Propagation Methods	Traits Fence Types	Prune Y/N	Other Uses/Notes
Acacia nilotica	Thorny Acacia	1-3	1	seed	Wide, thorny hege	yes	N - fixing, firewood
Agave spp.	Agave	1-2	1-2	offshoots	Succulent hedge	no	Ornamental, fiber
Anacardium occidentale	Cashew	1	1	seed	Large, broad hedge	yes	Fruit, nut, firewood, oil, gum
Bambusa vulgaris	Common Bamboo	1-2	2-3	Offshoots, cuttings	Tall, dense, Palisade, hedge	no	Large culms
Bambusa multiplex	Hedge Bamboo	1-2	2-3	Offshoots, cuttings	Medium, dense hedge	no	Medium culms
Bauhinia rufescens	Kharroub	1-2	1-2	seed	Dense hedge	yes	N-fixing, forage, fiber, lumber, tannin, medicine
Bixa orellana	Annatto	1-2	2-3	seed	Shrub hedge	yes	Vitamin A in seed coat, food coloring
Bombacopsis quinata	Pochote	2	2-3	seed	Tree, large, thorny bark post	yes	Lumber, tannin, medicine, firewood
Bromelia pinguin	Pinguin, Piñuela	1-2	1-2	Offshoots, seed	Forb, thorny, 1-2m spread hedge	no	Edible fruit, heart; not cattle resisitant
Bursera simaruba	Gumbo Limbo	1-2	1-2	Cuttings, seed	Tree, medium post, palisade	yes	Forage, medicine, firewood
Byrsonima crassifolia	Nance	1-2	2-3	seed	Tree, medium post	yes	Edible fruit, charcoal
Caesalpinia eriostachys	Saino	1-2	1-2	seed	Shrub hedge	yes	Firewood, bark poisonous to fish
Cassia grandis	Coral Shower	1-2	1-2	seed	Tree, small, fast post	yes	Medicine
Casuarina spp.	Australian Pine	1-2	2-3	seed	Tree, tall post, hedge	yes	Firewood, lumber, windbreak, erosion control, N-fixer, invasive
Cedrela odorata	West Indian Cedar	1-2	2-3	seed	Tree, large post	yes	Lumber, firewood
Cereus hildmannianus	Queen-of-the-Night, Hedge Cactus	1-2	1-2	Seed, cuttings	Cactus, large, thorny, branched hedge, palisade	yes	Fruit, ornamental
Cochlo-spermum vitifolium	Rope Tree	1-2	2-3	Seed, cuttings	Tree, medium post	yes	Cortex for rope
Codiaeum variegatum	Garden Croton	1-2	2-3	cuttings	Shrub, 1-2 m hedge	yes	Ornamental, edible young leaves
Cordia spp.	Cordia, Manjack	1-2	1-3	Cuttings, seed	Shrubs-trees, hedge, post	yes	Lumber, firewood, fruit of some
Cornutia pyramidata	Azulejo	1-2	2-3	Seed	Tree, small post, hedge	yes	Dye, firewood
Croton niveus	copalchi	1-2	2-3	Seed	Shrub hedge	no	Medicine
Cupressus lusitanica	Mexican Cypress	2-3	2-3	Seed	Tree, large post	no	Lumber, shade, windbreak

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Scientific Name	Common Name	Adaptation *		Propagation Methods	Traits Fence Types	Prune Y/N	Other Uses/Notes
Cyathea spp.	Tree Fern	2-3	2-3	Spores, Offsets, Trans-plants	Tree, small hedge	no	Starch, orchid production, ornamental
Brugmansia x candida	Angel's Trumpet	1-3	2-3	Cuttings	Shrub, small, succulent hedge, palisade	yes	Ornamental, medicinal, poisonous
Diphysa americana	Guachipilín	1-2	2-3	Seed	Tree, small, shrubby hedge, palisade	yes	N-fixing, forage, dye
Dracena fragrans	Dracaena	1-3	2-3	Cuttings	Tall – 2m palisade	yes	Ornamental
Drimys winteri	Winter's Bark, Canelo	1-2	2-3	Seed	Tree, medium post	no	Medicine, condiment, firewood, temperate region
Erythrina berteroana	Pito	1-3	2-3	Cuttings, seed	Tree, medium, thorny post, hedge, palisade	yes	N-fixing, forage, vine support, coffee/cacao shade, seeds poisonous
Erythrina poeppigiana	Coral Tree, Immortelle	1-3	2-3	Cuttings, Seed	Tree, large post, hedge, palisade	yes	N-fixing, coffee/cacao shade
Euphorbia cotinifolia	Mexican Shrubby Spurge	1-2	1-2	Seed, Cuttings	Shrub hedge	yes	Posionous to livestock
Euphorbia lactea	Candelabra Cactus	1-2	1-2	Cuttings or Pieces	Hedge, Palisade	Yes	Latex is skin irritant
Euphorbia neriifolia	Leafy Hedge Euphorbia	1-2	1-2	Cuttings or Pieces	Hedge, Palisade	Yes	Medicine, Latex is skin irritant
Euphorbia tirucalli	Pencil Tree, Milkbush	1-2	1-2	Cuttings	Dense shrub hedge	yes	Latex is skin irritant; cancer agents cited in some medical research
Ficus citrifolia	Citrus-Leaf Fig	1-2	2-3	Cuttings, Plantlets	Tree, dense post	yes	Forage, edible fruit
Ficus crocata	Higuerón	1-2	1-2	Cuttings, Plantlets	Tree, dense post	yes	Caudiciform base, shade
Ficus micro-carpa	Indian Laurel, Malay Banyan	2	1-3	Cuttings, Plantlets, Air Layer	Tree, medium, dense post	yes	
Gliricidia sepium	Gliricidia, Madre de Cacao	1-2	2-3	Cuttings, Seed	Tree, medium post, palisade	yes	Forage, firewood, edible flowers, rat poison
Grevillea robusta	Silk Oak	1-2	2-3	Seed	Tree, large post	no	Firewood
Hibiscus rosa-sinensis	Chinese Hibiscus	2-3	2-3	Cuttings	Shrub, palisade, hedge	yes	Forage, ornamental
Inga spp.	Ice Cream Bean Tree	1-3	1-3	Cuttings, Seed	Tree, medium post	yes	N-fixing, firewood, fruit
Jatropha curcas	Physic Nut, Jatropha	1-2	1-2	Cuttings, Seed	Tree, small palisade, hedge	yes	Oil, medicine, cattle won't eat leaves
Leucaena leucocephala	Ipil Ipil, Leucina	1-2	1-2	Seed	Tree, small post, palisade	yes	Firewood, charcoal, forage, edible shoots, N-fixing
Ligustrum lucidum	Glossy Privet	1-3	2-3	Cuttings	Shrub hedge	yes	Wax
Ligustrum vulgare	Common Privet	1-3	2-3	Cuttings	Shrub hedge	yes	Wax, dye, charcoal, fiber

Table 1. Plants used as Living Fences

Scientific Name	Common Name	Adaptation *		Propagation Methods	Traits Fence Types	Prune Y/N	Other Uses/Notes
Maclura pomifera	Osage Orange	1-2	1-2	Seed, Room/ Stem Cuttings	Hedge, Post	yes	Fruit is insect repellent, temperate region
Maclura tinctoria	Fustic	1-2	2-3	Seed, Cuttings	Tree, small, thorny post	yes	Lumber, medicine, dye
Mangifera indica	Mango	1-2	1-3	Seed, Grafting	Tree, large post	yes	Fruit, shade, firewood, forage, medicine
Manihot esculenta	Cassava	1-2	1-2	Cuttings	Shrub, Palisade	no	Edible roots/foliage, starch, feed, cyanide in leaves and roots - must cook!
Moringa oleifera	Moringa, Horseradish Tree	1-2	1-2	Cuttings, Seed	Tree, small palisade, post	yes	Edible foliage and pods
Morus spp.	Mulberry			Cuttings, Seed	Trees, small palisade, post, woven lattice	yes	Forage, fruit, fuel
Opuntia spp.	Prickly Pear or Cholla Cactus	1-2	1	Cuttings, Seed	Shrub, succulent, very prickly hedge	yes	Fruit, forage, edible pads
Pedilanthus tithymaloides	Japanese Poinsettia	1-2	1-2	Cuttings	Shrub, succulent hedge	no	Wax, medicine, laex is skin irritant
Phyllostachys bambusioides	Giant Timber Bamboo	1-2	2-3	Cuttings, Divisions, Offshoots	Hedge	no	Forage, edible shoots
Pithecellobiun unguis-cati	Cat's Claw	1-2	2-3	Seed	Tree, spiny hedge, post	yes	N-fixing
Pithecellobium dulce	Manila Tamarind	1-2	1-3	Seed	Tree, large, spiny post, hedge	yes	Edible pods, lumber, N-fixing, forage, medicine
Prosopis juliflora	Mesquite	1-2	1	Seed	Tree, medium post	yes	Forage, firewood, charcoal, tannin, gum
Randia karstenii	Crucilla	1-2	2-3	Seed	Tree, small spiny post	no	Firewood
Salix spp.	Willow			Cuttings	Tree, medium palisade, post	yes	Forage, firewood, medicine
Sesbania grandiflora	Vegetable Hummingbird	1-2	1-2	Seed	Treed, medium palisade	yes	Edible foliage, edible flowers, N-fixing
Spondias mombin	Yellow Mombin	1-2	1-2	Cuttings, Seed	Tree, large post, palisade	yes	Lumber, fruit, firewood
Spondias purpurea	Red Mombin, Jocote	1-2	1-2	Cuttings, Seed	Tree, medium post, palisade	yes	Fruit
Syzygium jambos	Rose-Apple	1-2	2-3	Seed	Tree, large hedge	yes	Fruit, firewood
Syzygium malaccense	Malay Apple	1-2	2-3	Seed	Tree, large, spiny hedge	yes	Fruit, firewood
Tabebuia rosea	Rosy Trumpet Tree	1-2	1-3	Cuttings, Seed	Tree, small post	yes	Firewood
Talipariti tiliaceum	Mahoe, Majagua	1-2	2-3	Seed	Tree, dense hedge	yes	Edible foliage, edible flowers, cortex for fiber
Tectona grandis	Teak	1-2	2-3	Seed	Tree, large post	no	Lumber
Yucca guate-malensis	Spineless Yucca	1-3	1-3	Cuttings	Palisade, hedge	mo	Edible flowers, dye

Table 1. Plants used as Living Fences

Scientific Name	Common Name	Adaptation *		Propagation Methods	Traits	Fence Types	Prune Y/N	Other Uses/Notes
Ziziphus jujuba	Chinese Jujube	1-2	1-2	Seed	Shurb-tree, small, spiny hedge		yes	Edible fruit, tropical to temperate regions

* Altitude: 1 – 0 to 2000 meters; 2 – 2000 to 4000 m; 3 – 4000+ m
Moisture: 1 – low (30-50 inches/yr); 2 – medium (50-70 inches/yr); 3 – high (70+ inches/yr)

Some Useful References

Willow fence videos.

- http://www.youtube.com/watch?v=PT6h6NYfz_c&feature=related
- http://www.youtube.com/watch?v=6xCfgwBwXmQ&NR=1

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