ECHO Development Notes

Edited by Dawn Berkelaar and Tim Motis | July 2012 | Issue 116

Living Fences

by Franklin Martin, revised by ECHO staff

Though ECHO has shared information about living fences for many years, we had not written about them in EDN. This information is also available as a Technical Note, with the addition of an extensive list of plant species that have potential as living fences.

Introduction

Fences are established on the small farm for a variety of reasons. They are used to mark boundary lines between farms or next to roads, and to separate adjacent fields used for distinct purposes. Fences are used to protect and keep animals from straying (to keep animals 'in'), or to protect crops from animal damage (to keep animals 'out'). Living fences are commonly used in a wide range of ecological situations, from semi-arid to rainforest conditions. Suitable plant materials are available for almost all ecological regions and conditions.

Palisade of Gliricidia in Honduras. Photo by Larry Yarger.

Very long fences are usually constructed of poles with wire strung between them. Shorter 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 types of fences may be constructed of living posts.

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 comprised of well-adapted plant species are not bothered by termites, carpenter ants and dry rot, which are a continual battle in maintaining "dead," wooden fence posts.

Fuel. As a general rule, firewood or charcoal is the primary cooking fuel in developing countries. 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.

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 both from species to species and with age. When living fence posts are used to produce forage, space is conserved on the farm.

Featured in this EDN

ECHO is a global Christian organization that equips people with agricultural resources and skills to reduce hunger and improve the lives of the poor.

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Food. Leaves, flowers, fruits and seeds of many living fence species are important for human consumption. For example, 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 species such as willow can be used for making home craftwork like woven baskets and carvings.

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

Windbreaks. In some areas, windbreaks are necessary to protect against the drying and lodging action of winds that can damage crops.

Cautions to be Aware of with Living Fences

Whether or not living fences are used on a farm will depend on the balance of the advantages versus the disadvantages. A few cautions to consider are:

- A living fence's canopy and roots can compete with crops for available sunlight, water and soil nutrients. The extent to which this happens depends on factors such as the species used and pruning height.
- Certain living fence species are readily eaten and destroyed by livestock, or may be invasive.
- Living fences must be carefully selected, maintained and managed.

Economic Considerations

A fence represents a major investment on the small farm. Using live plant material for posts, or for the entire fence, can increase the return on investment by providing the many secondary benefits and by-products already discussed. The cost of plant material for establishing a living fence can be minimized by obtaining seeds and/or cuttings from existing trees or plants. The labor costs can be high initially, as seeds or cuttings must be planted densely and/or over great distances. Species that produce large amounts of biomass will also require frequent pruning. Since living posts last longer than wooden (dead) ones, replacement costs are reduced.

Establishment and Care of Living Fences

In an area where you plan to promote living fences, first try to identify the species of trees already being used as living fences. Also try to determine if any of the native species are suitable for living fences.

A species used 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 species of trees can be suitable for use as living fences. 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.

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 ani-

Girdling a fence post.

mal-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 four to six 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

Only a few select and widely-used species are featured here. Table 1 in ECHO's Living Fence Technical Note lists many additional species.

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 throughout the tropics 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.

Gliricidia. Photo by Tim Motis.

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 the 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 vanilla orchids. In a living fence, gliricidia may be pruned every three years, yielding a good quantity of firewood.

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.

Erythrina. Photo by Tim Motis.

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 are 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 three to four 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.

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 six months produced the most edible leafy biomass. Pruned every four months it produces 30 t (30,000 kg) of edible dry matter per km of fence; pruned every six 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.

Gumbo Limbo. 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. Gumbo limbo otherwise has few other uses, as the wood is soft and the tree is short lived.

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 quickly, especially during 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. An AVRDC (World Vegetable Center) fact sheet on moringa (www.avrdc.org/LC/indigenous/moringa.pdf) suggests a spacing of 1 m or closer for trees established as living fence posts. 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. Photo by Tim Motis.

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 qualities suitable for use 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.

Euphorbia lactea, [raket, kandelam (Haiti)]. This cactus surrounds many of the small farms in Haiti. Cory Thede, an agriculturalist working in Haiti, shared the following comments:

Euphorbia lactea. Photo by Larry Yarger.

"The plant is called raket around here [northern Haiti, near Cap Haitien], I think it was called kandelam (from candelabra cactus) more on LaGonave. It even grows well here in the rainforest conditions, so it grows in all climates of Haiti. It is a good fence. It is good to wear eye protection when cutting since the sap is very irritating, especially to the eyes. Branches are cut and stuffed into minimal holes (depending on the height of the branch; deeper for taller branches, so they don't fall over) to make a fence. It sprouts and roots easily, since it is so wet here. As it is a succulent plant, it may be planted rather shallow to avoid rotting. With regular trimming it makes a neat hedge. Here they don't get much maintenance and vines often cover them, but they survive quite a bit of shade. The pineapple relative, pinguin, is the most common living fence here, but cows can eat it. It has nasty spines that go both directions and tend to break off under the skin."

Some Useful References

Willow fence videos.

www.youtube.com/watch?v=PT6h6NYfz_c&feature=related

www.youtube.com/watch?v=6xCfgwBwXmQ&NR=1

www.youtube.com/watch?v=mGYcXn0CCGg&feature=related

Live Fences, The Overstory #38. S.D. Cherry & E.C.M. Fernandez www.agroforestry.net/overstory/overstory38.html

Agroforestry Guides for Pacific Islands. C.R. Elevitch & K.M. Wilkinson (Eds.). 2000. Permanent Agriculture Resources, Holualoa, Hawaii, USA. Individual sections of the book can be downloaded in pdf format. See especially #5 (Introduction to Integrating Trees into Pacific Island Farm Systems) and #8 (Multipurpose Windbreaks :Design and Species for Pacific Islands). www.agroforestry.net/afg/book.html

Grow Your Own Living Fence, Farm Radio International broadcast script:

www.farmradio.org/english/radio-scripts/31-2script_en.asp

Intercropping for Pest Control: the Push-Pull Approach

By Tim Motis, PhD
abstracted from "Planting for Prosperity. Push-Pull: A Model for Africa's Green Revolution"

"Push-pull" is an intercropping strategy that protects maize and other grain crops against maize stemborer insect larvae (*Chilo partellus*) and a parasitic weed called striga (*Striga hermonthica*). In eastern and southern Africa, these pests have caused huge losses in maize and sorghum yields. Average maize yield losses to stemborer are 20%-40%, with losses as high as 80% in some instances. Striga reduces yields 30% to 100%, sometimes causing farmers to abandon fields.

The push-pull concept was developed by the International Centre of Insect Physiology and Ecology (ICIPE), along with the Kenya Agricultural Research Institute (KARI), Kenya's Ministry of Agriculture, and Rothamsted Research in the United Kingdom.

ECHO featured push-pull in *EDN* 77 (2002). At that time, the push-pull system had been tested on more than 2000 farms. A 2011 ICIPE publication (*Planting for Prosperity. Push-Pull: A Model for Africa's Green Revolution*), reports that push-pull has been adopted by over 40,000 farmers! We felt it would be appropriate to revisit the topic and spread the word about this growing success. Below is a brief recap of content from *EDN* 77, written by Dawn Berkelaar, followed by content abstracted from *Planting for Prosperity*.

Recap from EDN 77

How the system works

Trap crops that are attractive to stemborers, such as Napier grass (*Pennisetum purpureum*) and Sudan grass (*Sorghum vulgare sudanense*), are planted around a maize field to "pull" stemborers away from the maize. Napier grass produces a sticky substance that attracts the stemborer larvae, then traps and kills them.

Meanwhile, plants that repel stemborer, like desmodium species (such as forage silverleaf, *Desmodium uncinatum*) and molasses grass (*Melinis minutiflora*), are used as an intercrop to "push" stemborers away from the maize. Molasses grass also attracts a parasitic wasp (*Cotesia sesamiae*) that is a natural enemy of stemborers.

Benefits other than stemborer control

Several other benefits result from the use of these plants. For instance, each of them can be used or sold as fodder. Desmodium also fixes nitrogen, improving soil fertility, and suppresses *Striga hermonthica*, a parasitic plant often referred to as "witchweed." When maize was intercropped with desmodium, striga was suppressed 40-fold compared to a maize monocrop.

Highlights from Planting for Prosperity

Research findings

About thirty different grass species have been observed to host stemborers. The advantage of using Napier grass is that it is commonly used for livestock fodder. Besides "drawing" pests away from the maize, grasses such as Napier or Sudan grass are planted on field borders so that they do not compete with the main crop. Stemborer predators other than wasps include ants, earwigs, spiders and cockroaches, populations of which have all been higher in push-pull than in control plots.

Desmodium has been found to actually reduce the number of striga seeds in the soil. It suppresses striga in two ways: (1) the roots release chemicals that inhibit the growth of striga; and (2) it stimulates striga seed germination while inhibiting the radicle (part of the weed that grows towards and attaches to the host plant), causing "suicidal germination" of the striga seeds.

Studies are showing that the plants used in push-pull "communicate" by releasing chemicals that discourage stemborer moths from laying more eggs or attract wasps that parasatize the stemborer larvae. Such knowledge gives researchers key insights into what makes an ideal repellent or trap crop. It also means that planting anything else between the grass border and desmodium intercrop could reduce the effectiveness of the system.

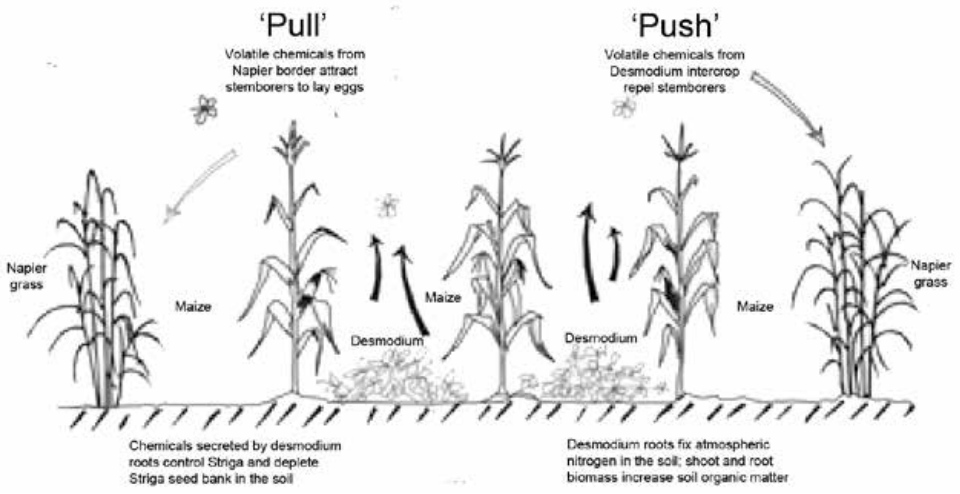

Diagram used with permission from ICIPE. Source: *Planting for Prosperity. Push-Pull: A Model for Africa's Green Revolution*

Farmer and economic impacts

According to an independent impact assessment (Fischler, M. 2010. Impact assessment of push-pull technology developed and promoted by ICIPE and partners in Eastern Africa. ISBN 92 9064 2157), push-pull increased maize yields from 1.2 to 3.5 tonnes per hectare and added the equivalent of about US$ 100 per family per year. Another review showed that, over a period of several years, the benefit to cost ratio exceeded 2.5. While initial labor costs associated with planting the Napier and desmodium are high, the benefits are long term. Increased grain yields and extra cash from forage sales (of desmodium and Napier grass) have allowed many farmers to expand or diversify. Some farmers, for instance, are able to purchase a goat or dairy cow, or breed their animals for increased milk production.

Versatility of the system

Push-pull has spread beyond Kenya and has been introduced in Tanzania and Uganda. It has also proven applicable to other grain crops besides maize, increasing sorghum, millet and upland rice yields by at least 50% and significantly reducing the effects of striga and stemborer in these crops. As these crops are better able than maize to thrive under dry conditions, the push-pull system should be considered in evaluating ways to cope with climate change. In drier areas, where cattle are often allowed to graze freely after the grain has been harvested, the intercrop and border rows need protection from livestock.

Knowledge dissemination

Elements of ICIPE's and KARI's dissemination efforts have included demonstration plots and field days, farmer-teachers, farmers' groups, and farmer field schools. Farmer-teachers are farmers who have successfully managed their own push-pull plots and have been trained and equipped to teach others. The ICIPE team has also developed training materials for use in famer field schools. The group aspect of farmer field schools encourages knowledge sharing and exchange. Various government and non-government organizations have also been involved in introducing the technology. The literature developed by ICIPE and KARI has helped to maintain consistency in what is being communicated through multiple entities to introduce and spread awareness of push-pull technology.

In summary

Push-pull is a successful intercropping strategy that emphasizes principles of crop diversity to increase food production by controlling crop pests without expensive pesticides. For much more information, visit www.push-pull.net, which contains the full version of "Planting for Prosperity," training materials with specifics on how to establish the intercrop and border rows (www.push-pull.net/ffs_curriculum.pdf), and numerous scientific publications.

UPCOMING EVENTS

West Africa Networking Forum

Pacific Hotel
Ouagadougou, Burkina Faso

September 25-27, 2012

The goal of this ECHO Forum is to enable networking related to alleviating hunger and poverty by those persons serving Africa's poor. Three mornings of plenary sessions featuring knowledgeable and experienced speakers will be followed by afternoon workshops and discussion groups led by regional agricultural development workers and experts. Post Forum field visits optional.

We are pleased to announce that the following speakers will be joining us for the West Africa Networking Forum:

- **Tony Rinaudo** with World Vision presenting on Farmer Managed Natural Regeneration
- **Timothy Watkins** from ECHO presenting Foundations for Farming
- **Dr. Dov Pasternak**, Senior International Adviser – Dryland Agriculture presenting on Crop Diversification
- **Dr. Hubert Badiel** from Africare presenting on the System of Rice Intensification
- **Beth Doerr** from ECHO presenting on Moringa: Health & Economic Benefits
- **Patrice Djamen** from African Conservation Tillage Initiative presenting on Conservation Agriculture
- **Dr. Hamado Sawadogo** with Natural Resource Management Group (INERA) presenting on Zai system, Half-Moons and other soil & water conservation methods
- **Dr. Abdou Tenkouano** from AVRDC: The World Vegetable Center
- **Timothy Albright** from ECHO presenting on the Challenges Farmers Face

For more details or registration visit: http://www.ECHOcommunity.org/events/event_details.asp?id=192519

ECHO Agricultural Conference

Fort Myers, FL

December 4-6, 2012

The ECHO Agricultural Conference in Florida is another great opportunity for

networking, information gathering & exchange. Over 200 delegates working around the world are expected. If you would like to know more, find out about how to be a presenter or register please go to the link on the ECHOcommunity.org calendar of events and search for ECHO Agricultural Conference 2012 or use the following link: www.ECHOcommunity.org/events/event_details.asp?id=219646

Early Registration ends October 14, 2012.

Mark your calendars for:

East Africa Symposium

Arusha, Tanzania
February 5-7, 2013

FROM ECHO'S SEED BANK

Pumpkin Varieties to Try

by Abigail Kautz and Timothy Chapman, recent ECHO interns

As indicated by their orange/yellow flesh, many pumpkins are high in beta-carotene, a precursor to vitamin A with antioxidant properties. Vitamin A is important for healthy eyes, skin, bones and teeth, and for proper immune system function. Many pumpkins are also rich in vitamins B and E and in calcium. The seeds contain essential amino acids and iron. Pumpkin skins, flesh, seeds, and leaves can all be cooked and eaten (What more could you want from a vegetable?). This versatile vegetable source also can be stored for up to several months if the fruit is left on the vine until it has hardened and then put in a cool, dry, and dark place.

Previous ECHO pumpkin variety trials (in 2002 and 2006) focused on tropical pumpkin (*Cucurbita moschata*). For this most recent trial in autumn 2011, we chose to evaluate two of our long-standing top performers (*C. moschata* 'Lloyd Marsh' and 'Acorn') along with new possibilities from *C. moschata*, *C. pepo*, *C. mixta*, and *C. maxima*. We planted three replications of each cultivar, with 10 plants in each plot.

Table 1 lists the varieties we tested, as well as the yield per plot and number of seeds per pumpkin. Unexpected rains in October provided a perfect chance to test the well-known disease-resistance and heat and humidity tolerance of the *Cucurbita moschata* species. The *C. moschata* cultivars performed best under the heavy fungal and disease pressure accompanied with the high humidity and rainfall at the end of our Florida rainy season. The results in Table 1 show that *C. moschata* "Lloyd Marsh" produced significantly more flesh (excluding the rind) per plot of ten plants and significantly more seeds per pumpkin that other cultivars in the trial.

'Acorn' (*C. moschata*), second in flesh weight per plot and seeds per pumpkin, ranked highest in the taste test (further details following) with comments of "very sweet & delicious" and "great texture and color." 'Guatemalan Blue' (*C. maxima*) and 'Thai Small' (*C. moschata*) ranked next in flavor, texture, and color. Top producer 'Lloyd Marsh' (*C. moschata*) has also been well enjoyed in stews, soups, and baked dishes.

We conducted a blind taste test with eleven participants that ate pieces of baked pumpkin flesh from each variety. Each person ranked the varieties overall and provided comments about taste, texture, and color.

'Guatemalan Blue' (*C. maxima*) has a long, blue, banana-shaped fruit, weighing about 10 lbs with orange, firm flesh. Its thick seeds are excellent when roasted. 'Thai Small' (*C. moschata*) is from Thailand and does well in tropical climates. The rind is ribbed and dark green with orange flesh. This variety ranked highly in the taste test.

ECHO's seed bank will continue to offer seeds of *C. moschata* ('Lloyd Marsh' and 'Acorn'), and will be adding *C. moschata* 'Thai Small' and *C. maxima* 'Guatemalan Blue'. Visit www.ECHOcommunity.org for information on how to request a trial packet of one or more of these cultivars. ECHO's seed bank will fill orders depending on available quantities. We also encourage you to try growing local varieties of squash and pumpkins. For more on cultivar crossing, see the following resources:

- A narrated slide presentation, entitled 'Pumpkin Pollination' (available on our website at ECHOcommunity.site-ym.com/?page=presentations)
- The book, *Breed Your Own Vegetables*, by Carol Deppe

Table 1. Pumpkin fruit and seed weights as influenced by *Cucurbita* species/variety.

Variety	Flesh weight (g/plot)	Seeds (no./pumpkin)
Cucurbita moschata 'Lloyd Marsh'	1463 a	676 a
Cucurbita moschata 'Acorn'	534 b	391 b
Cucurbita moschata 'Noob Taub'	337 b	352 b
Cucurbita moschata 'Thai Small'	345 b	299 bc
Cucurbita maxima 'Guatamalan Blue'	225 b	186 bc
Cucurbita maxima 'Jarrahdale'	158 b	331 b
Cucurbita mixta 'Cushaw White'	428 b	66 c
Cucurbita pepo 'Pacheco'	80 b	180 bc
Cucurbita (unknown sp) 'Jack-Be-Little'	51 b	88 c
P value*	0.001	0.001

*Each number in this table is a mean (average) of three values. Within each column of means, at least two are statistically different from each other because the corresponding P value for each column is <0.05. To show which means are different from each other, each number is followed by one or more letters based on Duncan's Multiple Range Test. Within each column, any two values are statistically different if none of the letters following them are the same.

ECHOES FROM OUR NETWORK

Bill Mebane sent ECHO a photo with the following explanation: "We took about 1 dozen of your ECHO "flyers" (written in Kreyol) depicting the benefits of moringa, how to plant it etc. to Haiti during our last trip. Long story short–we were overwhelmed with requests for more and people kept grabbing them from our meager stock pile!

"We were shocked at the response but were frustrated we did not have more to give away, sooooo we duct taped our remaining copies to the inside of the toilet stalls at the school where we were working–450 kids/day visit these latrines and can read your brochure as they use the toilet (captive audience forced to read about the benefits of moringa!). Smart marketing eh?

"We had some of our workers bringing moringa to eat and feed the fish the day after they read the brochure–good job ECHO...keep publishing!"

The flyer Mebane mentioned is entitled "Doliv: Yon Solisyon Senp Pou Malnitrisyon." It is a product of MPP (The Farmer's Movement of Papaye), distributed by ECHO with their permission. The pdf file is on our website (ECHOcommunity.site-ym.com/?page=tech_notes (scroll to the bottom of the resulting page).

FROM OUR REGIONAL IMPACT CENTERS

ECHO Asia

The latest issue of ECHO Asia Notes (Issue 13, April 2012) contains the following articles:

- Vegetable Production throughout the Rainy Season
- Three Cheers for Job's Tears: Asia's Other Indigenous Grain
- Electronic Resource Library

Link to the issue from here: ECHOcommunity.site-ym.com/?page=EchoAsiaNotes

ECHO East Africa

We are excited to announce the opening, as of April 2012, of a new Regional Impact Center (RIC) in Arusha, Tanzania serving East Africa. It is also our pleasure to introduce you to Erwin Kinsey, East Africa Regional Impact Center Director. Kinsey grew up on a Vermont dairy and maple farm. He volunteered with the American Friends Service Committee in Mexico for two years before finishing his Bachelor of Science in Animal Science from the University of Vermont. He has worked for 35 years promoting food security of small, low-income farmers and pastoralists, first with Heifer International in Tanzania and across Africa from 1977-2007, and for Global Service Corps in Tanzania from 2007-2012. He obtained a Masters in Rural Development from the University of London SOAS in 2008 and has written numerous farmer manuals and publications. We are very pleased to officially welcome Erwin to the ECHO network as he takes over the reins of the East Africa RIC. As Erwin's efforts progress, resources from the East Africa RIC will be available on our website (ECHOcommunity.org). You can connect with Erwin and the activities of this new Impact Center through "Groups/Geographic/East Africa" also at ECHOcommunity.org.

PLEASE NOTE: At ECHO we are always striving to be more effective. Do you have ideas that could help others, or have you experimented with an idea you read about in EDN? What did or did not work for you? Please let us know the results!