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**Edited by Martin Price and Dawn Berkelaar**

ECHO is a Christian non-profit organization whose vision is to bring glory to God and a blessing to mankind by using science and technology to help the poor.

## Issue Highlights



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## Chaya

*Compiled by Dawn Berkelaar*

Martin Price, executive director of ECHO, asserts, "I would consider chaya to be one of the five most important food plants ECHO distributes. I give it this rank because of its ability to thrive in both arid and rainy regions, its little need for care or extra fertility, its lack of insect or disease pests, and its exceptional nutritional value."

A few years ago, while working as part of ECHO's technical staff, Kristin Davis wrote about an experience with the chaya plant in Kenya (see below). Kristin is now in a PhD program at the University of Florida in Gainesville.

In addition to Kristin's report, we want to share what some members of our network had to say about chaya after we asked for feedback in issue 72 (July 2001) of *ECHO Development Notes*.

For years we have referred to chaya by the scientific name *Cnidoscolus chayamansa*. However, we recently learned from Mr. Jeffrey Ross-Ibarra at the University of California-Riverside that the scientific name of chaya has been changed to *Cnidoscolus aconitifolius* ssp. *aconitifolius.* This latter subspecies contains many wild varieties and four main cultivated varieties of chaya, including the cultivar 'chayamansa'. There are significant differences in levels of cyanogenic glycosides among cultivated varieties. Chaya is closely related to *Manihot* species (e.g. cassava) and *Jatropha* species.

### Experience with the Chaya Plant in Kenya

*Kristin Davis*

As an agricultural missionary in Kenya, I knew that many people in the arid north would eat more greens if they could just get them to grow. Greens such as cabbage, collards and spinach are not drought-resistant and are attacked by insects when grown in dry areas. I requested chaya cuttings from ECHO because I thought it would stand a better chance of growing in these drier areas, providing year-round greens for the people.

Chaya almost never produces seed, so it must be propagated by cuttings. Fortunately, the cuttings can survive a long time in the mail. It was six weeks' time from shipping to when the cuttings arrived in Kenya. Despite their long journey, they still looked in good shape, and I planted them in pots. Later they were transplanted in three locations in northern Kenya: Kokwo Toto, Kurungu and Kalacha.

The cutting at Kokwo Toto was later dug up and replanted, and then totally defoliated by goats browsing on the leaves. It recovered a second time and is now growing nicely, but is periodically defoliated by the local people who take the leaves to eat. The Kalacha cutting was planted in the far north of Kenya, at an oasis in the salty Chalbi desert. It remained stunted despite regular watering. It was later moved to a place that received more water and is doing really well.

The cuttings at Kurungu have fared the best. The original cuttings are now two big shrubs, about eight feet high. Missionaries and others passing through have taken many cuttings, and the local people recently took more cuttings and planted them in their gardens. About half of the cuttings have taken off. Roughly two-thirds of the people like to eat the chaya. None is being sold yet in the local market. Collards ('Sukuma wiki'; *Brassica oleracea*) in the same garden are being totally devastated by bugs, but the bugs do not bother the chaya.

Chaya is sometimes dubbed "the spinach tree." It is a fast-growing drought- and disease-resistant shrub that provides large quantities of edible, very nutritious leaves. It originated in Mexico, but has made its way around the world as people planted chaya cuttings. Because of the presence of hydrocyanic glycosides in the leaves, it is recommended to cook the leaves thoroughly before eating them by boiling or frying for at least five minutes. [Ed: Dr. Frank Martin tells us that the cyanide is quickly destroyed by cooking. The word "cyanide" may needlessly scare people. Most people, including scientists, that I have talked to in areas where chaya is used seem unaware that leaves even contain cyanate-producing substances.] The shrub has long been a popular food among native peoples in Central America and southern Mexico.

Chaya out-performs most other green leafy vegetables nutritionally. The leaves are very high in protein, calcium, iron, carotene and A, B and C vitamins. The complimentary amino acids in chaya are well balanced, which is important for those who have a diet low in protein and for children and pregnant or nursing mothers.

[MLP: Because its site of origin has seasons both of long droughts and of hot, humid rainy weather, it has outstanding resistance to pests and diseases under both sets of conditions. In Florida, ECHO has grown chaya for 21 years and never had a problem with disease or insects. However, during the cool, subtropical winter it essentially goes dormant. Any pests at this stage are just ignored.]

Preparation

The local Samburu people in Kurungu use chaya a lot. SuZann Beverly, a missionary in Kurungu, writes, "they cut up the leaves, add water, bring it to a boil, pour out the water, add fat, fry slightly and add it to their ugali [corn meal] mix. The Samburu people have no onions and spices to speak of, so they don't use it separately like other people would."

*Figure 1: Ruth Andersen in front of the chaya plant at Kurungu.*

At Kokwo Toto, the Pokot people cook chaya like sukuma wiki (collards), fried with onion in a little bit of oil.

In ECHO's book *Amaranth to Zai Holes*, several other ways of cooking and eating chaya are mentioned on pages 55-56 (also found on our web site at http://www.echonet.org /tropicalag/knowledgebank/AZ_files/az_2_16.htm).

## Experiences with Chaya by Others in our Network

In *EDN* Issue 72, we asked readers how chaya grows in various climates; whether or not it is accepted locally as a green vegetable; and if so, how it is usually prepared and served. Thank you to those of you who responded!

Growth of Chaya in Different Climates

We received reports from many different countries. Chaya has been found to grow remarkably well in a wide variety of climates.

Nancy Harper, working in Belize with Systems of Sustainability, wrote, "We have used chaya for the last ten years as our principal and preferred year-round source of greens. It tolerates lack of care, quite a bit of shade or full sun, and invasion by weeds. Few pests bother it, it is highly resistant to just about everything, and it produces a prodigious amount of leaves, even in the dry season, if given a little compost and mulch.

"After a few years, if not mulched or given compost, chaya can begin to die out, especially during prolonged drought. I believe it is a [viral disease] carried by an insect. As soon as I see these insects on the underside of the leaves and note the fading, sickly leaves, I take cuttings from the healthiest-looking plants and replant them in good soil with compost and mulch. This **only** happens when plants are heavily cropped, underfed, and dry.

"Besides compost and/or mulch, chaya enjoys wood ash (in our acid soil) and dilute urine…We can grow a lot of other greens, especially in the cooler months, but chaya never fails. Plant lots, everywhere you have space! Even our cats love chaya."

Carlos Echavez, Executive Director of Bol-anon Foundation in the Philippines, wrote the following: "On your request of chaya feedback. We requested planting materials of this plant years ago. It is vigorously growing but we only use it for mulching material and as a living fence instead of eating it." [see further comment below, in next section.]

Jay Ram wrote to us from Hawaii. "We have been propagating chaya in Hawaii and spreading it throughout the Pacific area for a number of years. We have observed the following:

"The 'spineless' variety [Ed: the variety with no stinging hairs; see end of paragraph] of chaya has been a persistent and vigorous perennial which thrives in high rainfall areas of 150-230 inches per year. No diseases have been noted. However, if an older plant is coppiced [cut back] too close to the ground, the entire plant can succumb to what probably is a fungal or bacterial rot which enters through the wounds. Some of our plants have been continuously coppiced for 12 years, and are still vigorous. Coppicing seems to work best when the new

cut is made just above the previous one, which makes the plant height eventually higher. If the new shoots are not consumed and [are] allowed to grow, [we coppice] every 2-3 months in this high rainfall climate, as growth is very rapid. Plants will grow to 8 to 10 feet [2.4 to 3 m] in that amount of time. Note that this rate of growth is without any external inputs of nutrients or anything else. Growth is also rapid in the winter season when temperatures are somewhat lower. Thus in this climate, aside from being a good food source, the plant is a great biomass producer as well. We also grow the chaya variety that has spines, for germplasm purposes [i.e. for genetic diversity]. It may be somewhat more vigorous than the 'spineless' variety." [Ed: They are actually stinging hairs, rather than 'spines.']

Charlie Forst, Appropriate Technology specialist here at ECHO, pointed out that for maximum production of tender leaves and 4 to 6 inch new shoots, you should pollard chaya (i.e. cut back the larger limbs and upper canopy to about 4 feet) rather than coppicing it (cutting back the whole plant, including the stem, to around 18 inches).

Tim Bootsma with CRWRC-Zambia wrote to us about how chaya grew in Eastern Province, Zambia. "We received the chaya cuttings in January, 2000. They all arrived safely. They were potted and all six cuttings grew well. Two got eaten by my dog, though; she liked to dig in flower pots. By March the [rest of the] plants were ready to plant out.

"In Zambia we have a four-and-a-half month rainy season that begins in mid-November and goes till the end of March. Then we get no rain until the following November. Our chaya plants were ready for transplanting in March, just at the end of the rains.

"Three plants survived the transplanting and early care. These three were planted in three different locations. One was way up on a dry hill, the second toward the high end of a gardening area (where water is close to the surface), and [the third] in a wetlands/lowland area. They all grew well until this past rainy season, when the one in the lowland got waterlogged and died. The other two did better, with much more vigorous growth on the one grown in the garden area in reach of more soil moisture.

"The one in the high area kept getting attacked by local chickens. At times it was plucked bare, with no leaves left but just a stem. It struggled, but it survived.

"One year after they were planted, the two remaining plants are about 6 feet tall…The two chaya plants are still teaching us new things. One plant is flowering, and we want to see if it will produce seed. [Ed: Our chaya flowers almost continually. One plant produced a few seeds once in 21 years.] The facilitator who has taken over the care of the chaya also wants to monitor it a bit longer to see when will be the best time to harvest the leaves. They have noticed that at some times the leaves are softer than others. The chaya is still being monitored to see how much trimming and cutting and abuse it can take. One of the two plants was accidentally chopped down by an eager person trying to clean up the garden. Since then it has started [sending up new shoots]."

Grant Kaufmann wrote from Villamontes, Tarisa, Bolivia, "Dear ECHO, in response to your question about chaya in *EDN*: We have subsequently started chaya at two locations in Bolivia: 1) Santa Rosa, 17 S latitude, tropical wet/dry (three-month dry season), 1500 mm [60 in] precipitation, 300 m [1000 ft] elevation and 2) the Chaco, 21 S latitude, subtropical dry (six-month dry season), 600 mm [24 in] precipitation, 600 m [2000 ft] elevation.

"The cuttings were hard to start at Santa Rosa because of fungus problems but once established the plants did well. In the Chaco the cuttings took well and had good first season growth. The plants frosted off at ground level but quickly regrew with the first rains."

John de Wolff, Dar es Salaam, Tanzania, wrote, "Concerning your question on chaya, I received in the past cuttings. Cultivation is easy and I have a nice stand. During a drought of six months it lost most of its leaves but now after some rains it has resprouted very well. A very easy crop to grow and I have not yet seen any diseases or pests."

Marsha Hanzi at the Instituto de Permacultura da Bahia, Brazil, wrote, "I brought chaya stakes back from an ECHO conference some years ago, and I now have enough to give away as many as people want. It has adapted to our garden in tropical Northeast Brazil, and also to the drylands, when planted in the vegetable gardens there. It is always a bit puny the first year, but takes off after adapting to the new site.

"It really does better in the dry season than in the wet, and gives better planting results in drier weather. (In the wet the stakes tend to rot.) This is fine, as we have a lot of semi-wild leaves for the wet season, but very few for the dry."

She added, "Chaya has the great advantage of being immune to leafcutter ants…it is totally pest-free, slow to establish but extremely resistant when well-rooted….We have spread it all over the place, in both humid climates and in the drylands, where it does well in the vegetable gardens as a green fence."

Later, Marsha wrote, "Chaya continues to spread and take hold here—even people who don't normally like vegetables like it. It has done well in the drylands gardens, and is into the fourth generation now. It is really a fantastic plant!"

John Freeman works in Nicaragua. He wrote, "Your chaya is doing very well…Sadly, the recent hurricane floods wiped out certain seed stocks we had…but the chaya lives on as it was firmly rooted and they all are over eight feet tall."

Deborah Kuiken in the Dominican Republic wrote, "We are very excited about the chaya. As a Peace Corps volunteer in a very dry and poor village, I believe chaya has great potential to improve nutrition here. Our agricultural trainer, Robert Crowley, took some chaya cuttings to Bani (where he lives). The cuttings will be transplanted at a nutrition center for mothers with malnourished children."

*Figure 2: Susanna Hall (left) and Ruth Beverly picking chaya at the Old Bight Mission Home on Cat Island, the Bahamas. Photo by Danny Blank.*

Chaya also has done well on Cat Island in the Bahamas, where the ground is mostly limestone, resulting in very difficult growing conditions for plants (see Figure 2). Since the picture in Figure 2 was taken, the chaya plants have grown to more than six feet tall. The leaves are harvested once every two weeks and prepared in a soup to be served to about three dozen orphans and workers at the Mission Home.

Is chaya locally accepted as a green vegetable?

It is encouraging to read about chaya's vigorous growth in different climates. But chaya's value is limited unless people actually use it as part of their diets. We wanted to know how chaya was accepted locally as a green vegetable.

Carlos Echavez (Philippines) wrote, "People are afraid to eat it considering that its cousin plant—the cassava—can cause poisoning. Can you give us more advice on this to avoid incident of poisoning?"

Jay Ram (Hawaii) said, "Interestingly, a wild variety of chaya (with stinging hairs and narrower leaves) was introduced to Hawaii some decades ago by the government as an alternative perennial vegetable. It never became popular (no doubt due to the stinging hairs), but can still be seen growing wild in the form of trees in some places.

"Some years ago, we introduced chaya to the Marshall Islands, Federated States of Micronesia, and Fiji, where it was well-received. Farmers in Fiji were so pleased with this vegetable that they somehow disseminated it on their own (probably through family) to areas of Vanuatu, where it is now established. I suppose that is the ultimate positive reinforcement for someone involved in development work who enjoys introducing new species into different regions."

James Golden, working in Belize, also wrote to us about chaya with stinging hairs. "For years, the only chaya trees here had stinging nettle on the bottom side of the leaves and on the tender shoots. When the stinging nettle came in contact with the skin, it really stung and itched. If you were to place one of the leaves on the tender part of your forearm, it would set you on fire for hours. [However,] even with the stinging nettle on the bottom of the leaves, poor people here grow it and eat it. They always handled the chaya by the stem that is between the leaf and the shoot. They were careful not to let the bottom side of the leaf come in contact with the skin. When it is boiled, it no longer stings like nettle."

[Charlie Forst at ECHO agrees. He says the stinging-haired chaya (often referred to as 'chaya brava') is as useful as the non-irritating chaya ('chaya mansa'). Use a glove or cover your hand with a thin plastic bag when picking chaya that has stinging hairs, or cut the leaf petioles with scissors and let the leaves fall into your basket. Cooking for 10 to 20 minutes eliminates irritant hairs.]

James Golden added that a new variety of chaya without the stinging hairs was introduced into the area of Belize where he lives and works. He demonstrated to many people in the area that this chaya didn't sting, by placing the bottom side of the chaya leaf on his arm and witnessing the amazed expression of his neighbors!

Tim Bootsma in Zambia wrote, "Chaya was cooked up and eaten by our volunteer agriculture promoters—13 people in all. They all liked it very much and want to grow it in their gardens this year.

"After the initial introduction, it looks like chaya could spread fast in this area. Farmers like the taste. It is quite a conversation piece. When farmers come, they often ask about what this plant is. It sparks a lot of curiosity. Until now, however, it has not been openly promoted. . . .Thanks for your help in sending us chaya. We hope and pray that chaya may soon be spread through Eastern Province!"

Grant Kaufmann in Bolivia wrote, "In neither location [Santa Rosa or the Chaco; see previous section] could we persuade people to eat the leaves, as "greens" are not a normal part of their diet. We "gringos" (foreigners) enjoy them, however—especially the women, who consider the local diet seriously short of green vegetables."

Jorge Lupitou R. wrote to us from Guatemala. "Here [chaya] also goes by the name "chatate," but unfortunately its consumption is not common. At home we add it constantly to our rice that they may cook together, and in tamales it is delicious. Too bad the cyanogenic glycosides won't permit the use of raw juice, for chaya juice could be the ideal supplier of chlorophyll, protein, etc."

John Freeman wrote that in Nicaragua, "About half the folks hate it, but others love it. I plan to work on drying chaya leaves to be added to soup, as (it) may taste different and be accepted by all. The traditional dish is a sort of rice and meat soup called "luk-luk" in the Miskito language. It could use some vegetables, so I hope to introduce chaya leaves as an addition."

John de Wolff in Tanzania said, "Because of my warning that unboiled leaves are poisonous, people did not take it…I am eating it but my family does not consider it as nice as the normal amaranth species here. Could you include cooking advice on this edible leaf?"

How is chaya usually prepared and served?

Indeed we can! Some of our readers wrote to let us know how they or people in their area typically prepare and serve chaya. Perhaps these ideas will inspire experimentation by others!

Nancy Harper in Belize said, "Central Americans usually fry the leaves with eggs and tomatoes. But I prefer to boil them first to be sure to remove HCN [Ed: the small amount of poison boils off as a gas]. The cooking water is a delicious tea, warm or cold, and is very good for high blood pressure. The boiled leaves can be drained (and squeezed if you want to remove all the water) and served like spinach, or fried with oil, salt, onions and garlic. Peanut meal or peanut butter is a very good addition, as are mustard, soy sauce or miso. The leaves are also good cooked in coconut milk with ground foods like potatoes and yams or breadfruit.

"Our favorite sandwich is to spread peanut butter on a warm cassava and flour tortilla, pile on the cooked chaya, and roll it up like a burrito. The cooked leaves can also be put in any kind of tortilla or bread dough. All children will eat bread or tortillas and can thus get their greens at the same time. Chaya can be used in any recipe that calls for cooked spinach, including lasagna and even pizza! The stem tips are very delicious, boiled and peeled. You can cut about 4 to 6 inches, depending on growing conditions. Remove the tough, longitudinal fibers after cooking.

"While moringa also produces all year round and is relatively care-free and resistant [to pests and diseases], it can't compare with chaya for ease of harvest and preparation. And we find moringa a little strong-tasting for everyday consumption."

Marsha Hanzi in Brazil said, "We eat it here as kale is eaten: cut into paper-fine strips, and stir-fried with garlic and ginger. [It needs to be cooked] longer than kale because it is more fibrous. I imagine that the very very fine cutting helps to dissipate the acid. It is delicious this way..." Sometimes chaya is blanched before it is stir-fried.

Some Other Uses for Chaya

Marsha Hanzi wrote, "It is…interesting to note that [chaya] is excellent chicken fodder, and can be used in permanent chicken forage systems, cutting whole branches for them to eat. We have observed that access to greens increases egg-production. [Ed: Access to greens also makes yolks a darker yellow]

"David Kennedy (Leaf for Life) also points out that it is excellent as a source of dried leaf meal [as a nutrional supplement]. It could be an excellent addition to animal feed in the dried form as well.

"It is also an excellent mulch material for vegetable gardens, when planted in hedges. The high mineral and nitrogen content really favors demanding vegetables."

Chaya cuttings will be available from ECHO in May, 2003. If you are working in development and would like to try chaya, send your name, organization's name and address, and we will put you on a temporary waitlist. Our current stock is low due to the discovery of a virus in our chaya plants; several months ago, we discovered that most of our chaya plants contain the common cassava mosaic virus (CCMV) (Note: this is NOT the same as the common cassava virus that can devastate cassava crops in Africa!). We know of no published studies indicating that CCMV can jump from chaya to other crops. A study we read indicated that around 70% of chaya trees sampled in the Yucatán (believed to be the center of origin of chaya) carried CCMV. Chaya (presumably with CCMV) has been grown on ECHO's farm for twenty years, but to our knowledge our cassava plants remain virus-free. Nevertheless, we would rather send out virus-free cuttings. We have virus-free plants, but they are still too small to provide cuttings. They will probably be ready by April or May). We are also working with a tissue culture scientist at College of the Ozarks to culture virus-free plants by meristem tissue culture.

# Is There a Market for Moringa Products for Small-Scale Farmers?

*By Martin Price, Ph.D.*

Lately we have received a number of letters wanting to know about marketing moringa products. In particular, several farmer groups in Uganda have written to say that they are growing a considerable number of moringa trees and now are asking us where to sell the products.

We are going to investigate this subject more thoroughly for a future article, exploring what might develop. If you have thoughts on this, or have had success marketing moringa products, we would like to hear from you.

ECHO heavily promotes the beneficial products of the moringa tree. But the reason we are so excited about moringa is that the poorest of the poor can plant a tree and eat the leaves and pods and use the powdered seeds to clarify dirty water. In some countries there are internal markets, for example for moringa pods in India.

You have read in *EDN* about how Church World Service and others in Senegal are using fresh leaves or dried moringa leaf powder to replace imported ingredients for treating malnourished infants or infants' mothers who can no longer produce milk. You have also read of how the leaves can be used as a major ingredient in feeding pigs. Production can increase quickly because the trees grow very readily from seed; a single moringa seed grows to a tree bearing hundreds of seed within one year.

But should a farmer's group plant moringa trees expecting that there is an international market for the seeds or leaves? In other words, they can sell coffee, sugar, cinnamon, vanilla and other products to a global market, so can they do that for moringa? With very few exceptions the answer is "no." The exception would be if there were a very innovative business already operating in your country that has somehow developed a market. A lot of businessmen are thinking about this and a few are working on it, but you should be very skeptical until

you see firm commitments from a company. Even if someone offers to buy some moringa product from you, it may be for experimental markets—which might either increase or disappear the next year.

We now have an idea as to why so many farmer groups in Uganda are writing to us and asking where the markets are. Baluku Yofesi wrote, "Here in Western Uganda there has arisen a certain group of people who claim that *Moringa oleifera* has a very high commercial value and they started selling seedlings at US$5 each but now they have come down to US$1 per seedling."

People can sell a product for whatever a customer will pay, but it is sad if the impression was given that there is an international market for the products. If the promoters know that there is such a market, that is terrific. Ask them where to find the businessmen who will buy your product, and then sell to them. We know of one business in Tanzania that might buy the seeds, but you would need to deliver them to Tanzania and I have no idea how much you would receive nor how much the trucking would cost. And there are farmers geographically close to that particular business who can and are growing moringa seeds.

There could well be in-country markets for moringa products, especially pods (if people like them) or leaf powder for the malnourished. Perhaps if there is a famine somewhere an NGO might want to buy a quantity of leaf powder one time to meet an emergency need.

In summary, the wonderful thing about moringa is that it grows quickly and easily and even the poorest of the poor can use it, either because they like to eat it or to overcome some causes of malnutrition. As for cash crops, a good rule for farmers is to never plant a seed until you know where you are going to sell the product, and for how much money.

# ECHOES FROM OUR NETWORK

## Green Leaf Extract

*By Denise van Wissen*
*Soynica—Soya Asociation of Nicaragua*

Denise van Wissen read what we wrote about drying and eating green leaves in EDN 73. She wrote to tell us about another product made with leaves, called green leaf extract (also written about in our book *Amaranth to Zai Holes*, pages 264 and 265, and found on our web site at http://www.echonet.org/tropicalag/knowledgebank/AZ_files/az_10_17.htm). Green leaf extract has an extremely high protein content and has an intense green color.

Denise wrote, "The Nicaraguan NGO, SOYNICA, was introduced to Green Leaf Extract ('extracto foliar' in Spanish) in 1987 by Engineer David Kennedy of Leaf for Life.

"We first used cowpea (*Vigna unguiculata*) leaves to make leaf extract, and now use a wide variety of edible leaves, ranging from squash, spinach and carrot leaves to fruit tree leaves such as lemon, jocote and guava, and bean leaves. Everyone has their own favorite!

"Leaf extract is very rich in vitamins and minerals, especially the two micro-nutrients most deficient in the Nicaraguan diet: vitamin A and iron. Leaf extract also provides high quality protein (essential amino acids), folic acid, vitamin E, and other minerals including calcium, zinc, magnesium, and copper.

"The technique David Kennedy taught us to extract this nutritious concentrate from leaves is simple, and can be done easily in the home. These are the steps:

1. Collect leaves, wash them, chop them up fine or grind them with a grinding stone (or blender).
2. Put the leaves with some water in cheesecloth (or similar fabric) and squeeze out the green liquid, leaving the leaf fiber in the cheesecloth.
3. Heat up this green 'juice' at high temperature, without letting it boil. Remove from heat when a greenish-yellow foamy substance rises to the top--this is the leaf extract!
4. Skim off the extract with a spoon and pour it through a clean piece of cheesecloth. Squeeze until it's dry.

"Children love this fresh extract mixed with honey (sugar water). It is good to add leaf extract to lemonade or other citrus juices, because the vitamin C aids the body's absorption of the iron in the extract. In dried form, women incorporate the leaf extract into their family's daily meals by adding it to the masa (dough) for tortillas, to beans, or even to the rice.

"<u>Note</u>: *Use the leaf fibre from step 2 for animal food and the remaining liquid from step 3 as plant fertilizer--nothing is wasted in this process!*

"Fresh leaf extract is very tasty and is highly accepted in our area, especially by the children, as mentioned above. We show mostly rural and semi-rural women how to make it, since urban families don't have access to fresh green leaves (they can purchase a dry form). We produced leaf extract in two women's cooperatives from 1995-1999. Since Hurricane Mitch, we've received donations of dried leaf extract from overseas, and distributed 16,500 kg last year (2001) directly to the families, barrios and communities we work with, and through other NGO's, preschools, and government programs.

"We estimate that approximately 30,000 Nicaraguans consume leaf extract with some degree of regularity (this includes 20,000 children who consume it in snacks provided in the state preschools). Families of higher incomes in Managua purchase leaf extract in the form of drink mixes (pinol from ground corn and oat drink) in supermarkets, or [it] may even be prescribed by homeopathic doctors.

"The Nicaraguan people have almost lost the healthy habit of incorporating greens into their daily meals, and this fact has made the promotion of green leaf extract a difficult task! Here in northern Nicaragua (departments of Nueva Segovia and Madriz) SOYNICA has been teaching the women how to make leaf extract since 1997. We have found that it is difficult at first for them to acquire the habit of making it, because of their own poor health and lack of energy and because we do provide it ready-made at a highly subsidized price. However, once these women begin to consume leaf extract, they feel more energetic (due to their increased iron levels), and are more likely to try preparing it themselves for their families.

"We've always insisted that leaf extract is a *food supplement*, but most people think of it as a medicine because of its curative effects. Dozens of women say that leaf extract has cured their children's asthma, for example."

Denise gave a talk about making green leaf extract at our Ninth annual Agricultural Missions Conference in November.

## Feedback about EDN 77

**The Green Famine Continues**. Tony Rinaudo, the author of the "Green Famine" article in the last issue of *EDN*, forwarded a very recent example of the point of that article (that famines are sometimes caused not so much by drought itself as by farmers growing crops poorly suited to the area.) It is excerpted from the United Nation's IRIN (Integrated Regional Information Network) Africa English reports, 12/10/2002.

"LUSAKA, 10 December (IRIN) - Civil society groups in Zambia are trying to raise almost US $60 million to buy the surplus of a bumper cassava crop in the northern region to distribute in areas experiencing critical food shortages... According to the latest World Food Programme (WFP) emergency report, Zambia needs 224,000 mt of grain until March next year..."

The fundraising coordinator said to IRIN, " 'Look at us now, we are panicking because we do not have maize, but our traditional foods are millet, cassava and sorghum. Let us not only return to our traditional staple foods, but farm the cereals best suited to our soil."

Zahrah Nasir in Pakistan also wrote to us about the Green Famine article. He said, "First of all please let me congratulate you on your Development Notes, October '02, Issue 77. As far as I'm concerned, it was the most informative to date and I read it, from cover to cover, immediately [after] it arrived. I…was given pause for thought, particularly on 'The Green Famine'. This made me realize that, even here, there are areas of the country which 'claim' to suffer famine from crop failure when perhaps they are growing the wrong crops; plus, as I have found time and time again, they do not know the important varieties of edible 'weeds'."

**Cultural Concepts of Weeds**. In response to several of the articles in EDN 77, Dr. Roger Sharland sent some reflections about the concept of weeds, taken from his PhD thesis. He wrote, "While doing fieldwork with the Moru of southern Sudan I found their concept of the weed an important step to understanding their agricultural perspective and problems….The European concept of weeds closely relates to the way field crops are grown, namely in pure stands of a single crop in a field. Mixed cropping is relatively unusual in European agriculture, so a weed is normally considered to be anything but the single stand crop in a field. Volunteers are thus weeds even if potentially useful. Mixed cropping is however the norm in Moru field types, and it is rare to have a pure stand of a crop. This links with the strategy of minimizing risk and ensures best use of special ecological conditions for different crops."

Sharland explained that the closest Moru word to our English word "weed" is "kangwa." But the word kangwa is broader in meaning than the word weed, and refers to garbage or to anything without use. He concluded, "Whether a plant is considered a weed (kangwa) or not thus depends primarily on its usefulness and therefore whether or not it will be weeded out of a particular field at a particular time."

# BOOKS, WEB SITES & OTHER RESOURCES

## ECHO's Bookstore

*By Gayle Bosscher*
*Bookstore Manager*

Just as there are underutilized and difficult-to-find seeds in the ECHO seedbank, so there are many difficult-to-find and specialty titles in the ECHO bookstore. ECHO is a unique ministry, and our bookstore attempts to support and undergird that ministry with a one-of-a-kind collection of books.

Several criteria are used when selecting books. First, we want books that reflect ECHO's vision of bringing glory to God by being well written and appropriate for the intended audience. Second, the books should reflect ECHO's efforts to find ways to help poorer peoples of the world find the plants and technologies to help them feed themselves. Third, it is understood that most of the people whom ECHO serves have a limited income; so paperback books are selected when available and are offered at a fair price. ECHO does not give away books for free, but neither do we try to make exorbitant profits.

A fourth criteria for selecting titles for the bookstore is wanting to preserve the current literature that missionaries and development workers find most helpful in their work. Unfortunately some very helpful books have gone out of print. Technology now exists that allows ECHO to "reprint" some of these treasures by placing them on CD-ROMs. This is a lengthy process and involves dealing with authors, computer technology and lots of visual proof reading; but it ensures that valuable books on tropical agriculture and related

topics will continue to be available to those who need them. A big advantage is that the cost of the CD-ROM is lower than that of the book would have been and the shipping is much less.

In addition to being on sale at ECHO itself, many of the books in our store are now available at ECHO's website (http://www.echonet.org/shopsite_sc/store/html/index.html) and can be purchased online. For me, the most gratifying sales take place during the three days of the annual Agricultural Missions Conference in November. It is rewarding to see smiles on the faces of our overseas delegates when they find books that contain the information and ideas that they are seeking. At times like that we know that the store exemplifies another phrase in our vision statement, that is, being "a blessing to mankind."

Books can be purchased by phone, fax, email, postal mail and online. For those who cannot visit the store, you can browse our listing on ECHO's web page. By clicking on the picture of a book, you can read the table of contents (and often the introduction or comparable material) about the book. Other than a visit, ECHO's website is the best place to see what is available. Alternatively, a hard copy list containing some of the basic technical books is available upon request. Credit card, check and money order payments (in US funds) are accepted in advance of shipping book orders.

# FROM ECHO'S SEEDBANK

## Bush Velvet Bean

*By Grace Ju, Ph.D.*
*Seedbank Manager*

For many years, ECHO's seedbank has distributed varieties of velvet bean (*Mucuna pruriens*), all of which are climbing vines. In 1997 Milton Flores with CIDICCO in Honduras provided our seedbank with seed for a bush velvet bean that is being grown widely in Brazil. We have grown and distributed this bush velvet bean on a limited scale since that time, and now are offering it to our network.

As the name implies, bush velvet bean is a dwarf or bushy type that does not climb. Because it will not climb on the stalks of corn, sorghum or cane, it can be intercropped with annuals without the extra work of controlling the vines. It is a short-lived annual that flowers in 80 to 90 days, unlike most velvet beans that flower only during short days. (Note that ECHO also has vining "90-day" velvet bean that flower regardless of day length.) Its short life and ability to set seed regardless of day length offer advantages in some crop rotations. Most vining types will not die until they have matured seeds, which could be a year or more from planting. Because of its determinate growth, it has a shorter life span and does not produce as much dry matter as the indeterminate velvet bean.

Bush velvet bean is used as a ground cover, green manure and forage, and in some regions the seeds are eaten. (We do not recommend that, because almost certainly they contain substantial amounts of L-dopa, the drug used to treat Parkinson's disease. See pages 289 to 293 in our book *Amaranth to Zai Holes*, as well as *EDN* 56). Bush velvet bean is often grown in orchards in preference to the climbing velvet bean varieties because the latter would frequently need to be cut from the trees.

Other than bushiness, shorter life span and lower production of dry matter, much that can be said of climbing velvet beans can also be said of bush velvet bean. It can fix as much as 200 kg/ha of nitrogen and produce about 4 tons/ha of dry matter in soils of medium to high fertility. It also promotes nematode control in soils. Bush velvet bean can grow at elevations as high as 2000 m. It grows best in temperatures of 20-30°C and is sensitive to frost. It is drought resistant and very insect resistant.

Animals can be sent into areas to graze the bush velvet bean leaves, pods and beans. The seeds can be ground into flour and used as feed; chickens can tolerate up to 15% Mucuna in their feed. Read our articles on uses and cautions of velvet bean as animal feeds in EDN 56 and 57.

The scientific name that came with the seeds sent to us, and the name used in literature from Brazil, is *Mucuna enana*. Nomenclature for velvet beans is incredibly complex and constantly changing. We try our best to keep up with the changes. A report written about use of velvet beans in the United States about 70 years ago mentions that a single bushy plant was selected from a farmer's field of vining velvet beans, implying that bushiness may have been a result of mutation. So are we dealing with two species of bush velvet bean or are they the same? We do not know. The bush velvet bean that was selected in the USA became widely grown until mechanization and use of fertilizers displaced velvet bean-based cropping systems in the USA. (Velvet beans originally came from SE Asia.)

Regardless of what its scientific name should be, if you are working not-for-profit in a developing country, you may select one sample packet of bush velvet bean free of charge. All others may purchase seed for $4.00/packet (includes shipping).