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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.

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ECHO
17391 Durrance Rd
North Ft. Myers, FL 33917
USA
Phone: (239) 543-3246
Fax: (239) 543-5317
echo@echonet.org
<http://www.echonet.org>
<http://www.echotech.org>

Soybeans in the Tropics

By Dawn Berkelaar

In *EDN* Issue 80 (July 2003), we asked for feedback from our network about raising soybeans in the tropics. Specifically, we asked, "Do soybeans grow in your area, or have they been grown? If so, what varieties have done well? Are they used for human food or animal feed? What problems do farmers face? If people eat soybeans in your area, do they like them? How do they eat them (i.e. as tofu, tempeh, soy milk, etc.)? How are they processed?" We heard back from several people and would like to share their responses.

Are or have soybeans been grown in your area? What varieties have done well?

Andreas Jenny wrote to us from Katmandu, **Nepal**. "Soybeans are a popular [companion] crop with paddy in the mountainous areas (500-1500 m altitude) of Nepal. During the monsoon (June to September), rice paddy is grown in basins irrigated by water from streams and under rainfed conditions. On the field [bunds] farmers grow local varieties of soybeans during the same time, however the harvest of soybeans is later than that of rice, I think about December or January."

Becky Eisses wrote to us from **Thailand**. She said, "I work in Chiang Mai province, Northern Thailand, as a CUSO Cooperant partnered with the Institute for a Sustainable Agriculture Community. Chiang Mai City is approximately 300 m above sea level and is at 18 degrees north. I can tell you far more than you want to know about growing soybeans in Thailand and, in fact, am the country's leading expert on organic soybean research. (I'm not being boastful; as far as I know, I'm the only one doing it.)"

"Yes, soybeans are grown. They can be grown all over Thailand but are mainly grown in the Northern Region. They can be grown in the dry season (Dec/Jan-April), late rainy season (Aug-Nov), or early rainy season (May/June-Sept) in some parts of the country. The main planting in the Upper North is the dry season, where soybeans are planted in paddy fields following the rice harvest. The same farmers often plant them in upland fields during the late rainy season as well, mainly in order to multiply seed since soybean seed quality deteriorates fairly quickly. Rainy season yields are generally lower than dry season yields.

"[As far as what varieties have done well,] my view is a little bit prejudiced because I used to work for the Chiang Mai Field Crops Research Center (CMFCRC), which has the national mandate for soybean research in Thailand. So I mainly know about their varieties. The most popular varieties in the Upper North are Chiang Mai 60, SJ 5, and SJ 4. There's a rogue variety quite popular in the Upper North that researchers rejected and didn't release but that farmers stole off the station. The farmers call it Chiang Mai 90 or SJ 9; the researchers call it Tawee 9. In the Lower North, Sukothai 2 is gaining popularity and in the drier Northeast, Chiang Mai 2, a short season variety, has apparently done well. There are also some varieties developed by universities. I don't believe there are any industry-developed varieties that are used to any extent except for vegetable soybeans (edamame). I think that the government gets a lot of its breeding stock from the Asian Vegetable Research and Development Center (AVRDC)."

Grant Kaufmann wrote to us from **Bolivia**. "Soy is grown as a commercial crop here in Bolivia (as well as in Brazil, Argentina and various other

South American countries). There are many good seed varieties available including both public and private varieties.

“Here in Bolivia soy is mostly grown below 1000 m elevation and as a rainy-season crop in rainfall zones of 650-1500 mm. It is also grown as a dry-season (winter) crop in the higher rainfall zones.”

Mr. Thompson Yin from the Upper East Region of **Ghana** wrote that soybeans are grown in his area (latitude 10°, altitude 0°). Varieties that have done well include “Sallimtuya 1x2.”

Pastor Samson Nyendwa is from a farming area in Fringilla, **Zambia** (latitude 15°, altitude 1500 meters). He wrote, “Here at Chisamba Ranch, the soils are a sandy clay and the demonstration plot where I planted the seeds you sent me is a clay soil. We received a mean annual rainfall last season of 910 mm.

“We have a very comfortable climate with excellent temperatures. In our area we are growing soybeans very much. I am mainly working with rural peasant farmers and we are giving them steps to take in order to improve their positions, say from a near subsistence cultivator barely growing enough maize for their families, to a hybrid maize grower with a high cash income.

“My main job and the basis for teaching the rural peasant farmers is the fact that certain crops such as soybean, velvet beans and sunflower could be integrated as cash crops into the farming system of the smallholder subsistence grower. These crops have the advantage of growing late in the season when the farmer should have done most of the major operations in local maize and groundnuts.

Samson commented that four main soybean varieties are grown in his area, including Kaleya and Magoye.

In an article in *Agricultural Systems* (1994; 46: 369-384), Dennis Shannon and Mwamba Kalala shared results of a survey of soybean production and use in Gandajika, **Zaire**. All 115 farmers that were surveyed (from nine villages) grew soybean. Soybean was second among grain legumes in terms of area cultivated, and fourth in terms of total sales. In Nigeria, 96% of surveyed Tiv villages grew soybean.

Are soybeans used for human food or animal feed?

Becky Eisses from Thailand said, “Both. I don't know in what proportion, but I do know that Thailand imports about 2/3 of the soybeans it consumes domestically as either food or feed. There is an import quota system that protects the domestic price, higher than the world price, which is due to be phased out under the Agreement on Agriculture (if the AoA ever gets back on its feet).

Grant Kaufmann commented that in Bolivia, “Nearly all of the crop is exported or processed internationally for its oil. Byproducts—soybean meal and “cascarilla” (hulls)—are used in dairy rations.

“Among the Mennonites (who are among the country's largest soy producers) the off-color and split beans are often toasted on the farm in homemade roasters for use in animal feed.”

According to Shannon and Kalala, most of the soybean harvest at the time of their survey in Zaire was eaten for human food, as flour mixed with maize and sometimes cassava, or as roasted grain.

Samson Nyendwa in Zambia said, “Soybean is used for human food as well as for animal feed. It has so many uses both to the people and our livestock.”

What problems do farmers face?

Becky Eisses (Thailand) commented, “If you ask them, they'll tell you a low selling price. (If they lose the import quotas, they'll be even worse off.) Farmers grow soybeans, even though they make very little profit on them, because the plants use less water than other dry season crops, are relatively easy to grow, and have a more stable price than other potential cash crops. In terms of pests, weeds are always a problem. They can be controlled with herbicides. In Northern Thailand, soybeans are mainly planted after rice in the dry season and a good alternative to herbicides is mulching with rice straw. This conserves soil moisture as well. The traditional use for rice straw is to burn it. [The burnt straw] gives a quick nutrient burst and the soybeans are tall and green early in the season, but by mid-season, the mulched beans look better. There are also problems with damping off, Phytophthora root rot, purple seed and rust for diseases, and bean fly, leaf rollers, pod borers, aphids, white flies and Spodoptora worms for insects. The government insists that fungicides and insecticides are necessary for high yields and that it's impossible to grow organic soybeans, but the group of farmers I worked with proved them wrong and didn't suffer serious yield loss because of pests. Farmers tend to plant with a higher seeding rate than the government recommends, maybe to make up for seedling problems like damping off and root rot.”

Shannon and Kalala stated that in Zaire, “...most farmers considered marketing the principal constraint to increased production.”

Thompson Yin in Ghana said, “The problems farmers are facing are rodents and grasshoppers [that] feed on the plant at their early stages. [The pods shatter] if not harvested early after maturity.”

Samson Nyendwa in Zambia shared, “The problem which farmers face in my area is the late delivery of farm inputs which sometimes come in the middle of the rainy season and sometimes a month or two before the off set of the rains [before the rains stop]. These inputs could include the seeds, fertilizers etc.

“The other problems come after harvesting, and these are related to poor marketing due to the economic situation we are currently facing. Also El Niño can threaten us. The previous season progressed almost as predicted with above average rainfall in the Chisamba area.

“Finally on problems, you can find that some farmers are very sick with HIV/AIDS during the planting season and some fail to grow and plant the soybeans and some do plant but fail to weed and some may fail to harvest and the soybean can go to waste in the field.”

Do the people like soybeans? How do they process and eat them?

Andreas Jenny said that in Nepal, “Soybeans are mainly consumed together with maize, which is made into popcorn. Soybean does not pop, but it becomes tastier and more nutritious when dry fried. The amount of maize/soybean used is about equal. It tastes very nice for a snack, but beware of cracking your teeth, as the beans are quite hard!

“Apart from that, I have not seen soybean used much in food. But some people might use the green pods, and also the beans as Dahl (pulse sauce/bean curry used in South Asia with every rice meal). There is also some use for it in ‘power flour’ mix which is used to feed weaned babies (like porridge).”

Becky Eisses shared that in Thailand, “Soybean products are processed into a number of common foods that are very popularly eaten. The main form in which it's consumed is soybean oil. Soy sauce and soybean paste (tao jiow) are ubiquitous. Urban dwellers are more likely to eat soymilk and tofu than villagers, and villagers don't make it themselves. One thing that villagers do make themselves is fermented soy discs (tua nao khaep). [When asked for more details, Becky said, “(To make them,) soybeans are boiled until soft. They are then wrapped in banana leaves and left to ferment for 2-3 days. When they have a nice, fermented smell, they are pounded into a paste in a mortar and pestle and shaped into discs about 4-5" in diameter, then dried in the sun. They can be kept for as long as a year.] Before eating, the discs are heated over a flame and then crumbled into curries. I think only people in the Upper North eat these. Organic soybean growers in Chiang Mai province presently are making and selling soy sauce, soybean paste and fermented soybean discs. They sell their soybeans to other people to make soymilk and occasionally make it themselves. They are presently conducting a feasibility study on organic soybean oil.”

Grant Kaufmann wrote, “There is very little direct human consumption of soy in Bolivia. In recent years a finely powdered toasted soy product, intended to be mixed with water or milk and consumed as a beverage (‘chicha’), has become available in the markets. We have promoted this as an inexpensive protein supplement for children and it has been well received as it has a pleasant ‘nutty’ flavor.

“Small amounts of soy are also used in processed ‘health food’ products and breakfast cereals aimed at the urban supermarket class. The Japanese around Santa Cruz use soy in traditional oriental foods such as ‘tofu.’ Because of cost and aesthetic considerations, neither of these uses is likely to have much impact on the diets of poor households.”

In their article, Shannon and Kalala stated that in Zaire, the most acceptable soybean foods were made with toasted full-fat

soy flour. People enjoyed eating roasted soybeans, porridge and nshima. Less popular foods were cooked beans (which take too long to prepare, requiring too much fuel) and soy milk (which is made using unfamiliar methods and spoils quickly). In Nigeria, soybeans were made into daddawa, a fermented condiment that is usually made from locust bean. Soybeans were also sometimes used with cowpea to make akara (fried cowpea paste) and moin moin (steamed cowpea paste). In another location, soybeans were used instead of egusi seeds in sauces. They were cheaper and easier to prepare than locust beans or egusi.

An article in *International Agricultural Development* (Volume 19, Number 1) described soybean use in Nigeria. The Soybean Utilization Unit from IITA, working with Nigerian research and extension organizations, worked hard to popularize soybean products. As a result, soybeans were included in several traditional foods. For example, soybeans were added to gari (one part soybeans to three parts cassava). Similar to Shannon and Kahala's findings, the article's authors reported that soybeans were substituted for locust bean (in preparing daddawa) and melon seeds (in preparing vegetable soup).

According to the above article, a process for making tofu (a curd made by coagulating soymilk) was also developed. Instead of traditional Asian coagulants (calcium sulfate or magnesium chloride), Nigerian tofu is made with lime or lemon juice, or with tamarind. The market for tofu has increased. Often it is made by housewives, then fried and eaten as a snack. Tofu is cheaper than wara (a soft white cheese from cow's milk).

Thompson Yin in Ghana wrote, “Soybeans can be used to prepare many types of dishes—e.g. milk, T.Z., Jallof, and a blend. It can also be used to prepare different types of Ghanaian soups and stews—like okro soup, allefu soup and bira soup.

“Milk is prepared by first soaking the soy for 4 to 5 hours. Then remove the shell, wash it clean and grind it into flour. The flour is then put in water until the whole flour dissolves—you then sieve and boil the water for 30-40 minutes. While on the fire, you will see some oil coming on top. Keep on removing the oil that will be seen on top of the boiling water until no more oil [appears]. You then remove the pot from the fire and your milk is ready for use. Milk can be drunk fresh or used in tea.

“Soy T.Z. is prepared with soy flour alone or mixed with maize or millet flour. Bring water to a boil, then add the soy flour and allow it to boil. Millet or maize flour is then added while stirring, until it is well mixed as T.Z. Your T.Z. is ready for use. It can be eaten with any soup you like.

“To make Soy Jallof, soy flour is used to prepare stew with other ingredients with oil and water while boiling; rice is then washed and added to boil.

“To make Soy Blend, measure one quantity of soy, two quantities of maize, and some quantity of groundnuts if you

wish. Toast soy and remove [shells]—toast maize separately then mix and grind into flour and your blend is ready for you.”

Samson Nyendwa in Zambia wrote, “Soybeans are very much liked by the Chisamba people. We roast the beans a bit and grind them into powder then we make either porridge or we bake some [scones] which taste very nice. We sometimes roast the beans and eat them straight away and this is what we call “Chiwaya.” We roast soybeans for a long time until they turn brown or black, then pound the beans. These are used as a substitute for coffee. The flavor is wonderful.

“We sometimes eat soybeans as a relish when it is fresh [green?]. Cook it and add some spices and eat it together with ‘nshima’ as a relish.

“We extract oil from soybeans. We use a machine called ‘Yenga Press.’ This machine presses the beans and oil is extracted from the beans and we use this oil for cooking as well as lubricating our machinery, also as a body lotion, that is after boiling it for too long.”

Mr. Nyendwa also commented that milk and soy cake are made from soybeans.

Soy Promotion by Plenty International

*By Charles Haren
Member, Plenty International*

Plenty International is a not-for-profit development organization dedicated to supporting efforts of economically disenfranchised families and communities to provide for their own basic needs, promote local culture and protect their natural resources. Plenty representatives work with women's organizations, farmers groups, cooperatives, indigenous communities, local non-profit organizations, government health and agriculture representatives, and small business owners who are seeking assistance to initiate or expand soybean production, processing, marketing and/or nutrition education programs.

Soybean Agriculture

Helping interested families and communities learn new agriculture practices and adapt the growing of new crops requires consistent delivery of quality **technical support**, combined with timely provision of **appropriate material** and **equipment inputs** over several years. We have found that if any of these three major components (technical service, materials and equipment) are missing or delayed, intended outcomes most likely will not be achieved. We have witnessed this happen several times while attempting to help farming families in the Caribbean, Central America, Asia's subcontinent, and Africa include production of soybeans within their cultural practices. We have also seen many families and communities succeed in adapting production of soybeans in rotation with rice, corn, root and/or vegetable crops, when required inputs were provided in a timely manner over a 5 to 10 year period.

Several technical considerations must be taken into account when attempting to help economically disenfranchised families and communities initiate and sustain production of soybeans or any new crop. Technical assistance cannot be done in isolation; one must provide more than just information about how soybeans are grown. Families need to know how to include soybeans within an overall agriculture improvement plan. The bottom line is that people you are working with will need to see, over an extended period of time, how including the growing of soybeans with other crops can help them: a) increase family income; b) improve food security; c) lessen pest and disease problems and dependency on chemical fertilizers; and d) improve financial returns for labor invested.

While implementing soy use programs, Plenty representatives have found the following agriculture tools can be maintained locally and, when used effectively, help farming families achieve increased financial return for their labor. Appropriate sized roto-tillers or small tractors can help prepare land. Push-along wheel seeders and cultivators are needed to lessen time required for planting and field maintenance. And, depending on the local economy, appropriate sized gas-powered cutter-harvesters and/or plot threshers may be needed to achieve desired financial return for labor and to encourage continuing involvement of youth in agriculture activities.

In Dominica and St. Vincent in the Caribbean, where Plenty was not able to provide all the required equipment needed to make soybean seed production cost effective, farming families did not continue to grow the soybeans. But in St. Lucia, the Roots Farm Cooperative, having gained access to a thresher and large roto-tiller, continues to grow soybeans. In Belize, Plenty worked with grass roots organizations and government representatives to increase awareness of the benefits of growing and using soybeans for food. The result was expanded production of soybeans, replacing some of the soybean imports. Soybean production has now become a priority pursued by the Ministry of Agriculture. In Nicaragua and Sri Lanka, Plenty worked with NGOs that were already promoting increased use of soy foods. Supporting these NGOs in their efforts to establish soy food processing and marketing small businesses has resulted in more farmers in these countries growing soybeans to meet increasing local demands.

Soy Food Processing, Marketing and Nutrition Awareness

Plenty's efforts to adapt soy foods to local cultures are directed toward members of women-led organizations, farming families and/or indigenous communities. Typically the desire is to establish small food processing and marketing businesses; sometimes to support community clinics, nutrition supplementation programs, or other important social services.

One of the most important characteristics of primary soy foods (milk, flour, tofu/cheese) is their ability to easily absorb flavors. These primary foods, for the most part, have a neutral taste, making them easier to season or flavor and to be included in traditional meals or recipes. In all of the countries in which we have worked, 90% or more of the people who

Plenty has seen the greatest success when working with grass roots organizations to develop and sustain soy food processing and distribution services for micro-enterprises. We make every effort possible to use locally available equipment and tools, even to the point of having semi-manual, stainless steel milk presses and tofu/cheese boxes fabricated in the host country. We have found that helping grass roots organizations to establish small to medium scale soy processing businesses is a very effective way to support community efforts to improve access to high nutrient, low cost foods. At the same time, this approach addresses education and economic development needs of disenfranchised populations. In each of the countries where we have worked with local organizations to initiate soy food processing, marketing and nutrition education activities, the number of people including soy foods within family diets, and the number of people making and selling fresh soy foods is increasing at a significant rate.

If you would like to investigate the potential of soy foods for your area, Plenty technicians are available to come and give advice. According to Peter Schweitzer, executive director of Plenty International, “Unless we have a grant to cover our costs, we do ask for expenses and, in some cases, a small stipend if we send a technician to a site. People can write us at Plenty International, PO Box 394, Summertown, TN 38483, or call 931-964-4323 or email to plenty@plenty.org.” Plenty’s website is www.plenty.org.

Larry Yarger, ECHO Staff

chemical dewormer, they discovered that the Gawali people, a local caste specializing in buffalo husbandry, used the hair-like *trichomes* from the seedpods of a wild type velvetbean as a dewormer in buffalo (*Bubalus bubalis*). From this information they translated the technology and applied it successfully to goats (*Capra* spp.).

Trichomes

On certain *Mucuna* plants, each 10 to 13 cm (4-5 in) seedpod bears approximately 5,000 barbed, easily detachable trichomes measuring 2 mm by 20 microns. Upon contacting an individual's skin, these trichomes cause an inflammation thought to be a reaction to toxins that include *mucunain* (a naturally-occurring nematocide and highly-irritating enzyme that digests proteins) and *serotonin* (a hormone and important neurotransmitter that has numerous benefits for the body but that also irritates the skin). Even hairs from dried *Mucuna* pods contain these chemicals.

He wrote: “Stinging hairs on the pods are scraped off with a knife, mixed in solidified sugar cane juice and made into pills to kill stomach worms in babies and calves. The worms die and are expelled.” No details as to dosage were given in the article. Other sources have reported mixing honey or syrup with the trichomes, although Conroy, *et al* seems to be the first to document dosages for deworming animals (*Livestock Research for Rural Development*, 14(3) 2002).

The following recipe is the formulation Conroy used for the trichome dewormer:

20 mg of trichomes per kg of body weight of animal (one seedpod contains about 100 mg of trichomes).
20 grams sugar

Dissolve 10 g sugar in warm water, and using a bottle (Fanta, Coke or beer) or large dose syringe, drench the goat with this mixture. Drenching is the method of administering liquids to an animal by pouring it directly down its throat. When drenching a goat, keep the animal's head in the normal position. Place the end of the dose syringe or bottle in the left side of the goat's mouth on the back of the tongue. Slowly pour the drench into the esophagus. This position is important so the goat doesn't aspirate or inhale the drench.

Dissolve the remaining 10 g sugar in warm water with the required amount of trichomes, and drench once again.

In the study, pregnant does were treated 15 to 30 days prior to kidding and re-treated the day of kidding.

This deworming plan was implemented for purposes of the experimental trial, and for pregnant does. If you choose to use *Mucuna* trichomes for deworming your goats, we recommend applying it to your regular worming schedule.

In the experimental trial, deworming the does significantly decreased the parasitic worm population. There was no significant difference in the average birth weight of kids born to treated and untreated does. There was no significant difference in kid mortality in the first month after birth, but at four months, mortality was significantly higher in kids born to untreated does. The average weight gain in kids born to treated does was significantly higher than that of kids of untreated does.

Both treatments of fenbendazole and *Mucuna* significantly improved the productivity of the goats. The major difference for the farmer was the cost.

Safety Precautions

When working with *Mucuna* trichomes, safety cannot be stressed enough. These trichomes are dangerous, can easily enter the skin, mouth, nose and eyes, and should be treated as a chemical pesticide. When handling the trichomes or when

near them in the field, proper protective clothing should be worn, particularly gloves, goggles, facemask, long sleeves and long trousers. Clothing should be well laundered after working with or near the trichomes.

The trichomes are scraped or "shaved" off the pod with a knife, scraping from the top down so as not to cause the hairs to "fly". Do this in an area out of the wind. Trichomes may be stored in plastic bags with zippered closures and will maintain their chemical potency even after they have dried out.

Should any trichomes come in contact with your body, within approximately 30 seconds after contact you will probably experience an itching and sometimes burning sensation that can last up to about two hours. This may be accompanied by swelling, redness and/or small blisters. The best first aid is to get out of clothes that may have the trichomes and wash the affected area with soap and water. This will remove the trichomes and dilute the irritant chemicals. Adhesive tape will also remove trichomes. Since the irritation is not histamine induced, there is some question whether medication such as benadryl® (diphenhydramine) would be effective in reducing the itch, but some literature recommends it.

Availability

The farmers with whom Conroy, *et al* worked were pleased with the outcome of the deworming research, and they were especially pleased that they could use an effective dewormer at minimal cost. Since *Mucuna* trichomes are an available resource in Africa, Asia, the Americas and tropical islands, this could prove to be a very appropriate technology for small farmers!

This is one seed variety, however, that we do not carry in the ECHO Seed Bank. Should you wish to utilize this deworming technique, we recommend that you only try it if hairy mucuna is already growing and you can harvest it in the wild.

ECHOES FROM OUR NETWORK

More about Grain Amaranth

Correction: Page one of the article on amaranth in issue 91 of *EDN* (column 2, second full paragraph) includes a statement about the "Incas in Mexico." That should read, "Aztecs in Mexico."

Jacob Alemu sent a few comments and corrections regarding the amaranth article in *EDN* 91. Unfortunately, the comments were received after that issue went to print. Please note the following:

* The correct word for "Weed" in Kikuyu is "Riya" not "terere", as it is indicated in the article. Terere is a typical name for a traditional vegetable,

which in our case is vegetable amaranth. In Kiswahili, weed is "Kwekwe."

* From my two years' experience, I see amaranth as a [relatively] high feeder, in terms of rain/water and manure. I have a problem when we say amaranth is an *extremely* drought tolerant crop.

* What do you mean by mixing amaranth seed with "ground corn" during planting? Here in Kenya, we mix the seeds for planting either with soil or sand or well composted manure. [Ed: Using corn that has been ground into meal would be similar to using these substances.]

* Two Kenyan farmers (about 200 km apart) began feeding their dairy cows and chickens amaranth stalks and cooked amaranth grains. The cows' milk production went up, and the chickens started laying more eggs with strong shells and very yellow yolks.

* Dr. Tagwira, of African University in Zimbabwe, says that after he began feeding amaranth stalks to his female goats they started giving birth to twins and triplets. Before he had one and now he has 50 of them.

* Some of the people who use amaranth in their diet claim to have added weight. This is not fun for some of

them, because they don't want to add weight. [Dick Dugger also shared that when he asked a group about any negatives they might have to discuss regarding amaranth, "One lady said she had a friend who loved amaranth and she ate too much of it. She said the friend gained much weight with her overeating." Dick added, "I don't really see this as a negative but just an

example of the nutritional value coming out of malnutrition."]

* Some of the amaranth users who are diabetic and suffer from ulcer problems say they feel much better whenever they take amaranth in porridge form.

Jacob concluded, "This is some of the feedback I get from the people with whom I interact as I promote amaranth among the Kenyan society. Everyday, I

hear and learn new things from the people."

Larry Yarger (ECHO staff member) shared that Johnny's Selected Seeds and Seeds of Change sell amaranth seed. Johnny's Selected Seeds sells *Amaranthus caudatus* and *A. tricolor*. Seeds of Change also sells those two, plus *A. cruentus* and *A. hypochondriacus*.

FROM ECHO'S SEEDBANK

Jackfruit (*Artocarpus heterophyllus*) "The World's Largest Fruit"

By Grace C. Ju, PhD
Director of the ECHO Seed Bank

If I told you there was a fruit tree that produces 1000 pounds of fruit a year, would you believe me? What if I told you each fruit has 100 to 200 nutritious and tasty seeds? This tree starts to bear fruit 3 to 4 years after planting and will grow to be 50 to 80 feet tall. The young leaves are edible, the young fruits can be cooked as a vegetable and the ripened fruit provides a sweet, aromatic fresh fruit (Figure 1). If I added that the tree grows straight and tall and also provides termite resistant timber, would you believe me? All this is true of the incredible jackfruit.



Figure 1: Opened jackfruit showing flesh and seeds. Photo by Danny Blank.

Jackfruit has long been valued and cultivated in tropical Asia. Thought to originate in the rainforests of India, jackfruit has remained relatively unknown throughout the rest of the tropics. Although distributed throughout the New World and the African continent, it has remained obscure because of poor selections characterized by their strong aroma,

sticky latex and overall poor eating quality. However, with the introduction of superior varieties from Asia and Australia, the attributes of jackfruit are finally being recognized (Richard Campbell, Fairchild Tropical Gardens).

ECHO asked Angela Boss, formerly ECHO's nursery manager and now working in Central African Republic, to interview Roy Danforth (one of the earliest members of ECHO's network) about his experience with jackfruit. Her report follows:

"Roy started doing agricultural work in the Congo in 1981. It wasn't until he first tasted jackfruit that he actually started to even think about doing anything with trees. The jackfruit changed the way he did agriculture. In his words, 'Jackfruit is the most complete fruit, nutritionally speaking [it is especially high in potassium and vitamin A and B] and in terms of pounds of fruit per tree, that I have worked with in my 28 years in Africa. It is accepted the fastest and is the most popular.' In his entire experience of planting jackfruit trees, and we are talking [about] thousands of trees, he has only seen two trees that have had any kind of disease or insect problem. He says, 'the miracle of the jackfruit is how quickly it fruits—two years from seed in our tropical region.' The jackfruit helped transform the way people thought about tree planting in the Congo. When Roy first tried to get people to plant trees, a taboo existed against planting trees. The common thinking was, 'Why plant trees if we are going to die before we ever get to eat any of the fruit?' Jackfruit, which fruits

in two years, changed the way people saw tree planting and was the catalyst for Roy Danforth and Paul Noren's agriculture program. Jackfruits are remarkably adaptable, virtually disease- and pest-free, and very versatile in the ways they can be prepared.

"In terms of the fruit's marketability, while in the Congo, Roy saw fruits for sale along the road (from trees he spread around) being sold and bought for three times the daily wage at the time. We are seeing the same trend in our area in CAR. One fruit can sell for nearly the daily wage here. We are also hearing of people experimenting with preparing the fruit in different ways including cakes and drinks.

"Before the war in Congo you might only find one tree planted at each person's house. However, postwar, you would find upwards of 10 trees around a single house. During the war, animals and gardens were destroyed and people found sustenance in the jackfruit fruits, including the seeds. Here in the CAR, we are finding that the jackfruit is among the top three trees requested at village seminars [other very popular fruit trees are inga and canistel]. It is compact enough that it is popular both around people's houses and in their gardens. Even the lowest quality jackfruits are favored. Among the Aka pygmies, jackfruits are a big success. You can find little nurseries of jackfruit seedlings around Aka huts throughout Southern CAR where we have introduced the tree." [End of Angela's comments.]

Jackfruit thrives in hot and humid areas with average monthly temperatures of

25 to 30°C (77° to 86°F). It does not tolerate temperatures below freezing. The ideal climate has a well-distributed rainy season (as in northwestern Congo). However, jackfruit trees have been observed doing well in an area with a 5-month dry season and 50 inches (125 cm) of rainfall (personal communication, Paul Noren, CAR). Provided with irrigation, the jackfruit's range may be extended to areas that receive even less rainfall. Jackfruit's optimal growing range extends from sea level to 2,200 ft (670 meters) (Richard Campbell). However, its upward range is limited to 4,000 to 5,000 feet (1524 meters), where quality and production may be compromised (Julia Morton).

Propagation of jackfruit is usually by seed. The seeds do not remain viable for long and need to be planted within a month. Soaking the seeds for 24 hours enhances germination. Seedlings started in pots should be carefully transplanted before getting pot-bound, as young jackfruit seedlings have fragile root systems. As with most trees, watering for the first year is critical for establishment. Jackfruit trees generally grow fast and tall, and in an optimal site can grow to 50 to 80 feet. However,

trees can be kept at 10 to 20 feet with pruning for ease of picking fruits.

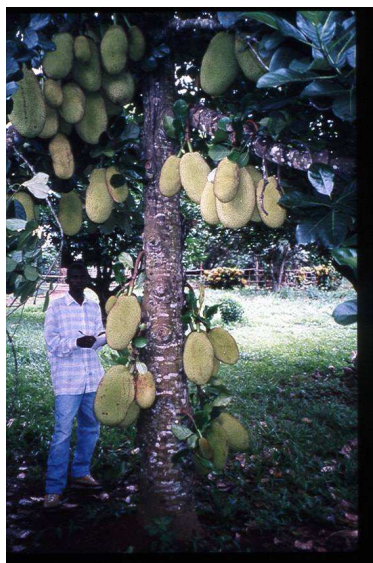


Figure 2: Jackfruit tree in Central African Republic. Fruits grow from the trunk and branches. Photo by Danny Blank.

Few trees can rival the remarkable production of a mature jackfruit tree. Trees can produce up to 1000 lbs of fruit per year. Equally impressive is the size of the individual fruits, which in some varieties exceeds 80 lbs (Figure 2). Jackfruit is a very versatile fruit crop. Young fruits are cooked as a vegetable and the ripened fruit provides

a sweet, aromatic fresh fruit. Jackfruit was one of my favorite fruits to eat when I was growing up in the Philippines!

This impressive, high-yielding tree with nutritious seeds and fruit, early-bearing habit, and wide adaptability is an excellent addition to home gardens and small farms throughout the tropics. With improved varieties now available outside of Asia, jackfruit has a promising future elsewhere in the tropics. Roy Danforth's success with jackfruit in central Africa is a testament to the impact this impressive fruit is having in the lives of many people.

Jackfruit seeds from ECHO are available seasonally from August to October. When requesting seeds, be prepared to plant as soon as you receive them, since the seeds only have a one-month period of viability. We will send the seeds to you in damp sawdust as soon as we harvest them. They may be sprouting by the time the seeds arrive. Those working in agricultural development in developing countries may request one free sample packet (8 to 10 seeds). All others may purchase the seeds from ECHO for \$5.00/packet.

UPCOMING EVENTS

Christian Community Development Conference

Mosbach, Germany (near Frankfurt)
September 22 to 26, 2006

The main themes of this conference will be: 1) the Role of Christians in Community Development (focus on HIV-AIDS and Reconciliation) and 2) Linking Relief and Development. In addition to the keynote addresses, four tracks of practical workshops will be offered: Basics in Christian Community Development; HIV/AIDS and the Response of Local Christians; The Role of Reconciliation as Development

Practice; and Linking Relief and Development.

For more information about this conference, please contact the organizers directly at mboeddinghaus@awm-korntal.de (general info and logistics) or karimsahyoun@yahoo.com (program structure-speakers and topics). You can also access the website for more information at <http://www.ccd-network.net/>. [Ed (MLP): This annual conference grew out of the efforts of German delegates to ECHO's annual conference in Florida and has many similarities. I attended a couple years

ago and greatly enjoyed it. All or most of the talks were in English.”]

Thirteenth Annual ECHO Agricultural Conference

ECHO, Fort Myers, FL, USA
November 7 to 9, 2006

Plans are well underway for this year's ECHO Conference! Speakers and their topics will be listed on our website as they register for the conference and as their proposed talks or workshops are accepted.

THIS ISSUE is copyrighted 2006. Subscriptions are \$10 per year (\$5 for students). Persons working with small-scale farmers or urban gardeners in the third world should request an application for a free subscription. Issues #1-51 (revised) are available in book form as *Amaranth to Zai Holes: Ideas for Growing Food under Difficult Conditions*. Cost is US\$29.95 plus postage in North America. There is a discount for missionaries and development workers in developing countries (in North America, US\$25 includes airmail; elsewhere \$25 includes surface mail and \$35 includes air mail). The book and all subsequent issues are available on CD-ROM for \$19.95 (includes airmail postage). Issues 52-92 can be purchased for US\$12, plus \$3 for postage in the USA and Canada, or \$10 for airmail postage overseas. ECHO is a non-profit, Christian organization that helps you help the poor in the third world to grow food.