
Soybeans in the Tropics

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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 Spodoptera 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 jio) 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.

Cite as:

Berkelaar, D. 2006. Soybeans in the Tropics. *ECHO Development Notes* no. 92

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