

EDN ISSUE 25. MARCH 1989

25-1 GIZA SORGHUM FOR FOOD AND FUEL. In the very first issue of EDN we mentioned this special Egyptian grain sorghum. Dr. Axtell at Purdue University had given us a packet of seed and explained that in Egypt the stalks sometimes sold for more than the grain because of its superior burning characteristics. The grain is of good quality, though it can be damaged by rains near harvest. (As we have threshed it by hand, it seems that it is hard to remove all the "glumes" from the grain too). Though we sent out several packets of seed in subsequent years, it was not until last spring that anyone in our network reported any excitement over it. Paul Butz's report from Peru is both encouraging and humorous.

ECHO was only able to send a small packet. Paul wrote that only 6 of 16 seeds germinated. Then two of these died of some disease. Later goats got in and ate half of the remaining four. The two that were left produced seed heads -- then birds ate most of the seeds. By covering the heads with plastic bags he managed to get 200 seeds. Unlike in temperate climates where sorghum is an annual, a stalk that is cut back in the tropics may tiller (send up new stalks). Each of the two plants sent up 3-5 new stalks which in turn produced seed.

The immediate purpose of Paul's work is to "produce fuel for firing bricks in this area" as well as for cooking. When we last heard they were expecting to plant a hectare which they calculated would produce enough fuel for the brick operation, giving at least three cuttings a year.

Our giza sorghum is about ready for harvest, so let us know if you would like to give it a try. Seed is free to organizations working with small farmers and \$1.50 for others. Our experience is that it loses its viability more quickly than most seeds.

25-1 BUFFALO GOURD IS ANOTHER CANDIDATE FOR FOOD AND FUEL. ECHO has grown buffalo gourds in our "semi-arid" greenhouse for several years now. Until recently I was not overly enthused about it, even though it is one of the National Academy of Sciences "underexploited" plants. It has some impressive traits, but I did not imagine that many in our network would really use it. My enthusiasm took a quantum leap when Dave Unander told me about the work of Drs. Wayne Bragg and Eugene Schultz and Debra Duke on its use as a cooking fuel.

The buffalo gourd, Cucurbita foetidissima, is a potential source of oil for animals and humans. On barren, arid land it may match the performance of traditional protein and oil sources such as peanuts and sunflower, both of which require more water. It is a vigorous perennial that grows wild on wastelands in Mexico and the southwestern United States. The fruits, 8 cm in diameter, are allowed to dry out and then can be "threshed." One hectare can produce 2.5 tons of seeds, which contain 30-35% protein and 34% oil. The crushed seeds yield a polyunsaturated oil (that is the "good" kind as far as cholesterol is concerned) and the pulp is fed to cattle. North American Indians used the seed for food and soapy extracts of the fruit pulp and vine for washing clothes and cleaning hides. (This was surely not for a fresh scented soap though. As the species name implies, the vine has a foul smell!)

Wayne says that within a few years the plant can develop a "colony" that covers an area 35 feet across and roots of the original plant can be nearly as large as a person. By then the roots are too difficult to dig and the "mother plant" soaks up all available water. Consequently he harvests most roots about 3 months after planting, at which time they may be the size of a large carrot. He leaves a few plants because wherever a bit of soil and water is placed over the sprawling vine, roots will develop. In this way a continuing colony is sustained, which can be selectively harvested as needed. He would not let any plant get over three years old or it will absorb too much of the available water.

Wayne and colleagues found that they can harvest more biomass from the roots (11 metric tons per hectare in 3 months) than from limbs of the common dryland firewood tree crop, mesquite (6 metric tons per hectare in 12 months). Roots are cut into thin segments, with some thin slivers, and sun dried. Roots are slower to ignite than wood, which is where the slivers help. Frequent feeding with small charges of roots is desirable. Size of the grate openings may need to be increased, as the root fuel requires more draft than wood. With enough air they produce no more smoke than wood, but do produce more ash.

Like wood, roots burn with flames until about 80% consumed, then coals burn at a lower rate. Flames are about half as high as wood (charcoal has no flames). Roots burn a third as fast as wood but 3.7 times as fast as charcoal. Because of lower heating value than charcoal they only release heat 1.6 times as fast as charcoal, but water can be heated about twice as fast as on a charcoal fire. The authors attribute this to efficiency of capture of heat from a root fire being about 1.25 times greater than from charcoal.

Cooking tests with women in Mexico, Niger and Senegal have been positive and some communities are now using rootfuel in Mexico. They say the smoke is not irritating.

You can request a free seed packet if you work with an organization that assists small farmers; others send \$1.50. If you have a long humid season with plenty of water do not request the seed. Other crops are much better. We have never been able to keep a plant alive at ECHO through the summer, even in our greenhouse.

25-2 NEW NAME AND ADDRESS FOR TROPICAL DEVELOPMENT AND RESEARCH INSTITUTE. In EDN 14-5 we reviewed the excellent reference book, Food Legumes, published by TDRI. If you are a new reader and intend to order the book, note that they have now merged with another organization. The new name and address is the Overseas Development Natural Resources Institute. The last address I have is 127 Clerkenwell Road, London EC1R 5DB, England. They publish many technical booklets on processing, storing and marketing tropical products (e. g. "An industrial profile of coconut fibre extraction & processing," "Packaging fruit & vegetables: a study of models for the manufacture of corrugated fibreboard in developing countries," "Dying of leaves and straw: a handbook for crafts instructors." They also offer short courses on post-harvest fruit, vegetable and root crop technology. The books are usually free to schools and PVO's, but the courses are not cheap! The 13-week course in 1988 cost 5,750 pounds.

25-2 ARE JACK BEANS SAFE TO EAT? I have become uneasy recently. I can tell by letters that some of you are excited at the human food potential of the large seeds from the high-yielding jack beans (Canavalia ensiformis) that we sent. They are edible, but read the following cautions carefully. (You may react like one reader who was frustrated at my discussion in the last issue of whether velvet beans are safe to eat. He wanted to know either "yes" or "no." Unfortunately the real world is often ambiguous. The only ones who can make definitive statements on ambiguous issues seem to be politicians. Your comments on history and methods of use of jack beans for human food in your area will help us clarify the question.)

The book Food Legumes says, "The mature dry seeds can be used as food, but are not popular because of their unattractive flavor and texture, and the fact that they require soaking and boiling in salt water for several hours to remove the toxic constituents and to soften them. [Ed: Flavor and texture might be less of a problem if beans were just one ingredient in a recipe.] In Indonesia they are often boiled twice, left in running water for 2 days after the removal of the seed-coat, then fermented 3-4 days and finally cooked once more." "Dried seeds can be used in livestock feed, but are not very palatable and can cause outbreaks of poisoning unless cooked or limited to less than 30% of the total feed."

Legumes in Human Nutrition says "the flowers, leaves and immature pods and seeds are used as vegetables." The Handbook of Tropical Food Crops says, "Foliage and seeds often contain poisonous substances and these have been implicated in occasional fatal poisonings. ...Apparently the amounts of poisonous substances vary with age of plant, maturity of seed, and possibly with environmental factors. Some varieties contain such small quantities of poisonous substances that they are commonly eaten and are considered harmless. There is no easy way to distinguish poisonous from nonpoisonous varieties. The commonly used varieties are not dangerously poisonous, judging from their popular usage."

Roland Bunch in Honduras says to "make sure people boil the bean and change the water twice. This means there will be an extra expense in firewood, but it is necessary to prevent ... problems." Tom Post in Belize says people there cut the immature pods into pieces and serve them in soups.

25-2 WHY ARE MY WASHINGTON (NAVAL) ORANGES DROPPING? Jiwan Dewan in Nepal wrote that half of the fruit was dropping and was filled with maggots. I called Dr. Campbell for help.

Carl said this is a tough one to figure out, but here are some thoughts. The first step is to determine if the insects are causing the drop or if they are a secondary cause, entering after some other problem. The letter did not say at what stage they dropped, whether as very young fruit or more mature fruit. If it is the mature fruit that is dropping, then it is perhaps more likely that the problem is directly caused by eggs laid in the fruit.

Fruit is dropping very badly this year in a couple Florida counties. It turns out to be due to the fungus anthracnose that is attacking the blossoms combined with both thrips and midges feeding on the ovaries of the flowers. A careful look at the blooms will show if there is either fungus or insect damage. It could be that a fungicide at bloom time would solve the problem.

Another common cause of fruit drop is dry weather. If it does not rain at least an inch a week one should irrigate (if that is a possibility). Citrus is very sensitive to lack of water.

It would help to know whether it is fly, beetle or lepidoptera larvae in the fruit. Here is a rough way to tell. Fly larvae have no legs, whereas both beetle and lepidoptera larvae do. Beetle larvae "look like grubs." Lepidoptera larvae tend to be longer and slimmer than beetle larvae and somewhat flattened.

If the fallen fruits are of a good size, see if there are any obvious puncture wounds. In the equatorial tropics an adult fruit-piercing moth causes a lot of problems in citrus. Usually no one even knows the moth is around. It pierces the fruit and sucks juice at night, then quickly leaves. What most people see is the fungal lesion that develops around the spot.

25-3 SWEET POTATO WEEVIL PROBLEMS. Matt Huber writes from Haiti, "An insect is severely damaging the roots of sweet potatoes. What can be done?" He sent us a jar containing several of the tiny worms (a few millimeters in length) in alcohol. Dr. Frank Martin identified them as sweet potato weevils. Here are his recommendations for their control.

It is very important to plant where sweet potatoes have not grown for about a year. It is also important to keep any wild relatives of the sweet potato from the field (e. g. morning glories). When cuttings are taken to start a new planting, soak them for up to 24 hours in a 1% solution of a systemic insecticide. One such insecticide is furadan. This will prevent introduction of the weevil into the new field.

He mentioned that the tubers are damaged extensively. Frank said that the observation that there is this much damage most likely means that farmers are using a long maturing variety [or are "storing" them in the field, harvesting as needed]. Sweet potatoes differ widely in time required for maturity. Matt needs to search for some short-maturing alternatives. In the meantime, harvest as early as possible.

25-3 ECHO BASIC DOCUMENT #2: SELECTING THE RIGHT CROP FOR YOUR LOCATION IN THE TROPICS OR IN THE SUBTROPICS. What question do we receive the most frequently from those of you in the "ECHO network?" Easily it is some variation of, "What crops can people consider for the region where I work?" This is usually followed by some description of climate, soils, etc. Often some especially difficult condition is outlined -- too much or too little rain, farms that are too small, steep, rocky, hot, infertile, swampy, or remote.

This is also one of the most frustrating questions to try to answer. We asked Dr. Frank Martin to put together something that would help you answer the question for yourself. He found it the most difficult assignment we have given him. "It should be possible to characterize soil and climate so that areas that are similar, even though widely scattered, could use the same technology. In practice this has proved very difficult." He knows of two large projects which tried to accomplish this, but neither turned up anything that appears to be useful. "The old fashioned technique of a variety trial is still the best method to determine the value of a particular crop for your region."

The more complex a system the more likely it is to be accurate but also the more frustrating to use. He chose three levels of complexity. In one table, the most complex, he pulls together 140 crops, including both annuals and perennials and vegetable, field and fruit crops. It will be useful as a rough screen to choose or eliminate crops you might consider. Other tables list several plants based only on rainfall amount and distribution and on temperature.

25-4 SUGGESTED CROPS FOR SPECIFIC CLIMATIC ZONES

TROPICAL MONSOON (STRONGLY ALTERNATING WET AND DRY SEASONS)

GRAINS	LEGUMES	VEGETABLES	FRUITS	OTHER
CORN	COWPEA	ARROWROOT	AVOCADO	CACAO
PADDY RICE	PEANUT	DASHEENS	BANANA & PLANTAIN	COCONUT
SORGHUM	PIGEON PEA	EGGPLANT	BREADFRUIT	COFFEE
UPLAND RICE	SOYBEAN	OKRA	CACAO	OIL PALM
	WINGED BEAN	PEPPER	CITRUS	SUGAR CANE
	YARDLONG BEAN	PUMPKIN	GUAVA	
		SWEET CORN	JACKFRUIT	
		SWEET POTATO	MACADAMIA NUT	
		TOMATO	MAMEY SAPOTE	
		YAMS	MANGO	
			MANGOSTEEN	
			PAPAYA	
			PASSION FRUIT	
			PINEAPPLE	
			SOURSOP	

HOT HUMID TROPICS (LONG RAINY SEASON, NO COOL WEATHER)

GRAINS	LEGUMES	VEGETABLES	FRUITS	OTHER
PADDY RICE	WINGED BEAN	ARROWROOT DASHEEN & TANNIER PUMPKIN SWEET POTATO TARO YAM (ASIAN)	BANANA & PLANTAIN BREADFRUIT JACKFRUIT PEACH PALM	BLACK PEPPER CACAO OIL PALM SUGAR CANE OTHER SPICES

DRY TROPICS (A LONG, HOT DRY SEASON WITH A SHORT OR IRREGULAR RAINY SEASON)

AMARANTH CORN MILLET SORGHUM UPLAND RICE	COW PEA LABLAB BEAN MUNG BEAN PEANUT PIGEON PEA SOYBEAN YARDLONG BEAN	CANTALOUPE CASSAVA CUCUMBER EGGPLANT OKRA ONION PEPPER PUMPKIN SWEET CORN SWEET POTATO TOMATO WATER MELON	AVOCADO BREADFRUIT CITRUS GUAVA MAMEY SAPOTE MANGO PAPAYA PASSION FRUIT SUGAR APPLE TAMARIND	SISAL COTTON
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BEACH CLIMATE (DRYISH, INTERMITTENT RAINS)

CORN SORGHUM	COWPEA LABLAB BEAN PEANUT PIGEON PEA SOYBEAN	CASSAVA EGGPLANT OKRA PEPPER PUMPKIN SWEET POTATO	AVOCADO CASHEW GUAVA MAMEY SAPOTE MANGO PAPAYA PASSION FRUIT	COCONUT OIL PALM
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25-5 HIGHLAND CLIMATE (WET AND COOL)

CORN	CHICK PEA SCARLET RUNNER BEAN	BEET CARROT CHAYOTE COOL SEASON VEG'S (ESP. CRUCIFERS) LEEKS LETTUCE ONIONS SWEET POTATO	AVOCADO PAPAYA PASSION FRUIT (PURPLE) PERSIMMON (JAPANESE)	COFFEE
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HIGHLAND CLIMATE (DRY AND COOL)

AMARANTH MILLET QUINOA SORGHUM	CHICK PEA COMMON BEAN	BEET CARROT COOL SEASON VEG'S (ESP. CRUCIFERS) LEEKS LETTUCE ONIONS POTATO TOMATO	AVOCADO FIG PAPAYA PERSIMMON (JAPANESE) WHITE SAPOTE	
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We have reprinted above the table that I think will be the most helpful to the majority of our network. We asked Dr. Martin to prepare a special list for six different climates based on the perspective of his own experience and judgement. No attempt was made to prepare an exhaustive list. For each of these climates, he has chosen several useful and probably familiar plants that would be well worth a try. Individuals working with organizations helping small Third World farmers can write us for a free copy of the entire 14 page document. Others please send \$2.00.

25-5 ECHO'S SEEDBANK HAS NEW FOIL-LINED SEED PACKAGES. The lengthy trip in the mail and, sometimes, time sitting on your shelf waiting for the rainy season, is hard on seeds. The two best ways to increase the life of seeds are to reduce temperature and moisture. The foil in our new seed packages forms a moisture barrier. Each seed lot is treated with insecticide and fungicide (to reduce risk of introducing a new pest), then dried. Seed packets are sealed with a quick brush with an ordinary iron (like you use to iron clothes). If you can put the sealed packets in a refrigerator you should have a much improved chance of good germination. You can reseal them with an iron if you wish.

25-5 SOYBEAN SEED. We have been able to obtain a modest amount of two soybean varieties, Davis (subtropical) and Duocrop (tropical), that were mentioned our Soybean Crop Production Bulletin. We also have two other subtropical/temperate varieties developed for the southeastern United States, Braxton and Wright. We can send only enough to see how a small row will perform. If you are at low to moderate latitudes in the tropics, request Duocrop; at high elevations or in the subtropics request the other three.

If soybeans have not been grown in an area before, it is more important than with some legumes that the seeds be inoculated with rhizobia. Without this they may be inefficient at fixing their own nitrogen. ECHO will inoculate the seeds we send before packaging. If you start growing soybeans, finding inoculant is going to be a big problem for many of you. The good news is that a little bit goes a long way (a small \$2 packet will treat 2 bushel of seed). If there is a local farm supply store, perhaps they can order inoculant. I will purchase a few packets to have on hand for those who cannot get it locally. Send \$4 to cover the inoculant and airmail postage (no exceptions on this).

25-5 TWO EARS OF CORN IS NOW IN SPANISH. We reviewed this outstanding book in issue #6-6 and I have personally recommended it to many visitors. Since then you have read items on green manures that the book's author, Roland Bunch, has shared with us. Rather than outlining any particular technology, the book talks about how to get started, choosing the technology to introduce, and thoughts on administration, expansion and consolidation of projects. I understand that it is now being used in college classrooms as well as by people who are actually doing development projects. You can order either the English or Spanish edition for \$7.95 plus postage (\$2 surface; \$3 airmail in the Americas; \$6 airmail elsewhere) from World Neighbors; Development Communications; 5116 N. Portland Ave.; Oklahoma City, OK 73112. By the way, World Neighbors has a wide range of visual aids and film strips that can be used in meetings with farmers and others. If you have need for this kind of material, by all means ask for their catalog.

25-6 GROWING VEGETABLES IN FIJI IS AGAIN AVAILABLE. ECHO receives letters every month from individuals who did not grow up in the tropics, but who now find themselves called upon to do vegetable gardening under tropical conditions. Some have not had previous gardening experience in any climate. Now they may even be expected to teach the subject.

I came across this formerly obscure book in the Peace Corps library in Washington. Kirk had written it while working as a Peace Corps director in Fiji. We have found it so helpful both in teaching basic gardening techniques and in bridging the gap between temperate experience and tropical realities that we asked its author, Kirk Dahlgren, for permission to reprint it. The shipment is expected in April.

I believe that many books could have been written with much fewer pages. One thing I appreciate about Kirk's approach is that he distills out the most important things you need to know, and says them in the least amount of space possible. Thus you will find this small book to be a great introduction to gardening in general as well as tropical gardening in particular. It is required reading for all ECHO interns.

He discusses vegetables with which people from temperate climates may not be familiar, but which are very well adapted to the tropics. But he also discusses techniques for growing temperate vegetables which may be difficult to grow in the tropics but for which there may be considerable demand (and potential profit). Though it may not be possible to grow a particular temperate vegetable in your location, Kirk's comments will help you give it the best chance of success.

We find that people moving to the tropics make two opposite mistakes. One is to assume that in the tropics they will easily be able to grow the kind of vegetables they knew from temperate climates. The other is to assume too quickly that it cannot be done. To be sure many temperate vegetables will not grow in most tropical locations. But every so often we find someone succeeding with a vegetable we might have urged them not even to try. Experiments in your garden will cost little!