

## EDN ISSUE 29. APRIL, 1990

**29-1 SOME THOUGHTS FROM THE EDITOR.** I am delaying the promised special issue on rooftop gardening until the next issue. Some recent experiments appear promising and I will want to include that data.

Now that the tropical fruits video series is about ready for duplication, we are learning how expensive it is to transfer video from the NTSC system used in the United States to the PAL and SECAM systems that many countries use. Apparently duplication is much less expensive if done in a country which uses that system. Any suggestions?

Dave Unander prepares an updated index after each new issue of EDN. Everyone who orders the complete set of back issues receives the latest index. But anytime you would like an updated index for issues since then, just drop us a line.

**29-1 LOST CROPS OF THE INCAS.** [Be sure to read the next several related notes also.] The National Research Council of the U. S. National Academy of Sciences has just produced the latest book, and one of their best, in the underexploited plants series. When I was doing postdoctoral research at Purdue University in the 1970's I was introduced to their first book, Underexploited Tropical Plants with Promising Economic Value (reviewed in EDN 2-1 and now out of print). This opened for me the world of plants that God has given to mankind that are still used in only a few countries and are little known elsewhere. It was that book which ultimately led ECHO to establish a working seedbank of underexploited plants.

This latest book, written under the leadership of Dr. Noel Vietmeyer and a panel of experts, takes a close look at the wealth of plants native to the Andes mountains of South America. The region that gave us the pepper and potato has a lot more yet to offer. All together, 31 little known fruits, nuts, grains, legumes, vegetables, and root crops are described in some detail. A chapter is devoted to each plant and includes a general introduction; prospects for the crop in the Andes, other developing countries, and industrialized regions; the plant's uses, nutrition, agronomy, harvesting, and limitations; and research needs. Chapters end with a two or three page synopsis useful for people interested in growing the plant. Each chapter is well illustrated with several photographs and drawings.

The book is written to provide an introduction to and stimulate interest in these crops, providing a valuable overview without going into too many details.

With the notable exceptions of the pepper and potato, Andean crops are seldom seen outside their native habitat. This is surprising in light of the wealth of crops that were developed over the centuries under the extremes of soil, rainfall, and temperatures of the Incas' vast empire. Many of the crops are quite nutritious and have only recently attracted the attention of researchers, but have the potential for worldwide usefulness.

Root crops include: achira (*Canna edulis*), containing a starch with unusually large grains; ahipa (*Pachyrhizus ahipa*), a legume whose sweet roots remain crunchy even after cooking; arracacha (*Arracacia xanthorrhiza*), carrot-like roots that can be boiled as a table vegetable; maca (*Lepidium meyenii*), a sweet, tangy delicacy in the highlands; mashua (*Tropaeolum tuberosum*), a staple that requires little labor; mauka (*Mirabilis expansa*), a "cassava of the highlands" that turns sweet after lying in the sun; oca (*Oxalis tuberosa*), a very hardy staple; little known potatoes (*Solanum sp.*) that

have potential as germplasm; ulluco (*Ullucus tuberosus*), a brightly colored source of carbohydrates; and yacon (*Polymnia sonchifolia*), a sweet, yet almost calorie free tuber.

Legumes detailed in the book include: basul (*Erythina edulus*), a tree with large edible seeds; nunas or popping beans (*Phaseolus vulgaris*), which are popped rather than boiled and make a tasty snack; and tarwi (*Lupinus mutabilis*), a lupine richer in protein than beans and peanuts with as much oil as soybeans.

Vegetables include lesser known peppers (*Capsicum sp.*) and squashes (*Cucurbita sp.*).

Several fruits have particular promise, especially in up-scale markets: unusual or large berries (*Vaccinium sp.*, *Myrtus sp.*, and *Rubus sp.*); capuli cherries (*Prunus capuli*), a popular city tree; cherimoya (*Annona cherimola*), a delicious fruit grown commercially in the Mediterranean; goldenberries (*Physalis peruviana*), an interesting jam berry; highland papayas (*Carica sp.*), which have potential as germplasm; lucuma (*Pouteria lucuma*), a staple fruit which bears year round; naranjilla (*Solanum quitoense*), a good fruit for juices; pacay (*Inga sp.*), a sweet-fleshed pod; passion fruit (*Passiflora sp.*) that are superior to most commonly known cultivars; pepino (*Solanum muricatum*), a prospect for premium fruit; and tamarillo (*Cyphomandra betacea*), a popular fruit eaten either raw or cooked.

Three grains were also researched: kaniwa (*Chenopodium pallidicaule*), a nutritious grain with 16-19% protein; kiwicha (*Amaranthus caudatus*), with good quality protein high in lysine; and quinoa (*Chenopodium quinoa*), a better-known protein source.

Two nuts are listed as well: Quito palm (*Parajubaea cocoides*), a high producer of tiny coconuts; and walnuts (*Juglans neotropica*), a fast growing tree with good quality nuts.

We do have a few of these plants in our seedbank at ECHO: *Annona cherimola* (cherimoya), *Canna edulis* (achira), *Chenopodium pallidicaule* (kaniwa), *Chenopodium quinoa* (quinoa), *Cyphomandra betacea* (tamarillo or tree tomato), *Lupinus mutabilis* (tarwi), *Passiflora ligularis*, (sweet grenadilla), *Passiflora edulis* (purple passion fruit), *Prunus capuli* (capuli cherry), and *Rubus glaucus* (Andean blackberry).

Copies of the book are free to developing countries, \$20 to others, from BOSTID Publications - HA 476, 2101 Constitution Avenue N. W., Washington, D. C. 20418, USA.

CAN YOU HELP US? We have kept in touch with Dr. Vietmeyer during the preparation of this book, hoping to have all of the plants available for our readers in other high altitude regions by the time the book was published. As you can see, our success was only partial. With some exceptions, high altitude crops are the most difficult in the world for us to propagate. Between Florida's normal seasons and our "semi-arid" and "rainforest" greenhouses, we can duplicate many climates. Duplicating a very long but cool growing season is our greatest challenge.

If you live in the Andes and can provide enough seed of any of the plants that we lack to make up 20-30 small packets for our seedbank, (or can send a few tubers if that is the way they are propagated) please let us know. ECHO can cover your expenses. Write in advance with details and so we can send you our seed import permit or advise you if someone else has already sent that item.

**29-2 THE ANDES BERRY (RUBUS GLAUCUS).** Thanks to Victor Wynne we now have fresh seed for four of the "Inca" crops. One of my fondest memories from visits to Victor Wynne's farm in Haiti (approx. 6,000 feet) is the juice made from the Andes berry (Rubus glaucus also called mora de castilla). The plant thrives on his farm, bearing over a very long season. Victor says that it bears most of the year, although berries do not command a high price.

According to the "Lost Crops" book, this blackberry is native from the southern highlands of Mexico to the northern Andes. It is widely cultivated in gardens in Ecuador and Colombia. "It is said to be superior in flavor and quality to most cultivated blackberries and raspberries. ...They are especially juicy and make excellent jam, which tastes like jam made from black raspberries."

The plants are normally propagated by tip layers or stem pieces because they yield sooner, but they can also be started from seed. They grow well on many kinds of soil. In well-tended plantings, annual yields are said to reach 20 tons per hectare. Victor says, "We kept our original seed continuously moist for at least two months before any seed germinated. Trays should be covered with some air-breathing transparent film to prevent drying out."

Those working with peasant farmers at higher altitudes in the tropics (and who have the patience to baby the seed until it germinates) can write us for a small packet of seed. Others send \$2.50. Be careful, for any "wild" berry can become a weed.

**29-3 PASSION FRUITS FOR HIGHER ALTITUDES.** Victor also sent seed for two of the passion fruits covered in the "Lost Crops" book: the sweet grenadilla, Passiflora ligularis, also called sweet passion fruit and the purple passion fruit, Passiflora edulus. Victor says, "I particularly recommend the sweet passion fruit to anyone with growing conditions approximating ours, perhaps over 5,000 feet, and a good depth of soil or subsoil to hold moisture during dry spells. The fruit never fails to sell locally to the supermarkets at a good price (\$2 per dozen). It takes about six months for the young vines to get established, and they should be protected from strong sun. We have strung a horizontal wire on 8 foot posts set 1 1/2 feet into the ground. The fruit is borne on side branches which reach almost to the ground." He would like to get away from posts and wire and is experimenting with trees. The vine "is in no way a killer of trees (i. e. it does not smother them as do some other passifloras). It is more moderate in its growth." Unlike the yellow passion fruit grown in the lowlands, this one "does not fall when ripe, so must be picked. Thus, a support tree should have a structure allowing one to climb up to reach the fruit."

According to the "Lost Crops," this fruit has been grown as low as 800 and as high as 3,000 meters in Bolivia and Colombia. Because of its strong rind, "it transports well without injury. Consequently Colombia is now exporting this fruit to Europe." It flourishes in Hawaii and is grown somewhat in New Zealand. "This plant sets fruit less abundantly than the common passion fruit, but can produce two crops a year. Because of its resistance to root and collar rot, it is a useful rootstock for other passion fruit species. ...Some people find [the taste] too sweet and flat, which is why lime juice is often added."

ECHO will send a small packet of seed for either of these two fruits (no charge to those working with peasant farmers at higher elevations, \$2.50 for others). If you are at lower elevations, however, we can send seed for the yellow passion fruit, Passiflora edulus. A couple years after I mentioned the yellow passion fruit project of George Gaskins in Puerto Rico (EDN 7-5), I came across the project in the Wall Street journal. Puerto Rico's passion fruit industry had grown to \$10 million! This fruit is grown in most tropical countries, so you may not need to write for seed.

**29-3 THE LOST CROPS OF AFRICA WILL BE THE NEXT IN THE "UNDEREXPLOITED PLANTS" SERIES.** Dr. Vietmeyer has asked for help from members of ECHO's network in Africa. Are you aware of plants that are important on a local basis but of which much of the world may be unaware or has ignored. He is not looking for wild weeds that might be edible but for plants that are already significant for at least one group of people.

Noel writes, "Although the greater part of African agriculture relies on introduced species, at least 2,000 indigenous food plants exist in [Africa]. Many have been used for thousands of years, but are now little appreciated. Some may have the promise to become major crops, but their modern potential is not being seriously assessed and they are receiving scant research, development or promotion." "Nearly 90% of Africa's major crops are foreign: maize, tomatoes, vanilla, and cacao from Mexico; groundnuts from Brazil; manioc, pineapple, cocoyams and sweet potatoes from the Caribbean; and potatoes and peppers from the Andes...common rice, bananas, plantains from Southeast Asia and wheat from the Middle East."

"Our aim is to catalyze actions that will vastly increase the use of the most promising of these traditional resources. Could you help us? ... We'd be most grateful for your views, as well as for information on particular species. Scribbled observations would be fine. We will integrate all the information into draft chapters for the book, and send them back for your review. ...When the project is completed, contributors will receive a copy of ... what we expect to be a large and influential book."

The list of plants nominated so far is too large to include in EDN, but we can send it to you. If you can help, it will enrich us all. Write to Noel with your nominations. Include comments about the plant and its use and why you think it should be tried elsewhere. His address is Dr. Noel Vietmeyer; "Lost Crops of Africa" Study; National Academy of Sciences; 2101 Constitution Avenue N. W., Washington, D. C. 20418, USA.

**29-3 ADDRESS FOR WHEATON'S CORRESPONDENCE COURSE.** In my review of this course in EDN 26-2, I forgot to include the address: Extension & Continuing Education, Wheaton College, Wheaton, IL 60187.

**29-4 ECHOS FROM OUR NETWORK.** Elmer Dick, Zaire "I have translated the information you sent on the moringa tree into the local language of Shiluba. People are showing a keen interest. Several have some trees started, so in a few months we should be able to give more of a progress report."

Ralph Kusserow in Tanzania. "After reading about the neem tree in EDN I really wanted to try it, but was afraid to order seed because it is viable for such a short time. Then I found that we have it here in Tanzania, though not in our area. In case you have anyone else in a Swahili-speaking area, it might help to know that it is called "mwarobaini" in Swahili. That means the "forty tree," so called because it supposedly makes medicines to treat 40 diseases. ...My main interest in neem is your report that the leaves can make a tea to deter termites. One of our friends has built a house every year for three years because of termite damage to the grass roofs. I am anxious to see if neem leaf juice might be used in this situation." So will the rest of the ECHO network, Ralph. Send an update.

Don Mansfield in Mali. "I planted jack beans (*Canavalia ensiformis*) in terrible soil (red clay with very little top soil). They were planted September 26 and are growing like mad. Yet we have had no rain since October 9. I planted them as a ground cover for land just cleared and a green manure. We have been staking the ox there. He eats the grass and does not touch the jack beans. I am really surprised and pleased at how well they are doing. I had the seed and figured I had nothing to lose by planting them."

Dr. Hal Reed, an entomologist at Oral Roberts University has a correction to the material contained in our review of the book on Africanized bees (EDN 28-7). "The review states that the Africanized bees readily interbreed with honey bees of European ancestry. This is not entirely correct. Recent evidence published in Nature and discussed at the recent National Entomology meeting indicate that very little interbreeding is taking place between the European and African strains. Indeed, researchers feel that the leading edge of the invasive population in Mexico is almost purely African, like the original bees introduced in Brazil. There is disagreement about the degree, if any, of interbreeding." ECHO can send a copy of the article if you have a special interest in the subject.

**29-4 WE HAVE SOME NEW PIGEONPEA VARIETIES FROM ICRISAT.** I often tell folks that ECHO specializes in growing food under difficult conditions. The pigeonpea, *Cajanus cajan*, is a prime example of a tough but nutritious plant for just such cases. This article is directed toward two audiences. For some of you, pigeonpea is already an important crop. You will mainly be interested in the information about and seeds for the vegetable pigeonpea varieties. For others who are not familiar with pigeonpea at all, the general discussion of pigeonpea is for you.

THE PIGEONPEA (The following information is gleaned from a very helpful book, Pigeonpeas: a Valuable Crop of the Tropics, by Julia Morton, Roger Smith, A. Lugo-Lopez and R. Abrams, available (at least it was 5 years ago) from the Dept. of Agronomy, Univ. of Puerto Rico, Mayaguez, PR, USA.) Why might you wish to grow pigeonpeas? I think of three principle reasons. (1) They grow under poor soil conditions. (2) They are tolerant of dry weather. (3) They are a nutritious, high-protein pulse crop. There are other reasons too. (4) Leaves can be used for animal feed. (5) The fast-growing plants make good shade for other crops, e. g. vegetables, herbs, vanilla. (6) Plants are perennial for up to 5 years. (7) Woody parts can be used for firewood. (8) Water and nutrients from deep in the soil can be caught by its deep taproot.

The pigeonpea is a shrub that grows from one to a few meters tall and perhaps a couple meters wide, unless special short-season varieties are chosen. Most types flower when the days are 11 to 11 1/2 hours long, but varieties responding to both shorter and longer day lengths are available, and some will flower at any time of the year. Usually flowering begins in 120-150 days and seed maturity in 250 days, but these figures can be as early as 60 and 100 days respectively.

It is often advisable on a small farm to have one area for higher value crops, where the soil has been improved by concentrating the limited amount of manure and mulch, and where perhaps even some irrigation is available. On the remaining, larger part of the farm, plants which yield in less fertile soil and require only normal rainfall are desired. Plants such as cassava, sweet potato and pigeonpeas fall into this later category.

A few pigeonpeas are also often grown near the house for ease of harvest. For household use "indeterminate" varieties are wanted because they will produce a few pods each day over a long season. I recall visiting a dry part of the Dominican Republic during the dry season. Very little was green in the gardens, but pigeonpeas were green and providing a small daily harvest. They do best where annual rainfall ranges from 500-1,500 mm (20-60 inches) a year.

The range of suitable elevations depends on latitude. In Venezuela they are grown up to 3,000 meters, in Jamaica up to 1,100 meters. In Hawaii they failed to set seed at 1,000 meters.

"When cultivated for the seeds, pigeonpeas are grown as an annual or biennial because the productivity declines after the first year and drops considerably after the third year. When grown for forage or green manure, it is usually maintained no more than five years. The plant will die in about 10-12 years."

"No regrowth occurs when plants are cut off at ground level, but regrowth is satisfactory with cutting heights ranging from 0.15 to 1.5 meters. Vigor declines and plant mortality increases somewhat after a first cutting and more markedly after a second cutting."

"The pigeonpea is noted for greater soil adaptability than other legumes [nitrogen fixing plants]. ... It performs well in a wide range of soil types. It can endure soil salinity of 0.0005 g NaCl/g. It seems well adapted to a soil pH as low as 5 and as high as 8." Plants also are rather resistant to nematodes.

**29-5 VEGETABLE PIGEONPEA** (The following is taken from a booklet by the same title by ICRISAT (International Crops Research Institute for the Semi-Arid Tropics, Patancheru, Andhra Pradesh 502 324, India).

Pigeonpeas are most commonly used as a pulse crop. (Pulses are leguminous crops, the dried seeds of which are used as human food.) When used as a "vegetable," the pea is picked when the seeds have reached physiological maturity, that is, when they are fully grown but just before they lose their green color. At this stage the green seed is more nutritious than the dry seed because it has more protein, sugar and fat." In addition, its protein is more digestible. "There are considerably lower quantities of the sugars that produce gas (flatulence) in the green seeds." The dried seeds contain somewhat more minerals. See Table I.

Table I. Comparison of some nutritional constituents of green and mature pigeonpeas on a dry-weight basis.

<u>Constituent</u>	<u>Green Seed</u>	<u>Mature Seed</u>
Protein (%)	21.0	18.8
Protein digestibility (%)	66.8	58.5
Trypsin inhibitor (units/mg)	2.8	9.9
Starch (%)	44.8	53.0
Starch digestibility	53.0	36.2
Amylase inhibitor (units/mg)	17.3	26.9
Soluble sugars	5.1	3.1
Flatulence factors (g/100g sol. sugar)	10.3	53.5
Crude fiber (%)	8.2	6.6
Fat (%)	2.3	1.9
Minerals and trace elements (mg/100g)		
Calcium	94.6	120.8
Magnesium	113.7	122.0
Copper	1.4	1.3
Iron	4.6	3.9
Zinc	2.5	2.3

In comparison with green peas, vegetable pigeon pea takes longer to cook and is not as sweet, but is much more nutritious. On a fresh weight basis, it has greater edible portion (72% vs 53%), more protein, carbohydrates, fiber and fat than green pea. It also has more minerals and much more of some vitamins (469 vs 83 vit A/100g; 0.3 vs 0.01 vit. B2; 25 vs 9 vit. C).

"The best vegetable pigeon pea cultivars have long pods, with as many as 9 large sweet seeds which are easily removed from the shell." Sweetness is also desirable. In contrast, what is usually sold in Indian markets for use as a vegetable are small pods with small seeds.

"Consumers prefer vegetable pigeon pea with green pods, ... but tests ... have shown that differences in pod color are not related to cooking time, taste or quality." However, cultivars grown from white seeds leave clear rather than colored cooking water.

The large pods are especially attractive to insects. Insect damage can also be greater in cultivars that have the pods clustered in bunches at the tops of the plants, but these varieties are also shorter and are easier to spray with insecticides and easier to harvest.

If the rainy season is long, or the field is irrigated, pods may be produced as long as the plant remains free of disease and the mean temperature remains about 15-30 degrees C. A yield of 11 t/ha of green pods in five pickings was obtained on one plot.

The pods should be harvested just before the seeds start to lose their bright green color. Because pod color at this stage will be different with different varieties, you will need to sample seeds to find when it is best to harvest. In the Caribbean harvesting has been mechanized by adapting green bean pickers.

The ICRISAT book has four interesting and complicated recipes, which, unfortunately, I cannot squeeze into this issue. You can write us for a copy. (They will, of course, be in the Indian tradition.)

If you would like to give vegetable pigeon pea a try, we will send you three small packets. Specify "vegetable" pigeon pea. (No charge if you are working with small farmers in the Third World; otherwise \$1.50 per packet to cover our costs and postage). If pigeon peas are not grown in your area and you would like to try the regular pulse-type, ask for a packet of regular pigeon pea. If you are already familiar with pigeon pea and wish to do a major trial, then write to ICRISAT; Patancheru, Andhra Pradesh 502 324, India and tell them details of the trial you intend to undertake.

**29-6 IMPORTANT NOTICE TO EDN READERS WHO ARE CITIZENS OF OTHER COUNTRIES.** ECHO's network is greatly enriched by a considerable number of "nationals" (people working in their own country) who work with peasant farmers or urban gardeners in their community and participate with us in the "echoing" of information and seeds back and forth across the globe. There seems to be a lot of mis-understanding, however, about what services ECHO provides, resulting in a lot of wasted time and money on correspondence. Effective immediately, ECHO will not reply to letters that fall into any of the following categories:



## 29-6 THINGS ECHO DOES NOT DO:

We do not offer money to carry out any project, no matter how worthy it may be, nor suggest contacts to help fund such projects.

We do not cover travel expenses to come to ECHO or to go anywhere else. We do not help people find sources for travel money.

We do not provide help in locating a place to study. Neither do we provide scholarships, or help in locating scholarships.

We do not arrange schedules, write supporting letters to an embassy, make contacts or help in any other way in conjunction with a visit to this country.

We give away nothing that has not been mentioned as free in ECHO DEVELOPMENT NOTES.

We do not provide seeds for farmers' gardens. What we do offer is a single packet of seed for a plant new to your area, not readily available through seed catalogs, that you want to try on an experimental basis. You can save your own seed after that, if the plant does well, and never be dependent on anyone for that seed again. (So, please do not write asking for a supply of common temperate vegetable seeds, e. g. carrots, radishes, green beans, corn, onions, lettuce. Occasionally we may buy a quantity of some especially disease resistant temperate vegetable to share with you, but this will be clearly offered in EDN.)

Because there are so many millions of farmers in the world, it is obvious that our small organization cannot help them all directly. We must channel our help through you, that is, people working with organizations that in turn are helping peasant farmers or urban gardeners. Please do not give our address to private farmers. If you need help in answering their questions, you should write us yourself.

**29-7 UPCOMING EVENTS.** If you are sponsoring an event that would have broad appeal to those in ECHO's network, send me details as quickly as you know them. (If we assume people need at least 3 months notice to plan their attendance, that EDN is published quarterly and mail takes a month, we should have 7 months advance notice AT A MINIMUM!). Many have expressed special appreciation for this service. It is a good way to get the word out to over 2200 people in 103 countries. We are interested in both regional and international events. (Though space will not permit me to mention everything that comes to us, I will try to work in those events which I believe will be of the greatest interest to our readers.)

First, ECHO's own "Unconference." A date (June 4) selected this summer so that people planning a visit have the opportunity to be here at the same time and learn from each other. Roy Danforth and Pete Ekstrand from Zaire and Dr. Frank Martin have indicated their intent to be here so far. No fee; we will try to arrange housing.

Servants in Faith and Technology (SIFAT). Phone 205/396-2017, address Rt 1, Box D-14; Lineville, AL 36266 USA. Each summer for the past several years SIFAT has offered a summer training program. I just received a letter from Christie Flanders with details for this summer. There will be three courses. Feeding the Body and Spirit is a four week course, May 21-June 8, designed for those exploring the possibility of service to poor communities. The cost, including room and board, is \$850. Technology and Human Need is an eight week course (\$2,100), June 18-August 10, designed for people already involved in service, but perhaps still needing to pick up basic technical skills, including working with tools. Practicum in Appropriate Technology and

Community Development (\$2,400) is an eight week course, September 4-October 26, offering a more in-depth, hands-on course for technically oriented people. The four components are water management, sustainable agriculture, alternate energy, health and sanitation. Special hands-on projects are arranged depending on the particular interests of the student.

Write Christie for a brochure. SIFAT will consider requests for financial aid to cover tuition and room and board while at SIFAT, though these arrangements must always be made well before you leave home. In no case will they cover travel expenses. The government will not grant education visas to attend SIFAT because they are not a degree granting institution, so citizens from other countries should apply for a tourist visa. They are located on a 180 acre farm approximately half way between Atlanta and Birmingham.

The 2nd Organic Agriculture Conference will be held in Adelaide, South Australia September 23-27, 1990. Write Elizabeth Eaton, P. O. Box 986, Norwood, SA 5067, AUSTRALIA.

Sustainable Development for the Third World is a course in using permaculture to extend traditional techniques. Course I is June 13-30 in Oregon and Course II [they call it a "linked" course] is July 13-30 in Mexico. The cost for each is \$700 (\$350 plus another \$350 to provide Third World scholarships). There is a 25 person limit on enrollment. They have held these for six years now, so even though this may be too late for you this year, you might get on their list and try for 1991. Write the Aprovecho Institute; 80574 Hazelton Rd; Cottage Grove, OR 97424, USA (phone 503/942-9434).

8th International Federation of Organic Agricultural Movements conference. "Socio-economics of organic agriculture August 26-30, 1990 in Budapest, Hungary. Cost is 180 CHF (however much that is!). Apply to Biokultura Association; Conference Secretariat; Arany Janos Utca 25; Budapest H-1051, Hungary, Europe.

Fourth National Amaranth Symposium, August 23-25, 1990 in Minneapolis, MN. The University of Minnesota is hosting this conference for growers, researchers, processors, extension agents, businesses etc. who are interested in this newly commercialized crop. The grain of this pigweed relative was once a mainstay of the Aztec empire (see EDN 3-1 and 4-1.) Topics to be discussed are production and biology of the amaranths, production and processing technology, marketing, and needs for research. Registration is \$175. Write to: Extension Special Programs, Minnesota Extension Service, Univ. of Minnesota, 405 Coffey Hall, 1420 Eckles Ave, St. Paul, MN 55108-1030, USA.

**29-8 Tillers International.** Phone 616/342-6040, address 1402 Hillcrest Avenue; Kalamazoo, MI 49008, USA. Richard Roosenberg, the director of Tillers International, asked that we alert our readers to the opportunity to train with them in animal power for the small farm and use of simple tools. He wrote, "The other day we had the pleasure of spending a day giving Warren Hessling an intensive introduction to animal-powered farming. He is on leave from Sierra Leone, and had heard of us through ECHO. We would be pleased to work with others who are as serious and apparently capable as Warren."

Sessions are selected to match the needs of each group from the following: ox driving, hitching, and training; yoke building; blacksmithing; wood working; tool making; selection & care of oxen; draft horse use; animal-powered field work; hay and ensilage; rice production; animal-driven gear powers & excavation, etc.

Fees range from \$85 for one day, \$500 for 10 days and 10% discount beyond that. When the cost has been a problem for an individual, they have sometimes been able to work out an arrangement where he works on the farm for hands-on experience and only pays for the more intensive training days that come up during his stay. Often living arrangements can be made with local farm families.

Training is normally scheduled between April 15 and October 15 each year. They also have a highly competitive internship program. For example, 20 former Peace Corps Volunteers applied for the 2-4 positions this year. Interns are paid \$125 a week.

Because the training is set up according to individual needs, and people with similar interests are preferably grouped together, it is well to begin correspondence with Dick several months in advance.