EDN

ECHO DEVELOPMENT NOTES

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IN MEMORIAM
SCOTT SHERMAN, AGE 36

ECHO and Scott's family were dealt a severe blow on January 10 when Scott, ECHO's Assistant Director, died unexpectedly after a brief illness. He is survived by his wife Kelly (formerly ECHO's Director of Public Relations), a two-year-old son Levi, a baby girl Hosanna Joy born in March, and his parents and sister.

Many in our network either knew Scott or corresponded with him. For the last eight years he spent over half of his work time answering the technical questions that arrive daily. He was unique in being able to spend hours at the computer writing careful replies to inquiries, or in the library or on the phone researching answers to difficult questions.

How will his death affect ECHO's ministry? He was exceptional at organizing information. A common phrase around ECHO was "Ask Scott." He would either know the answer or have it for us in a few minutes from his incredible computer databases. This trait has made the transition much easier than might be expected as we learn how to locate and use all the things he had on computer.

ECHO's 1995 Five Year Plan emphasized cross-training so that there would be no essential function at ECHO that only one person knew how to do. This has served us well in the face of this tragedy--and will be emphasized even more in the future. ECHO's technical writer, Laura Meitzner; nursery manager, Peggy Kemna; and Scott's assistant, Dan Sonke, have ably taken up the assignment of answering your inquiries. So keep them coming.

We know from Jesus' words in the Bible (John 5:24) "Most assuredly I say to you, whoever hears my word and believes in Him who sent me has everlasting life. He shall not come into judgment but has passed from death into life." Scott heard, believed, and worked harder than most of us to make his life like that of Christ. So our grief is moderated by the knowledge that he is now with the Lord.

TROPICAL HIGH-ALTITUDE GROWING CONDITIONS seem quite similar to the temperate-zone summer growing season. North American workers in the lowland tropics expect to "relearn" agriculture in their new settings, since the climates and crops of the lowland tropics are so different from temperate regions. But at higher elevations in the tropics, where cooler temperatures favor *Brassica*s, apples, and other familiar "temperate" plants over "tropical" crops, they feel right at home--but should they? We asked our network to identify unique factors in growing food at high altitudes in the tropics.

Latitude (distance from the equator) is very important when discussing altitude (height above sea level). While "high elevation" crops may be found at 1500 m in Central America at 15°N, the same plants may start growing at a much higher altitude in Ecuador at 0° latitude. You must adjust for your latitude when reading "altitude limitations" given for plants, such as tree species recommended for reforestation in a certain area.

Microclimates and climatic instability are very important aspects of growing food in the highlands. The complex ecological mosaic of mountain ranges and valleys determines wind and rain patterns, leads to marked temperature differences within a small area, and creates many microclimates which farmers can identify and use in their planning. The topography also produces wide variation in soil type and fertility and phenomena such as localized frost pockets. Paul Bueker in Ecuador writes that "microclimates are somewhat unstable over time. Rainy and dry seasons, hail, frost, and pest cycles are harder to predict than in temperate climates. There is an extra degree of randomness in the growing conditions and therefore less certainty for agricultural investment. The variations are not extreme, but they are sufficient to cause real problems in agriculture." Farmers in the Andean highlands cope with this variability and uncertainty by staggering plantings through time, planting in several plots at different altitudes, and maintaining a diversity of crops.

Alfredo Petrov works with gardening and reforestation in Bolivia between 2700 m and 4100 m (at about 18°S). "At high altitudes, our sunlight is extremely intense: the atmosphere is thinner and so absorbs less of the shorter wavelengths like UV, and the sun angle is higher [than in the temperate zone], resulting in less shade, higher soil

surface temperatures, and more evaporation. The intense sunlight is not a problem in temperate lowlands, regardless of temperature. The sun is great for solar energy, but young seedlings can get fried by the burning light. Two things that help combat this are artificial semi-shade and walls or thick hedges to reduce wind and evaporation. We use a black net for partial shade in our tree nurseries; results were poor before we started using this. Even native tree seedlings in the wild have a much higher mortality out in the open than in the shade of their mother tree. It was found in the high-altitude deserts of California and Arizona that the most important factor in growth of cultivated plants is walls for wind protection."

Intense sunlight and other climatic factors can result in extreme weathering of exposed soils in the highlands. Bare soil at high altitudes can quickly lose its fertility. Hillside fields are also particularly vulnerable to erosion, and heavy rains and strong winds can quickly carry the soil off a slope. Soil protection and conservation techniques, such as creating living barriers along contour lines or planting trees, may be priorities in mountainous areas. Windbreaks and soil cover are more critical in the tropics than in temperate areas which have snow cover for several months of the year.

Many workers new to the tropical highlands are thrilled to discover a very pleasant climate with temperatures that could produce food year-round (with sufficient water, which is often a seasonal problem). They discover that crop yields are not directly comparable to temperate areas. Short days result in less photosynthesis, and together with the relatively low average temperatures, the same crops may take much longer to mature at high elevations in the tropics than in temperate areas. Alfredo Petrov notes that vegetables do not reach the sizes they do at higher latitudes, even with optimal fertilizer and watering. (At the other extreme, huge vegetables are grown in Alaska.)

Some crops require long or short days to flower, so plants must be selected for their adaptation to tropical daylengths and grown in the proper window for seed production. Plants which can flower regardless of the hours of light are called 'day-neutral,' such as tomatoes, peppers, eggplants, sweet peas, artichokes, and most cucurbits. Photoperiod-sensitive plants are classified as long-day or short-day. Long-day plants are those which flower at some time during the long days (in reality, short nights), including spinach, sugar beets, radishes, Chinese cabbage, and most onions and carrots of temperate origin. Short-day plants only flower and set seed during short days. Examples include pigeon peas, chayote, roselle, amaranth, jícama, and most winged beans. (Daylength also affects plant growth responses other than flowering. For example, short days favor root and tuber growth in many tropical crops: white and sweet potatoes, taro, yam, jícama, Jerusalem artichoke, and cassava.)

In addition, many temperate plants are not adapted to the daily temperature extremes common in the highlands. Alfredo Petrov tells of a treeless Bolivian village at 4000 m in which a Canadian student initiated a tree-planting project. Since winter night temperatures sink to -20° C in that area, the student tested Siberian elm trees, which withstand temperatures even lower than -20° C in their native range. However, the village's temperature usually reaches +20° C by 11 AM. All the trees died, perhaps due to the temperature fluctuations which never allowed them to go dormant.

Many traditional highland foods, such as quinoa in the Andes and buckwheat in Asia, are well adapted to high altitude conditions and are exceptionally nutritious. However, the temperatures may simply be too cold at very high altitudes to grow the variety and quantity of foods needed for optimal nutrition. In addressing the cold limitations, Food for the Hungry-Bolivia has had great success with mini-greenhouses in the highlands at 3000-4200 m. Greenhouses enable people to grow vegetables and other crops under plastic where previously there was little food production, despite the abundant sunlight. In Ecuador at 2900 m, I [LSM] found that the biointensive vegetable gardens, which were planted in beds filled 1 m deep with undecomposed organic material, did not show the frost damage evident in adjacent gardens planted in normal soil. The heat generated by the 'composting' in the beds apparently protected the plants from cold damage.

Most highland crops do not thrive in ECHO's climate, so we do not specialize in crops suitable for cooler, highland areas. A university in a highland zone may provide good information on plants adapted to your conditions. At present, we do not know of any one organization which connects people working in highland agriculture worldwide, although there are many interested individuals. ECHO is building a list of resource groups for people working in highland regions; if you work in the mountains, please write us with information about your organization and services.

The seed company High Altitude Gardens (P.O. Box 1048, Hailey, ID 83333, USA; phone 208/788-4363; fax 208/788-3452; e-mail higarden@micron.net) specializes in frost-tolerant, quick-maturing varieties which do well in cold climates. Their catalog ($3) lists over 300 varieties of vegetables, plus herbs, wildflowers, and grasses. The cover crops resource CIDICCO has a bulletin on "Using Legumes in Traditional High Altitude Farming Systems" (US$1.50). Write them with your experiences and ask for a publications list: CIDICCO, Aptdo. Postal 4443, Tegucigalpa, MDC, HONDURAS; fax 504/39-9896; e-mail cidicco@nicarao.apc.org. The catalog of the Kenya Forestry Seed Centre has an exceptional listing of tree species categorized by their suitability in various climate zones; contact ECHO for a copy of their seed list.

A great introduction to crops adapted to the highlands is *Lost Crops of the Incas* (EDN 29-1). It is out of print, but is being reproduced, with color photocopies of its excellent pictures, from Craig at Redwood City Seed Co., Box 361, Redwood City, CA 94064, USA. Cost is $40 including surface mail. For airmail add: Americas, $12; Europe, $16; Pacific Rim, $20. His home page is http://www.Batnet.Com/rwc-seed/.

PORTABLE GARDENS MADE FROM OLD TIRES. We have hardly mentioned rooftop/above-ground gardening since EDN 30, but activity has continued in this area both at ECHO and a few other locations. Last summer a large garden was grown on the roof of the main prison in St. Petersburg, Russia, and 18 other rooftops there had gardens ranging from small to substantial. We are exchanging weekly e-mail messages with a group in Moscow that expects to begin work this summer.

I [MLP] recently visited Doug VanHaitsma and his national colleagues in El Salvador to evaluate the potential of urban gardening in a low-income part of San Salvador. After seeing slides of all the methods mentioned in EDN as well as tire gardens, everyone chose the tire gardens as most relevant for their needs. I share their enthusiasm. (The method seems to have been developed or at least promoted by a United Nations project).

Portable gardens that can literally go almost anywhere are made from old tires and a small sheet of plastic film (e.g. garbage bag). The group in El Salvador had fun moving a tire garden to unlikely places for a garden: on a flat rock, on a steep hillside supported on the downhill side with rocks, on the roots under a tree. If there is danger of theft or damage by chickens and goats, the tire can be placed on top of something, even along the edge of the tin roof of a shanty. (People often put pieces of iron on this type of roof to keep it from blowing away because there is not enough framing to adequately secure the corrugated roofing, so one or two gardens might not be a problem.)

If a vegetable needs full sun in the winter it can be set there, then gradually moved into the shade of a tree as the season approaches when the sun is overhead. If the garden is on a rooftop, it can be placed on sticks or stones so that air can circulate underneath, keeping the roof surface dry. If gardeners themselves have to move, they can take their gardens and the improved soil they contain to their new home. When ECHO staff member Dan Holcombe (see picture) returned from vacation to the church in Mexico City where he had a rooftop tire garden, he found it flourishing--on a different building. The church moved it to add a second story to the original building.

Construction is simple and elegant. Lay a tire flat on the ground. Note that the top rim is a mirror image of the bottom rim. With a knife or machete, cut off the top rim. Place a piece of plastic inside the tire on the bottom rim, large enough so that an inch or two of plastic stands up along the walls of the tire. Now turn the top rim that has been cut off upside down. It fits like a lock on the bottom rim, holding the plastic firmly in place.

Any suitable soil, compost or potting mix can be used to fill the tire. You will need to judge when/if fertilizer is needed, based on what you use for a medium and how plants are growing. At ECHO we sometimes place an empty flower pot or a PVC pipe in the center so that we can see how much (if any) water is standing in the bottom and so judge when to water.

We usually incorporate something with a lot of air space into the medium. This helps extend the growing medium that is usually in short supply, and makes the garden much lighter. At ECHO we use cola cans with holes cut into the sides so roots can penetrate the can. In El Salvador coconut husks, which are everywhere, were broken up and incorporated. In Mexico City, Dan used a layer of alfalfa hay to provide initial aeration plus subsequent nutrients.

NEEM SEED SHELF LIFE is generally very low; seeds may not germinate after 3-4 weeks in storage. The Green Gold International seed company (EDN 51-3) recently wrote us of their method for extending the viability of neem seed. "As you know, neem seeds lose their viability quickly if they are swept from the floor. We collect the seeds right from the tree which maintains better seed keeping quality. ...The shelf life of the neem seed can be improved if green drupes with slight yellow tinge are collected right from the tree, depulped quickly through running water, dried slowly in the shade, then stored at low temperature (4°C) after treating with fungicide. In this way the seed life can be improved up to 7-8 months."

HOW TOXIC IS THE HERBICIDE 2,4-D? [Abstracted from *HortIdeas* February 1996]. This is the most widely used herbicide in the world and the third most widely used in the USA. The US Environmental Protection Agency has required that it be re-registered to assure its safety. Several years ago I [MLP] spent a summer in laboratory research on 2,4-D. People were not yet so conscious of delayed injury from chemicals, so I often had it on my hands. When I

heard that the EPA was taking a new look, I recalled that time with concern.

After completion of nearly all of the more than 200 studies required for re-registration, members of the pesticide industry task force presented results in a symposium. "None of the studies suggest that the chemical poses any significant risk when used properly." Various experts reported the following: when ingested orally [eaten] it is less toxic than caffeine and about as toxic as aspirin; it has low reproductive toxicity; it does not cause birth defects or genetic damage; it has low potential for damaging the central nervous system; there is little risk of exposure from eating crops treated with the herbicide; it rapidly degrades into non-toxic materials in the soil; it is improbable that it is carcinogenic.

For those not familiar with 2,4-D, it mimics a plant growth hormone, causing uncontrolled growth and curling, leading to death after several days. Grasses are not affected because they contain an enzyme that destroys the herbicide, but most broad-leafed plants are killed.

THE NITROGEN FIXING TREE ASSOCIATION is now part of the FACT Net (Forest, Farm, and Community Tree Network). Their publication formats will remain the same but will now cover both N-fixing and non-N-fixing multipurpose tree species. You can still address all your questions on various species and tree management to their "global extension service." They are one of the best resources for selecting, planting, and maintaining trees. To join the FACT Net, request publications, or present technical questions, write FACT Net, Winrock International, 38 Winrock Dr., Morrilton, AR 72110-9537; phone 501/727-5435; fax 501/727-5417; e-mail forestry@msmail.winrock.org.

SEEDS FOR THE AMERICAS sends garden seeds to participating agencies throughout Latin America and the Caribbean. End users might include needy individual families, orphanages, schools, churches, 4H clubs, community groups, prisons, etc. One unit of 1,400 packets of seeds normally include 12 kinds of vegetable and two kinds of flower seeds for each garden, packed 100 packets of each seed per bag. The quality of the seed is checked by Mississippi State University before packing. They charge 3¢ per package to help defray costs.

I asked whether seeds were selected for various micro-climates. "The seed we distribute is very well received, but has not been tested in all the microclimates in which they may be used. In many cases the varieties/hybrids are superior to what is available locally. Seeds distributed in the program are for vegetables that are normally grown and have proven successful in many places in Latin America and the Caribbean."

If your organization is interested, contact John Batcha for further details: 4947 Foxbriar Trail, Charlotte, NC 28269, USA; phone/fax 704/597-7789; e-mail GGFG89A@ prodigy.com. Please do not write if you do not work in Latin America or the Caribbean.

HOME-GROWN BEANS PRODUCE LESS GAS. The November 1995 *Organic Gardening* quoted Dr. George Hosfield, a dry bean researcher with the USDA. "Despite being dried and stored, the beans you grow in your own garden are *fresh*. Store-bought beans are anywhere from 6 months to a year older than homegrown. As those beans age they get harder. Hardened beans are less likely to soak up water and soften when cooked. The result is starch that doesn't cook no matter how long you leave your beans on the stove. The starch goes through your stomach undigested, passes into the large intestine and [produces] gas." He suggests storing the beans in as ideal conditions as possible, namely "a dark place where the temperature [in degrees F] and [percent] humidity added together are less than 100." [Ed: This is the same formula often used for seedbank conditions.]

"As further insurance against flatulence [gas], soak your beans overnight before cooking them and discard the water. Then when you cook them, make sure the water temperature gets up to at least 200°F. If you don't eat beans regularly, gradually introduce them into your diet. Eating small amounts of beans frequently, rather than a lot of them once a month, also helps minimize [gas]."

ANNOUNCEMENTS FROM ECHO

E-MAIL AND FAX provide us with almost instantaneous communication these days. We have been receiving many requests by these methods. However, <u>always include your postal address on your fax or e-mail message</u>. Recently we tried to reply to several requests electronically, but the messages were returned, leaving us no way to contact the individual. Also, ECHO cannot afford the high cost of responding by overseas fax.

Note our new e-mail number, ECHO@xc.org. (This is a "cross-connect" account with Missionary Aviation Fellowship. Its purpose is to provide a constant address from which e-mail is forwarded to whatever address you give. It could even follow you from country to country if you do a lot of travel. ECHO still uses the old Compuserve number, but we don't want to commit to it forever. ECHO@xc.org will always deliver to whatever internet access company we happen to be using. The cost is $40 per year. Contact them at helpdesk@xc.org).

ECHO is placing all of our technical publications on the World Wide Web (http://www.xc.org/echo). Though not yet completed, our web site is active and already contains much material. Many of you cannot access the Web

because it requires a direct connection to the internet. We just learned that there is a way to retrieve documents from the Web using regular e-mail.

If you already have some familiarity with the Web and would like to try it, you should get a file called "Doctor Bob's Guide to Offline Internet Access" which will give details. Retrieve this file by sending an e-mail to one of the addresses below:

In the Americas: mail-server@rtfm.mit.edu
Enter only this line in the BODY of the note: send usenet/news.answers/internet-services/access-via-email

In Europe and Asia: mailbase@mailbase.ac.uk
Enter only this line in the BODY of the note:
send lis-iis e-access-inet.txt

ECHOES FROM OUR NETWORK

Joel Matthews in Niger sent a photo of a pigeon pea he had received from ECHO two years ago. "The short-duration pigeon pea (#89-077) has done quite well. We are continuing to experiment with this variety as an intercrop with millet. The local pigeon peas take too long to mature for use as a rain-fed crop." The picture shows a plant only 3 months old with a lot of flowers and many full pods. Joel planted it in July with no inoculant. Thanks for the good report!

Mike Salomons with the Mennonite Central Committee in Zaire sent us his seed trial report form. The tropical onions (see EDN 39-1) have attracted a lot of interest when two varieties produced good bulbs, but local seed supply is a problem in his area. Of the two sweet corn varieties from ECHO's seedbank ('Buhrow's White Desert Sweet' and 'Hawaiian Supersweet'): "A lot of the corn here is eaten fresh, so the advantages of these types are that they are ready a month or so before the field corn varieties, and they taste sweet. Local people were very surprised by how sweet it is, and lots have asked for seed to grow corn for their kids." [Both these sweet corn varieties are open-pollinated (not hybrids), so you may save and distribute your own seed.]

"Quinoa has attracted a lot of curiosity...'What is that?' People here eat a lot of leaves, so I think it may have potential for that, as well as for the seed. ...they seemed to produce very well. One problem was that quite a few seed heads broke off because of the weight of the seeds. I could use more information on quinoa. When do you harvest it? How do you get rid of the saponins on a small-scale, village level? How do you cook and eat it?"

Let us address two issues he raises. First, the problem of local supply of onion seed. In EDN 39 we asked onion researcher Dr. Lesley Currah, "Under what conditions might a farmer be able to save his/her own onion seed?" She replied that it can be difficult. "You need a variety that will easily bolt (send up a flower stalk) the second year. You do not want any variety that bolts the first year because that trait would create havoc in your harvest. Select bulbs from the best onions and store until the next season. Timing then becomes important. If you plant too soon while daily temperatures are increasing they may go into bulbing mode and split rather than flower. Wait to plant the bulbs until the average daily temperatures have started decreasing. The stalk gets a lot of diseases so, unless it is very dry, you may need to spray a lot."

Now, the questions about quinoa. Saponins are bitter, toxic anti-nutritive substances which must be removed before cooking, or the food may be too bitter to eat. (The laboratory method of testing saponin content is to place 0.5 g quinoa grains in a 16 x 160 mm test tube with 5 ml distilled water. Cap the test tube and shake for 30 seconds. Allow to sit 30 minutes then shake another 30 seconds. Saponins produce a foam on the surface of the water; 'sweet' quinoas will have very little if any foam, while 'bitter' varieties may have up to 8 cm of foam.)

Saponin elimination from traditional varieties involves washing the seedcoats, which contain most of the saponins. Grain can be washed 1:8 in water, sometimes with up to 20 changes of the soapy water. Grains are rubbed on a hard surface (rock, tile, etc.) with much water, but this can damage and lose many grains. Another method is putting grains in a cloth sack and agitating it in running water or placing the sack in a stream. Where available, grains can be put with water in a blender on medium speed, changing the water until the grains are no longer bitter. Mechanical 'dehullers' may also be used, such as barley dehullers or rice polishers.

Quinoa breeding has largely been focused on selecting "sweet" (low saponin) varieties, although these may suffer increased bird damage. ECHO now has seed of the new commercial variety 'Tunkahuán' selected by INIAP for the highlands of Ecuador. The saponin content is so low (0.06%) that seeds need only a light rinse before cooking. It has large leaves, and it is recommended for 2200-3400 m at the equator (lower at higher latitudes), with 600-1200 mm rain/year. Development workers overseas may request a free packet of this variety; $2.50 to others.

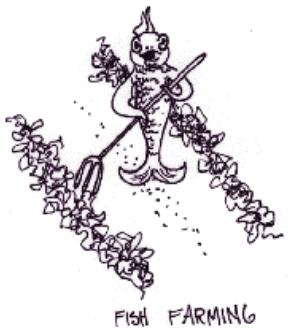
According to an INIAP booklet, quinoa must be sown when the soil is very moist and harvested in the dry season when the plant turns yellow and/or loses its leaves and the grain resists pressure of the fingernail. Harvesting in the Andes is usually done manually with sickles, early in the morning (afternoon harvests drop more of the dried grains). If there is no danger of rain and birds are not a problem, the grain can be left in the field to dry, but many seeds may drop if plants are left in the field too long. If there is excess humidity when the grains are mature, they may germinate

while still in the seedheads. Threshing is carried out by beating the seedheads, or using modified cereal threshers for very dry grain. After threshing, dry the grains in the sun.

Quinoa is usually cooked in soups or as with other cereals. It contains no gluten, so pure quinoa flour bread is not recommended, although it may be added (10-20%) to bread and other baked goods. A good cookbook of Andean crops with many quinoa recipes is available in Spanish from FAO-Chile (see EDN 47-7/8).

If you have had good success with your quinoa trials so far, Dr. John McCamant (at Sierra Blanca Associates, 2560 S. Jackson, Denver, CO 80210, USA) is a specialist in quinoa breeding and has a big quinoa collection from various regions in the Andes. He will share seed samples if you would like to try a few more varieties.

UPCOMING EVENTS



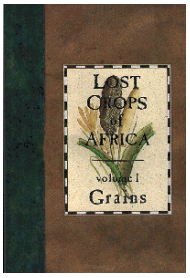
Aquaculture Workshop, November 15 and 16, 1996 at ECHO. An intensive two-day aquaculture workshop will be held immediately after ECHO's conference this fall. It will be taught by Living Waters International (LWI) staff, most of whom are professors at Auburn University's International Aquaculture Center. Details are still being arranged. It is being held right after the conference (at ECHO) to minimize travel costs for people wanting to attend both events.

Two additions to resource speakers at **ECHO's Third Annual Agricultural Missions Conference (November 12-14, 1996)** are Dr. Bryan Duncan, head of Auburn's International Aquaculture Center, and Dr. Uday Yadav, a specialist in using mycorrhizal fungi to obtain greater growth of trees in reforestation projects and to help get trees established in severely denuded areas.

Agricultural Missions Conference in Haiti. ECHO is making serious plans to sponsor a conference in Haiti sometime in the spring of 1997 to enhance networking among the many groups working in that country. The conference language will be Creole with translation into English available. It will be held near Cap Haitien. We are gathering a list now of people who want to be kept informed of plans. Write "Haiti Conference" on the envelope. Registration limited to 150 people.

BOOKS AND OTHER RESOURCES

LOST CROPS OF AFRICA. VOLUME 1: GRAINS (383 pp.) is now available from ECHO! This is the newest in the National Academy of Sciences series on very promising but little-known or neglected species. Writing was funded by USAID. This inspiring volume (the first of three which are planned) discusses the potential of African grains for producing food and other products in Africa and around the world.



The series is "intended as a tool for economic development" among those who may promote these crops for local cultivation, develop markets for the grains, and explore the multiple uses of these species. The species discussed in this series were selected from nominations by people around the world (see EDN 29-3). The information given about the crops helps readers to understand and appreciate the unique value of each plant and evaluate its potential for a given area. There are also very insightful appendixes on "potential breakthroughs" in some of the most pressing problems for development workers, including grain handling and child nutrition.

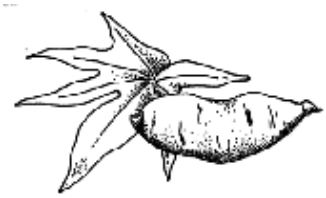
The species covered include: African rice, finger millet, fonio (acha), pearl millets, sorghums (subsistence, commercial, specialty, and fuel and utility types), tef, other cultivated grains (guinea millet, emmer, irregular barley, and Ethiopian oats), and wild grains. These plants offer much promise because they tolerate many extreme growing conditions and produce well with minimal inputs. They are generally nutritious and offer new flavors. They also offer other benefits; for example, the "fuel and utility sorghums" are used as firewood, liquid fuels, soil reclamation, wind erosion protection, weed control, crop support, fibers, brooms, and animal feeds. As with all the NAS books, further reading and many research contacts are given for each crop.

Noel Vietmeyer and Mark Dafforn with the National Research Council told us they can think of no group more likely to make use of this book than those of you in ECHO's network who work in Africa. So they will donate enough books to send you a free copy while our supply lasts. IF you are already a member of ECHO's overseas network working in any Third World country you may request one free copy of the book by writing clearly the address where the book is to be sent and enclosing postage if your work is not in Africa.

For addresses **in Africa only** ECHO will pay surface postage. Readers in Western countries can purchase the book for $24.95 plus $4.00 surface postage and handling. For all others (and in Africa if you want airmail) please send appropriate postage: surface $4; airmail Latin

America, $6.00; airmail Europe, $11.00; airmail Africa and Asia, $11.70. MasterCard and Visa or checks in US dollars written on a US bank are the only payments we can accept.

"INTRODUCTION TO TROPICAL ROOT CROPS" VIDEOS FROM ECHO. (Reviewed by Dr. Al Gebben, retired professor of botany at Calvin College.) ECHO has produced two videotapes on tropical root and tuber crops featuring Dr. Frank Martin, a familiar name to ECHO's network as author of many of our technical notes. Dr. Martin is a retired research scientist in tropical crops, long associated with the USDA research station in Puerto Rico, and a frequent consultant to ECHO on a variety of technical questions. This new video series covers one of his specialties.



In Part I (35 minutes) of the series, Dr. Martin provides insights on the nutrition, agricultural origins, adaptations, propagation, growth rate to maturity, seasonality, storability, processing, food values, and insect and disease problems of six categories of tropical root and tuber crops: potatoes, sweet potatoes, cassava, true yams, taro or dasheens, and tanias. Each category noted above is compared for the crop characteristics mentioned.

In Parts II-V, Dr. Martin gives detailed descriptions of individual root crops using live plant materials. He describes plant propagation and plant culture, frequently illustrating the techniques in the field. In addition, methods of food preparation are sometimes demonstrated in the kitchen. Food processing tips are included along with discussions of potential problems and methods of control for pests and diseases within the root crop category. In Part II (47 mins.), true yams are described. In Part III (38 mins., beginning the second videotape), he discusses corm-producing aroid species such as tanias, taros, eddoes and dasheens. Cassava constitutes Part IV (32 mins.), and sweet potatoes, Part V (43 mins.).

The nutritional value of most root crops is limited primarily to calorie-providers or "belly-fillers" in Dr. Martin's words. They frequently are the starch staples in tropical diets, much as the cereal grains are in temperate regions. Some provide additional benefits as sources of dietary fiber or as sources of vitamins A and C. Limited amounts of protein are contained in all of them; however, some like the potato and yams are much better sources of protein than the others. Dr. Martin stresses that root crops by themselves are not a source of a complete diet, just as no single food crop, by itself, can be considered a source of a complete diet.

Tropical root crops are differently adapted to tropical climatic conditions. The white potato needs moderate rainfall in regions with cool nights and warm days. Sweet potatoes and cassava require a hot climate but need only moderate rainfall. Cassava is quite drought tolerant. Taro and tania root crops are very "thirsty." Taro often is grown in paddy culture but tania is normally grown in wet upland conditions.

Root crops also differ greatly in their growth rate to maturity. Whereas white potato may be harvested in 2-3 months, sweet potato requires 5 months in the tropics and up to 7 months in the temperate regions. Cassava commonly requires up to 18 months to maturity but early varieties may require only 10-12 months. Yams commonly require 8-11 months to maturity; taros and tannias 10 months to a year. Information on harvesting times is helpful in planning farming systems. The video series may help you define whether a new crop would be suited to your area, or to better understand common crops in your area that you may not know much about.

Dr. Al Gebben also prepared several excellent study helps to accompany the video series, which will be sent with the video. Outlines and study questions guide you through each section, highlighting some main points of the material in the video. A few questions answered in the videos include: Which of the tropical root crops do not store well? How can you tell when yams are ready for harvest? What parts of the tannias are used for seed material? How should a dasheen corm be prepared for eating? What is tapioca, and how is it prepared? What other plants may harbor the sweet potato weevil?

You may purchase the Introduction to Tropical Root Crop video series from ECHO. The two-tape set costs US$32 in VHS/NTSC format (used in the USA), $50 in PAL or SECAM [specify which], plus postage. Postage is $5 in the Americas, $11 elsewhere.

MOVABLE CHICKEN HOUSING PLANS. Dr. John Bishop (see EDN 50-1) wrote two technical notes on housing chickens in a "protected free-range" system. These houses give small farmers a relatively inexpensive alternative to fencing while protecting birds from predators and garden areas from free-range chickens. There are two documents: "Movable Henhouse with Free-Access Range Run for Single Sire Flock of 25" and "Movable Brooderhouse with Free-Access Range Run for Natural Reproduction of 25 Chicks." Complete building instructions and diagrams are given for each range run. They use minimal housing materials and include wire-covered range areas, with a lift bar for moving to a new site. Plans for homemade feeders and waterers are also given. Available from Heifer Project Exchange, P.O. Box 808, Little Rock, AR 72203, USA.

TWO GUIDES TO APPROPRIATE EQUIPMENT. It

is important to have the right tool for the job. *Tools for Agriculture* (238 pp.), now in its fourth edition, can help you identify and find the most suitable tool for your situation. This is an unbelievable resource for anyone who uses agricultural equipment from plows and threshers to oil expellers, pumps, and shovels. Thought-provoking and informative chapters discuss various processes and equipment used in land preparation, sowing and fertilizing, pest control, harvesting, water lifting, livestock care, and beekeeping. The text will help you evaluate which technologies are suitable for your work and area. Then, many manufacturers (mostly in developing countries) are listed for the equipment. [In addition, the publishers maintain an agricultural tools database which is periodically updated. Specific, detailed questions on a wide range of technical matters may be directed to their Technical Enquiry Unit at ITDG, Myson House, Railway Terrace, Rugby CV21 3HT, UK; fax +44 -1788 540270; e-mail itdg@gn.apc.org.]

Small-Scale Food Processing (158 pp.) gives you information about and sources for the equipment needed for preserving and packaging products (including vegetable oils, baked goods, beverages, milk and meat products, and more). As an example, the chapter on fruit and vegetable products outlines basic production stages and equipment required for jams, marmalades, chutneys, sauces, and dried products. The "packing" stage refers you to an illustrated section on the back of the book which lists sources for various sealers in 12 countries. Half of the book is the directory; it includes sources (many in India and the UK) for slicers, hullers, mills, packaging equipment, and much more.

The books are available free from CTA only for nationals of the 70 ACP countries (most of **A**frica and the **C**aribbean, and several **P**acific Island nations); write CTA, Postbus 380, 6700 AJ, Wageningen, Netherlands. Non-ACP nationals can order the books directly from Intermediate Technology Publications, 103-105 Southampton Row, London WC1B 4HH, UK; fax +44 171 436 2013, or in the US from Women, Ink., 777 United Nations Plaza, Third Floor, New York, NY 10017; fax 212/661-2704; each book costs £30 or US$58.50 plus postage. Ask for their catalogs for some of the best new books in development and technologies.

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