

ECHO DEVELOPMENT NOTES

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ECHO'S FIRST AGRICULTURAL MISSIONS CONFERENCE. We were surprised by the response when we announced that every November ECHO would sponsor a conference for agricultural missionaries. Would anyone even come when most of our potential delegates work overseas? We hoped for at least 30, but we ended up with 90 delegates, several of whom had come from overseas primarily for the conference.

Since the delegates themselves represented years of relevant experience and ideas, networking sessions were scheduled into the daily agenda. These included both formal delegate presentations and informal times to share solutions and contacts. The minute any formal session ended, the group was abuzz with conversation among people with an amazing diversity of expertise. In addition, several individuals presented profiles on the technical or outreach aspects of their work, such as Dr. Rolf Myhrman's work on velvet bean featured on page 2.

The three keynote speakers donated their time to interact with the delegates (Dr. Carl Campbell spoke on tropical fruit, Dr. Frank Martin on improving the small tropical farm, and Dr. Hugh Popenoe on farming in tropical soils). Half of every day was spent on the ECHO farm for hands-on interaction with speakers and delegates around the plants, animals and appropriate technologies at ECHO. Workshops included grafting, cooking with tropical fruits, and rooftop gardening. Many stayed after the conference to use the library.

OUR SECOND ANNUAL CONFERENCE: OCTOBER 30 - NOVEMBER 2, 1995. Plan now to attend. Two of the main speakers have been lined up already. Dr. Bryan Duncan is head of Auburn University's International Center for Aquaculture. He is president of a relatively new non-profit organization, Living Water International [see EDN 40-5], which provides technical assistance in aquaculture and water harvesting to mission agencies.

Dick Roosenberg is director of Tillers International [EDN 29-8 39-4, 43-7]. Tillers is a non-profit organization that offers workshops and publications on using animal power. He will provide a perspective on options for animal power and lead a workshop on training draft animals, using ECHO's new, untrained water buffalo to demonstrate.

If you are interested, even if you are not yet sure you can come, we would like to begin corresponding with you as quickly as possible. Write for an application. Tell us if you would be willing to make a presentation in your particular area of expertise. We will keep the price unusually low for such a conference, knowing the tight budgets that so many of you work under.

We hope that several members of our network who live in Third World countries will be able to attend. However, ECHO cannot sponsor nor pay travel or any other expenses for delegates. Help in obtaining a visa will be limited to a letter stating that we are holding the conference, outlining the expenses, and that you are welcome to attend. Please do not write for sponsorship as we do not have resources for this. We hope you can find funding from an agency working within your country.

VIDEO TAPE OF CONFERENCE IS AVAILABLE. We have put six hours of the conference on video. The cost is \$20 for the set of three tapes, available on NTSC, PAL, and SECAM. (Because of technical problems the first morning, Dr. Campbell's talk on tropical fruit is not included. Much of that material can be seen on the first tape in his video series *Introduction to Tropical Fruits* [EDN 31-1].) Send a check in US dollars drawn on a US bank or Master/Visa card number, expiration date, and your signature. Please add 6% sales tax for orders shipped to Florida addresses. Add postage as follows: \$5 in the USA; \$6 Canada/Mexico; \$9 Central/South America, Caribbean; \$14 Europe; \$20 Africa/Asia.

NEW INFORMATION ON THE TOXIC SUBSTANCE IN VELVET BEANS. Velvet beans are being grown more widely, because corn yields can be increased considerably by intercropping with velvet beans. (For other

beneficial effects, see the following article).

Velvet beans have potential to be a significant food. Bean yields are high, sometimes when common beans fail due to drought. The beans are nutritious, with a high protein content. Many recipes have been developed for their use and people enjoy the taste.

Herein lies a major dilemma for farmers and their advisors. About 5% of the weight of the bean is a psychoactive substance called "dopa." Dopa is still a commonly prescribed treatment for Parkinson's disease, though it has side effects such as uncontrolled muscle twitches and, in extreme cases, even psychotic disorders including schizophrenia.

Dr. Rolf Myhrman brought both good and bad news on the subject at ECHO's Conference for Agricultural Missions. In his lab at Judson College in Illinois, he has been studying dopa in velvet beans from different countries and after different methods of preparation for human consumption.

One thought has been that one might get rid of the dopa by removing all the seed coats. This can be easily done by hand after cooking. However, Rolf was unable to detect any dopa in the seed coats.

One major use of velvet bean by humans is to make a coffee substitute. (The coffee is called "nutri cafe" in Central America and the bean is sometimes called "Nescafe bean." Ideally, the dopa would either be destroyed by the heat or remain in the grounds, leaving the coffee free of dopa.

Rolf found, on the contrary, that making "coffee" is an ideal way to extract intact dopa! "An 8-ounce cup of velvet bean coffee can be expected to contain between 250 and 300 mg of dopa. For comparison, a physician might start a Parkinson's patient on 500-1,000 mg of dopa per day." [The other side of the question is whether someone with Parkinson's disease, but who cannot afford prescription dopa, could drink velvet bean coffee as a treatment. Do any physicians in our network have ideas on this?]

Rolf is working closely with Dr. Dan Buckles at CIMMYT, the International Center for Improvement of Corn and Wheat. According to Dr. Buckles, many people in Ghana eat velvet beans most days, using them primarily as a soup thickener. People in Benin mix 10-30% velvet bean flour with corn meal. Various preparation techniques are being used and sent to Rolf for analysis.

The good news is that a large fraction of the dopa can be removed from beans by grinding and soaking in water. Simple detoxification techniques might soon be available to remove most of the dopa. "Soaking the powder in room-temperature water, even for only two minutes, removes over half of the DOPA. A second two-minute soak removed another 29%. 80% is removed in two short soaking periods." Soaking 5-10 minutes does not remove additional dopa.

Using 50°C water is no more effective than water at room temperature. However, soaking 5 minutes in boiling water removed 89% of the dopa and repeating the soak removed 99%.

Dr. Buckles sent Rolf velvet beans from a community in Ghana where people regularly eat velvet beans. Might these be extra low in dopa? Surprisingly, they had even more dopa than some others. Rolf suspected that they are detoxifying the beans and requested details of food preparation methods.

"We now understand how the Ghanians remove the dopa. They boil the beans 45-60 minutes, discard the water, add cool water and let the beans cool, then discard that water. Although our extraction techniques have all been with flour, it does not surprise me that they are removing a significant amount from whole beans by boiling."

This work began when Rolf requested an ECHO publication called *Hunger-Related Research Opportunities*. These list research projects that could be performed with a modest budget that would benefit peasant farmers.

Can you Help? Rolf is asking whether there might be other needs within our network where an analytical

laboratory oriented toward needs of Third world small farmers could be helpful. If there are, he will seek funding to set a lab to provide such needs at minimal cost to our network. He would like to hear your ideas. Write him at Judson College, 1151 North State St., Elgin, IL 60123. Phone 708/695-2500 ext. 3740. Email rmyhrman@nslsilus.org.

INNOVATIONS IN GREEN MANURES. Roland Bunch, author of *Two Ears of Corn*, the popular book on how to do agricultural development (EDN 6-6; 25-5), sent an intriguing report on his visit to the state of Santa Catarina in Brazil to see the work of EPAGRI. "It was, technologically speaking, the most impressive piece of work with small farmers that I have ever witnessed: highly innovative, aimed at a crying need throughout the Third World, very popular with the farmers, widely disseminated, and with results in better economic standards among the farmers."

"Probably the most important issue of all is that we must get away from the escalating dependency on velvet bean (at least in Central America)." He suggested that ECHO increase the number of green manure/cover crops (GMCC's) in our seedbank, which we have now done (see page 5). The following is abstracted from Roland's report.

The project has been continuing for 13 years, on both flat coastal areas and mountains. The technologies include contour grass barriers and orienting crop rows on the contour, but by far the most popular aspect of their work is green manures/cover crops. These plants are used to fertilize and condition the soil, usually left on the soil surface rather than buried. They are valued both as green mulches while growing and dead mulches after being cut. The vast majority of farmers use a traditional animal-drawn tool called a "rolo-faca" (knife roller?) which knocks over and cuts up the GMCC. Then with other animal-drawn instruments, they clear a narrow furrow from the mulch and plant their next crop. The resulting mulch both reduces or simplifies weeding and noticeably increases soil fertility. The majority of farmers who have used any of these systems for more than 5-6 years are no longer plowing, evolving from a minimum-tillage system to a no-till system. Seeds of the succeeding crop are merely hand-drilled into the soil. Some farmers' animal-drawn plows are rusting in abandonment.

The project works intensively with some 60 species of GMCC and have seen widespread adoption of about 25. We very much need to continue finding new species and varieties of GMCC's. Also, if we are to avoid having more and more insect and disease problems with GMCC's, we must rotate them just like we rotate major crops. Furthermore, we must avoid becoming dependent on one or two species, lest we fall into the trap that *Leucaena*-based programs did in Southeast Asia when psyllid insects defoliated thousands of hectares of the world's most successful alley cropping. More specifically, for those many programs totally dependent on the velvet bean as a green manure crop, it should be noted that in southeastern Paraguay, a fungus has wiped out two of the four varieties of velvet bean that were previously used in the area.

Maintaining soil cover is much more important in preventing erosion than terraces or soil conservation barriers, live or dead. Roland says, "This is the first program I have seen which took this fact to heart, and was able to convince the farmers of its value through their own observation and experience. Thus, one more nail has been pounded into the coffin of our old bag of tricks, which featured contour ditches, grass or tree barriers, and contour rock walls. We are not ready to abandon these practices entirely, but certainly we are in the middle of a process of re-examination which will probably result in a major de-emphasis in our use of at least rock walls and contour ditches."

"The overall quantity of biomass is more important, relative to amount of nitrogen fixed, than we had previously assumed." For example, both oats and turnips are widely used as GMCC's. This makes sense if covering the soil and achieving a no-till system are as important to the farmer as are supplying nutrients to the soil.

The possibilities of GMCC's to fit into a wider and wider number of cropping systems was confirmed. Farmers were using GMCC's in cropping systems based on corn, onions, cassava, and fruit trees. Also Roland was shown photographs of GMCC's associated with wheat, grapes, tomatoes, soybeans, and sorghum.

There is a tremendous need for farmer experimentation to discover new species and ways to adapt to differing

agricultural systems. No agronomist-staffed research stations will ever be able to investigate and refine all the possibilities.

Probably the single most important result of the Brazilian work is that by eliminating the need for most of the weeding and all of the plowing, the small farmer is at much less of a competitive disadvantage with the large, mechanized farmer. Small farmers, especially on hillsides, were never able to carry out the really heavy and expensive labors of plowing and weeding as cheaply as could the mechanized farmer. The answer lies not in the mechanization of these jobs, but in their elimination.

Roland cites a study by Flores and Estrada which compared no-till velvet bean-based system with a neighboring mechanized modern system in Honduras. The velvet bean system was less productive, but the costs per ton of corn produced were 30% less.

Roland has started a non-profit consulting and training organization, COSECHA, whose purpose is to spread knowledge and use of the "people-centered development" process as described in his book *Two Ears of Corn*. Roland's address is: Apdo. 3586, Tegucigalpa, Honduras. Phone (504) 76-22-56; telefax 76-23-54.

SOME USEFUL NUMBERS. How many trees would you need per hectare for a particular spacing between trees? The following comes from a booklet published in Colombia, *Cómo crecen los árboles*.

Distance Between Trees Trees per Hectare
in Meters

| | |
|-----------|-------|
| 2.0 x 2.0 | 2,500 |
| 2.5 x 2.5 | 1,600 |
| 3.0 x 3.0 | 1,111 |
| 4.0 x 4.0 | 625 |

KEEPING ELEPHANTS OUT OF THE FIELDS. I always imagined that elephant damage to a field was akin to hurricane danger at ECHO -- it could happen but it might be years before it does.

This view changed a few years ago when I visited Kristin Kroll at her Food for the Hungry project in Marsabit, Kenya. Her experimental plot of Buhrow's white desert sweet corn had been destroyed just before my visit. (It had been doing well and was almost ready to harvest, by the way). If I recall correctly, elephant damage was so prevalent that people seldom bothered growing crops. Elephants also can be dangerous. Two farmers and a little girl had been killed in the past year, I was told, when they accidentally came across elephants after dark.

Kristin was able to obtain a grant for an electric fence, which I understand admirably controlled the problem. But what alternatives are available where an electric fence is too expensive or might be stolen?

A Mennonite missionary told me that some 70 years ago in Tanzania the British government wanted to keep elephants north of an area where crops were grown. It was bounded on two sides by two large bodies of water, I believe he said about 30 miles apart. The government constructed a trench approximately 4 feet wide and 4 feet deep between the two bodies of water. Elephants reportedly are so large that they will not try to cross such a trench.

I mentioned this to Harrison Akabala from Kenya who recently visited ECHO. His face brightened and he said, "That is how farmers near the river keep hippopotamuses from their fields. They dig trenches."

Do any of our readers have first-hand knowledge of this technique, and how well it works, or of the old project in Tanzania? Someone told me that elephants will fill in a trench to cross to the other side. I can also imagine that if the land is sloping, the trenches could cause erosion. And if the land is flat, they might fill with water and lead to mosquito-born diseases or bilharzia. This is a problem I never expect to face at ECHO, so I would love to hear from those with experience. (See EDN 18-1 for another method to keep elephants from the garden.)

CAN YOU HELP US?

1. We are trying to gauge the degree of interest that might be shown in a Spanish version of *Echo Development Notes*. How would your group use it? How many copies? Do you know of other groups that would use it? We basically assume the typical EDN reader has a college degree in some subject. It is not written for farmers, but for extension agents, teachers and scientists who work with small farmers.

2. A reporter asked me this morning, "What specific human benefits can you point to from 13 years of work?" This is an important question, and one that we cannot answer ourselves. We do have many report forms returned after harvest of the seeds we have sent out. But these are always sent as soon as the first harvest results are known -- long before there has been time to see any human impact.

You could be an enormous help to us if you have had any long-term success with any idea or plant that ECHO has sent or brought to your attention. The more precise you can be as to how this has affected or will affect people the more helpful this will be to us.

FOR YOUR INTEREST ONLY.

[The following is based on an article in *International Agricultural Development* July/August 1994.] Research aimed at transferring the "apomixis" gene from a wild grass into rice could result in farmers being able to save seed year after year from hybrid plants. Normally the special traits that cause farmers to purchase hybrid seeds are lost if seed from that crop are saved and planted and yields may be low and unreliable. "Plants with the apomixis gene are able to reproduce *asexually* through their own seeds" (i. e. without cross-pollination). So these seeds would be identical to the original hybrid seed. "Although the apomixis gene occurs in around 300 wild plants, it is rare in crops of economic importance. Wild plants are so different that scientists have had little success in transferring their genes into domesticated crops."

Scientists at CIAT in Colombia have identified "markers" for apomixis in a grass called brachiaria and confirmed that in this grass a single dominant gene controls apomixis ("This is a little like finding the road signs.") When the gene is found, the next step is to clone it into unrelated crops. "Cloning may take 3-5 years."

NEW ADDITIONS TO ECHO'S SEEDBANK

ECHO is currently expanding our range of forages, cover crops, and green manures. Upcoming issue(s) of EDN will cover some of these in more depth, but for now we will list the new seeds in our seedbank. Up to 5 trial packets available free to development workers; others please include \$2.50 per packet.

The following leguminous forages have been provided to ECHO by Frank Sauer & Sons P/L, P.O. Box 117, Rockhampton 4700, Queensland, Australia, distributors of grass and legume seeds suitable for tropical pastures. Larger quantities of these seeds and many other species are available from this company; write them for their current catalogue and seed list. ECHO will be eager to learn the results of your trials.

Greenleaf desmodium, *Desmodium intortum*: perennial, grows well in cool temperatures, flowers in short days, tolerant of acidic and poorly drained or waterlogged soils and drought, 890-1270 mm annual rainfall. **Sirat**, *Macroptilium atropurpureum*: deep-rooted perennial; very tolerant of drought, heat, and wide range of soils; establishes quickly; persistent even under heavy grazing; 760-1780 mm rain. **Forage peanut**, *Arachis hypogea* 'Pinto': persistent perennial for well-drained soils of moderate fertility, >1000 mm rain. **American joint vetch**, *Aeschynomene americana* 'Lee': short-lived perennial for wetland regions and waterlogged areas, also used as a green manure, >1000 mm rain. **Centurion**, *Centrosema pascuorum* 'Cavalcade': annual for seasonally dry tropics, extremely drought tolerant, survives seasonal flooding, requires high growing season temperatures, 700-1500 mm rain. **Glycine**, *Neonotonia wightii*: perennial, needs moderately fertile soils and good drainage, not tolerant of

acidic or waterlogged soils, 760-1525 mm rain; 'Cooper' is early flowering, vigorous, drought resistant; 'Malawi' is slower to establish but withstands heavy grazing and adverse conditions in poor soils. Stylo: **Common Stylo**, *Stylosanthes guianensis* 'Cook': suited to warm humid zones, tolerant of acidic, poorly drained soils of low fertility, variable palatability to animals, vigorous, high-yielding, >1525 mm rain; **Caribbean Stylo**, *S. hamata* 'Verano': heat-loving, drought tolerant, 600-1700 mm rain, not for cool areas or altitude over 300 m or latitude over 20°; **Shrubby Stylo**, *S. scabra* 'Seca': hardy perennial with deep tap root, extremely tolerant of drought and infertile soils, >500 mm rain.

The following seeds are new to the seedbank; several will only be available for a limited time until our supply runs out. Limited to Third World orders.

Burmese '**Salay Zee Thee**' **Jujube** fruit, *Ziziphus* sp.: reportedly a superior variety, prolific bearer, thorny, may be cold, drought, and flood tolerant; very limited quantity. **Cherokee red clover**, *Trifolium pratense*: warm [not hot]-climate clover suitable for tropical highlands. *Sesbania grandiflora*: fast-growing tree even on waterlogged sites; good fodder, green manure; edible leaves and flowers. *Sesbania rostrata*: annual shrub, green manure, exceptional at fixing nitrogen (forms nodules on stems), best in hot rainy season on waterlogged soils. *Cratylia argentea*: shrub legume well adapted to very acidic soils of low fertility, grows and establishes quickly, drought tolerant; palatable forage if leaves are wilted for a few hours after cutting.

ECHOS FROM OUR NETWORK

Alfredo Petrov, Cochabamba, Bolivia shares his experience in controlling leaf-cutter ants, in response to our question in EDN 46-5. "I work in a semi-arid valley, 2,700 meters above sea level. Leaf-cutter ants have defoliated our peach trees, rose bushes, potato fields and tree plantation seedlings. So they are not only a problem of the humid tropics.

"The best protection for tall plants with narrow stems, such as roses or young peach trees, is loosely-wadded sheep wool tied around the stem! Ants don't like to cross it and it is almost totally effective. Local sheep conveniently deposit the necessary tufts of wool on our barbed wire fences. This method is not practical for older trees with thick trunks or for tree nurseries with thousands of seedlings.

"For trees with thick trunks, merely whitewashing a section of the trunk with lime seems to somewhat reduce leaf-cutter damage. We mix the lime with mucilaginous cactus (*Opuntia* sp.) juice to help it stick on longer. Perhaps the black ants don't like to cross the contrasting white background, which makes their black march easily visible to predators?

"Several Bolivians have recommended wrapping fruit tree trunks with sticky tape, sticky side outward. I haven't found this to be very practical; in our intense mountain sunshine it doesn't last long -- the tape soon dries out and turns brittle. There is a sticky liquid sold in the USA for painting on tree trunks to trap crawling pests called "Tanglefoot". Does anyone have more information on this? [Ed: This product is indeed very sticky, not affected by temperature or weather, and very effective at trapping insects until it traps a lot of dirt and no longer has a sticky surface. It does not dry out and can last several months. The price in one U.S. catalogue is \$25/5 lbs--not exactly inexpensive; does anyone have experience with alternatives? See EDN 26-3 for description of using STP oil treatment as a substitute.]

"One local person suggested that I protect prized plants with a circle of sugar poured on the ground around the stem. I don't know why this would work, and haven't been desperate enough to try it yet. One successful elderly farmer has effectively protected his potato field with a barrier strip of organic debris taken from distant ant colonies. Presumably the ants avoid the smell of ants from other ant colonies.

"The other philosophy is to find the local ant colonies and kill them, instead of protecting the plants directly. This is usually done by sprinkling powerful insecticide powders around the entrance holes, a practice to which I am ecologically opposed. Since human urine contains a fungicide, I tried attacking a colony's fungus garden by pouring urine down the entrance hole. It did get rid of the colony, but took several applications a day for eight

days -- too much trouble for more than one colony."

James Gordley, Panama. "I am having great results with New Zealand spinach, *Tetragonia tetragonioides*. [Ed: This is a popular spinach substitute in hot parts of the USA. Because most seed catalogs carry the seed, ECHO does not handle it.] By tying it up on chicken wire it takes very little space and the leaves are kept off of the ground. Before using the wire I had trouble with mold growing on the underside of the leaves. Not anymore. I also find it helpful to use a straw mulch around the plants, especially during hard tropical rain storms to keep the leaves from being splashed with mud. The muddy leaves also become diseased. With the mulch and wire, neither are problems. I harvest the leaves and allow the stalk to remain on the wire. Within days new leaves have grown out and one cannot see where the leaves were removed. We clean the leaves then soak for three minutes in a solution of 1 tablespoon of 3% hydrogen peroxide in 1 quart of water. There is no aftertaste from the peroxide."

Fr. Gerold Rupper, Tanzania. Concerning mothers with insufficient milk for nursing (EDN 43-3), "This was the problem which led to the introduction of soy beans into southern Tanzania. But the scheme is only succeeding because we were fortunate to get the solution for making pure soy flour without any nasty taste -- remove the hulls (skin). The flour tastes like chocolate. It keeps fresh for at least one month under our conditions. It is true that the milk does not keep long, but this is the case with any milk."

More about monkeys (EDN 38-6 and 43-6). "After all you have to kill them if you do not want to simply drive them away from your own field into your neighbor's farm. The common method in this part of Africa is to locate the herd of monkeys. Then you fix a large net on trees for a length of 30 meters. The 'killers' hide themselves behind thick trees with knob-kerries (sticks with knobs). Another group of men, in the very early dawn, chase the herd toward the net. They bypass the trees with the men in hiding, arrive at the net, try to climb it, and are caught in its meshes. They are then killed by the men with knob-kerries. The tribesmen hired for this cruel work get to eat the monkeys." Fr. Rupper prefers using borders of sunn hemp (see EDN 36-7) to protect his own field.

Paul and Stephanie Whitney, Tanzania. "We've been using the rat trap idea from EDN 20-1. Boy have we caught some whoppers!! It's neat to have such practical ideas."

UPCOMING EVENTS

International Training Program in New Crops: Aromatic and Medicinal Plants, June 19-30, 1995. It will be held at Purdue University. The \$1,800 registration includes field trips, notebooks and field supplies. Lodging at Purdue is not included. We list half of the 18 topics to be covered: Collection, preservation and propagation of native and wild plants. Development of appropriate agricultural production systems. Processing and extraction of secondary products. Medicinal compound extraction, isolation and identification. Natural product chemistry. Tissue culture for micropropagation and natural product production. Quality control. Marketing. Economics and budgets for new crops. Developing industrial - government - farmer partnerships. For information write Continuing Education Business Office, Purdue University, 1586 Stewart Center, Room 116, West Lafayette, IN 47907-1586. Phone 317/494-7220, fax 317/494-0567.

An International Conference on Tropical Bees and the Environment will be held March 11-15, 1995 at Pedu Lake, Kedah, Malaysia. Participants will visit the rainforest and see traditional honey-gathering methods before the conference. The themes of the conference include the link between apiculture and a healthy ecosystem, bee research, indigenous knowledge on sustainable beekeeping, and the biological diversity of tropical bees. The registration fee of \$150 USD does not include hotel accommodation (\$35-50 per person per day). Registration forms and further information can be supplied by Dr. Markhdzir Mardan, Beenet Asia Secretariat, Plant Protection Department, Universiti Pertanian Malaysia, 43400 UPM Serdang, Selangor D.E., Malaysia; fax: 60-3-948-3745 or -2507.

The Appropriate Technology Institute offers 15-week training modules at Providence Farm in North Carolina. A ministry of United World Mission, ATI prepares missionaries to use technology appropriately as they assist in church planting movements. The 15-week courses run March 18-June 30 and July 29-November 10 in 1995, and

the time is devoted to spiritual, cross-cultural and technical preparation for overseas living in the areas of appropriate technologies, food production, community health systems, and graphic communications. Participants examine a holistic approach to development (sprinkled throughout the other courses) and experience community living in an isolated setting throughout the course.

The extensive readings and the technical preparation in the curriculum cover most aspects of village living a missionary is likely to encounter overseas. Instructors for each module are highly qualified, and the learning is largely hands-on. Those not able to participate in the full curriculum can take one or more of the modules (each lasts about a month). Total cost for the full 15-week program is approximately \$1800/couple, \$1000 single. They also offer 2-week intensive courses in missionary medicine (in June and November during 1995). These are designed to prepare students to use the *Village Medical Manual* as a diagnostic tool for common health issues in developing countries. Total cost of the medical course is \$362 per person.

Write Appropriate Technology Institute, P.O. Box 250, Union Mills, NC 28167 USA; telephone: (704) 738-3891; fax: (704) 287-0580.

BOOKS AND OTHER RESOURCES

CULTIVOS ANDINOS SUBEXPLORADOS Y SU APORTE A LA ALIMENTACION, by Mario Tapia, FAO. 205 pages, Spanish only. (Reviewed by Hugo Valverde, ECHO intern.) This book was prepared by the FAO to provide practical knowledge of Andean ecology and agriculture, the domestication of Andean species and agricultural techniques used to grow these plants, agroindustrial potential, and their nutritional value and use. The task of the book is to provide a base to develop and improve underexploited Andean crops.

The book begins with a brief history of the domestication of Andean plants. There are listings of wild relatives of modern Andean crops and the plants cultivated at the time of the Spanish invasion. The book also contains ecological classifications of different areas of the Andes, and the elevations at which the principal Andean plants are grown. However, most of the book provides detailed information of principal Andean cereal, tuber, and root crops (quinoa, kañiwa, amaranth, tarwi, oca, ulluco, isaño, arracacha, yacon, maca, and chago). For each crop there is a botanical description, comparison of varieties, cultivation and rotational practices, pests and diseases, brief harvesting and storage techniques, uses, and nutritional value tables. The book contains excellent color pictures and diagrams of the different Andean species. The cereal crops quinoa, kañiwa, amaranth, and tarwi receive more attention than many others. The author briefly explains indigenous and mechanized practices to remove toxins present in some plants. He also devotes a chapter to the commercial development of underexploited Andean crops so that indigenous people might benefit from growing their native plants.

The book is written for people who conduct research oriented toward larger-scale development in the Andes. However, the book could be helpful to anyone planning to or currently working in the Andes in agriculture or nutrition. For anyone interested in introducing Andean crops into their own communities, it is a good starting point with many references. It is only available in Spanish. Available free upon request from Dr. Cecilio Morón, Oficial Regional de Política Alimentaria y Nutrición, Oficina Regional de la FAO para América Latina y el Caribe, Casilla 10095, Santiago, Chile; fax (56-2) 2182547.

LIVESTOCK FOR A SMALL EARTH: The role of animals in a just and sustainable world. Ed. by Jerry Aaker. 111 pages. The authors are all staff at Heifer Project International (HPI), which provides technical training, livestock, and organizational assistance to rural community groups in developing areas. They present a theory and process of sustainable rural development which includes animals in the system because of their many benefits to the small farm family. Dotted with insights and case histories from HPI's fifty years of experience around the world, the text is a readable blend of facts and ideas. Emphasis is given to the ecological and social facets of the work, although the book also provides practical suggestions for the beginner in village-level sustainable animal agriculture. It includes ideas developed by HPI such as "passing on the gift," in which recipients of female animals are required to give an offspring to another family in the community, and its implementation in several cultures.

There is an extensive bibliography on sustainable agriculture, rural development, and technical manuals on animal husbandry and related topics. This is an extremely useful book for a broad spectrum of people, from development workers to policy makers, who want to understand the key role of livestock in both the tangible and intangible sides

of community development. Further information about HPI and copies of the book (send \$10; includes shipping) are available from Heifer Project International, 1015 S. Louisiana St., Little Rock, AR 72202, USA.

Educational and Training Opportunities in Sustainable Agriculture, 7th ed., Dec. 1994. This USDA educational booklet lists over 100 programs for those interested in studying or gaining experience through university programs, farms, and other organizations in the U.S. and Canada. The institution, contact person, and a brief description of the programs offered are listed. The booklet is available at no cost from Alternative Farming Systems Information Center, National Agricultural Library, Room 304, 10301 Baltimore Blvd., Beltsville, MD 20705-2351; telephone: (301) 504-6559; fax: (301) 504-6409.

THIS ISSUE is copyrighted 1995. Subscriptions are \$10 per year (\$5 for students). Persons working with small farmers or urban gardeners in the Third World should request an application for a free subscription. Issues through #35 in a binder, *EDN: the First Ten Years*, costs \$20 plus air postage: \$3.00 USA (surface), \$6 Latin America, \$10 Europe, \$13 elsewhere. Issues 36-47 cost \$15, postage paid. ECHO is a non-profit, Christian organization that helps you to help the poor in the Third World to grow food.

The \$2,500 cost of producing and mailing this issue is covered by a gift in loving memory of William and Esther Haskell by their son Dale Haskell (a past ECHO intern).

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