ECHO DEVELOPMENT NOTES 17430 Durrance Road, North
Fort Myers, FL 33917-2239
Phone: (941) 543-3246, Fax: (941) 543-5317
Email: 74172.370@compuserve.com

ISSUE 50 **October 1995** **EDITED BY MARTIN L. PRICE AND LAURA S. MEITZNER**

IMPROVING BACKYARD CHICKEN PRODUCTION. "Probably more people are directly involved in chicken production throughout the world than in any other single agricultural enterprise," according to Dr. John Bishop, a poultry specialist who has worked extensively in Latin America and Africa to improve the production of traditional small-farm poultry. Maintaining and improving the productivity of backyard chicken flocks is important for the well-being of rural families.

Backyard producers value chickens for their adaptability, contributions to the family's income and nutrition, and for insect control and fertilizers in the garden. In most family flocks, chickens scavenge plant or food residues and insects around the home. With minimal care, they can hatch and raise chicks, produce high-value meat, and give eggs which meet a strategic nutritional need of children. Live chickens sold for meat bring a good price and are a primary source of household income. (This is why "new" fowl are not always quick to catch on in village settings: farmers raise chickens because they sell easily in markets--not primarily for home use or egg production--and it would be harder to sell more unusual birds.)

"The efficiency of backyard animal production lies in the fact that it utilizes excess family labor and surplus on-farm feed" with few purchased inputs, so income from sale of the chickens is virtually all profit. High-input, large-scale poultry systems are obviously not suitable for family flocks, and even "transitional" systems of 200-300 birds which apply large-scale technologies (such as hatchery breeds, balanced feeds, and artificial lighting and brooding) to small farms are rarely successful.

It is extremely difficult for families to maintain flock numbers and replace birds which are lost or sold if they cannot produce chicks on their farm. Buying replacement chicks from a hatchery is expensive and can be disastrous for household chicken production. Hatchery birds may require artificial incubation, disease control measures, or special feeds not available on the small farm. All these effects are serious for the farm family, but the loss of hens' broodiness (readiness to set on eggs for hatching) is particularly serious.

When hatchery roosters cross with traditional hens, flocks can lose their ability to hatch and raise chicks in just one generation. In Ecuador, for example, the commercial hatcheries surrounding the cities may "dump" their extra birds (mostly roosters) in rural areas at low prices. While traditional ('criollo') hens are selected for broodiness, superior egg-laying hatchery varieties are not broody or show only incomplete broodiness, such as laying eggs but not setting consistently. This can quickly make the farmer dependent on buying incubated hatchery stock, which may not perform well in backyard conditions. People who substitute them for criollo birds may have little success with incubator hatching methods in areas of erratic electricity.

Farmers who have encountered this problem learn quickly. Dr. Bishop told of a worker in the Amazonian region of Ecuador who was improving a flock to share with local indigenous farmers. When the farmers saw one white bird they said, "We don't want to contaminate our flocks." They then told how a specialist gave them "superior" white roosters, and they had to get rid of their flocks and start over with chickens from tribes that had not participated. Broodiness is a key link in the small-scale poultry production system, since the producer sells hens, not eggs. Of criollo birds in a backyard management situation, only one third of a flock usually lay each day; one third laid the day before, and the other third are setting or caring for chicks.

Dr. Bishop suggested that development projects make it their policy to avoid dealing in hatchery birds (even traditional breeds like Rhode Island Reds have lost most of their ability to successfully hatch eggs) and purchased feeds. He named the following key elements for economically viable family poultry production. (1) Use small-scale production systems with low purchased inputs and minimized risk. (2) Choose appropriate breeding stock which can incubate and brood replacement chicks by natural reproduction. (3) Apply the fundamental pest and disease control practices outlined below.

Basic, inexpensive disease control markedly increases the survival and productivity of a family flock. Traditional chickens that are vaccinated and treated for common infections and parasites are usually hardy enough to thrive in backyard conditions. The following four preventive practices, given every three months, will eliminate most health problems in poultry flocks: vaccination in the eye for the Newcastle disease virus (which is highly infectious and can kill the whole flock), deworming for roundworms and tapeworms, dusting under wings for irritating external parasites such as lice, and treatment for chronic respiratory disease which lowers production.

As for nutrition, the main limiting factor in traditional production is inadequate energy in the feed available to backyard birds. Scavenging chickens can usually fulfill their protein, vitamin, and mineral requirements, but are unable to obtain sufficient energy for adequate growth and egg production. Small amounts of supplemental grains such as corn can yield impressive results in weight gain and egg production. It is often more profitable to convert surplus grain into eggs and birds for sale than to sell the grain directly, since in many areas a chicken sells for more than a whole sack of corn.

Consider a permanent flock stabilized at 12 adult hens and one rooster. The farmer could let one broody hen set per month with 10-12 eggs and thus produce at least 4 replacement chicks per month, after losses in incubation and brooding. A hen takes about 4 months to raise her chicks, so at any given time about 4 of the 12 permanent hens would be caring for chicks, leaving the other 8 hens for egg laying. Without supplemental energy feed, the farmer would probably only get 2 eggs per day. By feeding the twelve hens one pound of corn per day, the 8 laying hens will give an average of 4 eggs per day. This system would produce 4 replacement chicks and about 10 dozen eggs per month. For the farmer, the broody hens likely earn more by raising 4 chickens for sale than the value of 4 months of eggs.
Dr. Bishop says that where the traditional flocks have disappeared or are being eroded, it is necessary to establish **multiplier flocks** of appropriate breeding stock which can naturally incubate and brood replacement chicks. He has a foundation breeder flock in Ohio of "Triple Production Reds" (meat, eggs, and chicks), and can provide a limited supply of hatching eggs for a starter multiplier flock. He is the founding director of the nonprofit ministry Poultry Development Service, 11806 SR 347, Marysville, OH 43040; tel: 513/348-2344. For more information on this subject and details on the disease control measures, write to ECHO for Dr. Bishop's Technical Note "Chickens: Backyard Production in the Humid Tropics" (free to development workers; $2 for others). To inquire about receiving hatching eggs, contact Dr. Bishop directly at the above address.

LEAF CONCENTRATE (LC) is an extremely nutritious food used to alleviate malnutrition. The process of making LC separates the protein, vitamins, and minerals from the fibrous portion of fresh green leaves. LC can be made from by-product leaves of commercial vegetables (beets, broccoli, etc.) or even from productive forages or cover crops not normally used as human food. Incorporated into local recipes, it boosts the nutritional content of a variety of foods.

LC is very rich in vitamin A, iron, calcium, high-quality protein, and other key dietary elements. Green leaves are very efficient producers of these nutrients, and leaf products can be the lowest cost source of iron and vitamin A, critical nutrients often missing in poor diets. LC technology is most appropriate for nutrition programs with groups of children, pregnant or nursing women, or elderly people who suffer from dietary deficiencies. For a community project designed to supplement children's diets, mechanized equipment costs about US$1500.

The basic process for making LC is to harvest and wash fresh leaves, grind them to a pulp, press juice from the pulp, bring the juice to a boil, separate out the curds which form in the heated juice, and press the liquid out of the curd. The solid portion of the mild-flavored curd is the leaf concentrate which can be added to traditional recipes fresh or preserved in various forms. David Kennedy of Leaf For Life (see below) visited ECHO and prepared some pasta using LC made from broccoli leaves (in a household blender) and flour; even the staff who ate only a small portion of this (green) pasta for lunch did not feel hungry for the rest of the afternoon due to the high protein content of the leaf concentrate.

One difficulty in introducing LC-enriched foods is that the concentrate imparts an intense green color to the foods. Considerable work on recipe development has been helpful. One recipe which can substantially increase the leaf nutrient intake by children takes advantage of the bright color: green LC lemonade. To make the syrup, dissolve two kilograms of sugar and 40 g of salt in 1 liter of lemon juice. Mix this into 1 kg of moist LC. The

mixture is ground or blended in a high speed mixer until smooth, then bottled. The concentrate is stable for months. Prepare the lemonade by mixing 30 ml of syrup in 200 ml of water. Combining the LC with a good source of vitamin C improves the body's absorption of the leaves' iron as well. A pitcher of LC lemonade made from moringa leaves was served at a recent dinner at ECHO. Most people seemed surprised at how tasty it was, though a few added extra sugar to reduce a "green grassy taste."

The organization Leaf For Life (called Find Your Feet in the UK) has been investigating and promoting LC for improved nutrition in tropical villages for thirty years. They also work with simpler techniques to better utilize leaf crops for food enrichment, such as drying leaves in ways that maintain more of their nutrients. They have a comprehensive, experience-based "Field manual for small scale leaf concentrate programs" (192 pp.) which details processing of LC, basic nutrition, information for evaluating and growing various leaf crop species, economic considerations in organizing a LC program, and recipes from around the world. The manual is available in English (Spanish translation in process) for US$20 within the US/$25 overseas surface mail from Leaf For Life, 260 Radford Hollow Road, Big Hill, KY 40405, USA; tel/fax: 606/986-5418. In the UK, contact Find Your Feet, 37/39 Great Guildford St., London, SE1 0ES; fax 44 1 71 261 9291.

THE WOOD-MIZER COMPANY HELPS CHRISTIAN MISSIONS AND SCHOOLS WITH PORTABLE SAWMILLS. In some parts of the world lumber is most expensive where trees are most abundant--in remote forested sites. Since these remote locations do not have processing equipment, logs are hauled away and lumber is hauled back.

For twelve years the Wood-Mizer Sawmill Company has helped missionaries and organized local Christian ministries who need wood for building schools and churches by donating half of the cost of a portable sawmill. They also like to see the local people reap more of the benefits from their own trees. One example is Pacific Island Ministries in Papua New Guinea (PNG). This mission, which has a school in a remote area, intends to establish a sawmill in each nearby village so they can produce their own lumber. These small sawmills can produce 500-800 board feet per day. The mission will buy some lumber from them for school construction, and the communities will market the rest.

The project began when the mission learned that Japanese businessmen had met with the community leaders. The missionary realized that if each community had a sawmill, it could easily make 10 times what the foreign companies were offering. And since the local people cherish their forest, they want to cut on a selected basis rather than clear-cut.

In another PNG community, Beechwood Ltd. bought logs as cheaply as 5¢ per board foot for sale within the country. They still went out of business because of the high cost of transporting logs out of the remote area. With a portable sawmill, people do not move the sawdust, water and slabs, but only dried lumber. Wood has two kinds of water, free and bound. Free water between the wood cells is 80-90% removed by a week or two of air drying. (A typical rainforest tree is 60-80% water, but the water content of air-dried boards is about 20%.) Bound or intracellular water is harder to remove, but this extra drying step, accomplished with solar kilns or other methods, can significantly increase the value of the lumber.

"Value added" is the key concept. The sawmills enable people to sell boards rather than rough logs, and well-dried boards bring an even better price. For this reason, solar kilns are also part of Wood-Mizer's donations program where appropriate (two 1500-board-ft kilns may be needed with each sawmill). For example, the cheapest sawn lumber might be worth 80¢-$1 per (air-dried) board foot when sold in country. Exotic species roughly sawn (not dried) might only bring 25¢, but may sell for at least $2-4 per board foot after solar kiln drying. At these prices, solar kiln-dried exotic species could even be profitably flown out of the area for export.

There are other situations where a lumber project could fit the goals of a development organization. Darryl Mortensen in Mexico wrote us this summer that a field survey by AMEXTRA, a Mexican development organization, turned up some incredible statistics. He writes, "200,000 trees have been ordered for the reforestation program in Chiapas. Many trees have been cut down ... to clear land for planting. A recent survey showed that there is salable lumber in logs that are just lying on farmland which farmers want to clear for crops. AMEXTRA is looking into ways to market this lumber rather than burning it, as there is sometimes more than $500 worth of lumber on a single farm which would be more income for the farmer than 2-3 years of planting

corn."

Envision the following scene. Fell a tall tree. After removing the branches, cut the tree into logs of the desired length, so the cut logs remain end-to-end. Carry the sawmill to the site and set up beside the first log. This 10-minute set-up involves fastening the mill to skids 10-12 feet (3-3.6 meters) long to give it stability. Two to three people roll the first log onto the mill with cant hooks. As soon as this log is sawn into lumber, slide the mill along the length of the tree to the second log. Repeat the process until the entire tree is sawn. If the log is on a hillside, place blocks under the mill to make it level before sawing. Stack the boards criss-crossed (X) against a strong tree for 10-12 days to air-dry before carrying them out of the area, perhaps to the site of the solar kiln.
How portable is the sawmill? Wood-Mizer makes many models of portable sawmills, any of which can be transported where there is a road. For really difficult sites, they recommend the LT20 (see photo), a model that is no longer produced, but which the company occasionally takes in on trades. It can be dismantled and put in the back of a truck in 10 minutes. The heaviest piece is 67 pounds. Twelve people can carry the sawmill and accessories into off-road sites; some have been carried as far as 15 miles.
"One of our questions before giving a sawmill is whether they know the local Forestry Department people. We require that recipients replant trees at a ratio of 100:1. Any Wood-Mizer sawmill and future parts and supplies are available at a 50% discount. Any non-profit organization actively involved in meeting human need may apply. Christian missions in developing countries are given priority. Decisive factors are the organization's goals and prospects for long-term use." The first step is to write Wood-Mizer to explain your program and how the sawmill would fit into it. If this meets the company's criteria, you will be sent a formal application. It could be three months to four years before you get the mill, depending on the waiting list. Even if you do not meet their donation criteria, any licensed, accredited educational institution can receive a 25% discount.

Coordinators of the sawmill donations program are Glen Munro and Dan Owens. You can write them at Wood-Mizer, 8180 West Tenth Street, Indianapolis, IN 46214-2400 USA. Phone 800/553-0182 or 317/271-1542; fax 317/273-1011.

IDEAS FOR CONTROLLING CHICKPEA POD BORER. (From *International Agricultural Development*, Jan/Feb 1994.) Chickpea leaves and pods exude extremely acidic (pH 2) droplets which repel most pests from attacking the plant. But recently the pod borer, which eats the contents of the pods, has become tolerant to the acid and has devastated crops in Asia. Pod borers have become resistant to many insecticides, and biological control is difficult because beneficial insects do not tolerate the acidic conditions.

Scientists at ICRISAT are breeding low-acid chickpeas and recommend wider planting which gives birds (like cattle egrets) paths to walk through the field to eat the caterpillars. Another creative way to control the pest is to intercrop the chickpeas with coriander, a commercial spice crop. Coriander has an umbel flower (like carrots or Queen Anne's Lace) which serves as a "platform" for predator insects to enjoy nectar and sun and an acid-free home from which they can attack the pod borer. Research showed that using these techniques enables Indian farmers to quadruple their chickpea yields.

CAPTURING WATER FROM FOG for household or agricultural use is a promising technology. It is not a new idea: African nomads and Andean people have long taken advantage of trees' natural water-catching properties by collecting morning dew or using the water trapped by forests. But now scientists around the world are working to enable more dryland communities to harvest the fog water in their regions.

The technology is simple: polypropylene meshes are set up vertically in areas with dense fog and light winds. As the fog passes through the mesh, the suspended water droplets are caught by the net and drip down into a collection trough and are channeled into a storage tank. Water captured by the nets is of excellent quality--fog is a long-term sustainable resource much more reliable in both availability and safety than groundwater in many areas. This technology is best suited to upland areas with persistent fogs that limit visibility to 100 m or less and light winds (about 10 km/h) needed to carry the fog through the mesh. The knitted polypropylene meshes known to be effective are inexpensive (about US$0.25 per m^2), durable, and available from many sources worldwide.

Last month, three ECHO staff visited one site just north of Quito, Ecuador, in which the water-catching nets have been successfully installed. The area near the Mitad del Mundo ("Middle of the World") equatorial monument is

a dry, eroded zone plagued by dust storms. Nearby is a fertile volcanic crater called Pululahua, an ecological reserve known for its unique vegetation. The people above the crater can see the near-constant fog from distant humid valleys which blows across the crater and over their dry land. A few years ago, trial fog collectors of 1 m^2 were erected on the ridge above the crater (at 2830 m elevation) to catch water droplets in the fog that passes through the nets. The trial collectors harvested up to 20 liters of water a day, with a daily annual average of 12 liters. Based on these results, sixty-three 4.5 m x 6 m mesh panels were set up on the ridge and are now capturing water for the nearby arid community.

Fog collection is one of the most hopeful water- harvesting technologies for certain zones. It is not suited to every area, however, and trial nets are a wise investment if you believe fog collection has promise in your area. Some limitations include very strong winds which can damage the collectors, not enough wind, insufficiently dense fog, and inaccessible sites. A collector (two vertical posts mounted in well-packed holes and anchored with strong cables, mesh secured with cables, and a plastic collection trough) with a 50 m^2 surface area could cost US$300-500, which could cost significantly less than buying water from trucks, for example.

Dr. Robert Schemenauer of Environment Canada is a cloud physicist and one of the primary researcher-promoters of fog collection. He sent ECHO some excellent publications on site evaluation for fog harvesting, clear details on how to set up a trial net, sources of meshes in various countries, and more. Write to ECHO for this introductory information if you see a potential for your area. Address more specific correspondence to Dr. Schemenauer at Atmospheric Environment Service, 4905 Dufferin St., Downsview, Ontario M3H 5T4 CANADA; fax: 416/739-4211. There will be a July 1998 conference on fog collection in Vancouver, BC, Canada; write Dr. Schemenauer or watch future *EDN*s for more details.

IS MORNING ALWAYS THE BEST TIME TO HARVEST VEGETABLES AND HERBS? Not in the case of basil. *National Gardening* magazine (July/August 1994) reports findings from a University of Michigan project that basil picked in the evening stored twice as long as basil picked in the morning. A possible explanation is that basil picked in the evening has just spent the day building up sugars. This may somehow help it to survive the shock of being cut longer than basil that has been actively growing all night (and using up sugars).

No extrapolation was made to other plants. In light of the magnitude of the effect, however, it might be worth checking the influence of harvest time on leafy vegetables or herbs if you are having trouble with storage life.

SHREDDED TIRES IN SOIL MIXES are gaining popularity. Recycled rubber seems an inexpensive addition to growing media, and in fact ECHO has tried this idea on some rooftop beds in the past without successful plant growth. The August 1994 *HortIdeas* cites research which found that chrysanthemums grown in soil mixes with even small proportions of shredded tires did not fare as well as plants in rubber-free media. The plants grown in rubber had zinc levels 74 times higher than normal, which could lead to toxicity levels for some species. For now it may be best to avoid using tires in your soil mix. If anyone in our network has more information or experience with using such mixes, please let us know.

ECHOS FROM OUR NETWORK

A RESEARCH IDEA: CAN AN ORGANIC CATERPILLAR CONTROL BE MADE IN A COCONUT? *Bacillus thuringiensis* is a common and effective organic method for control of caterpillars and other insects. Though not unusually expensive for an insecticide, its cost can be prohibitive to many small farmers. "BT," as it is sometimes called, is a living bacterium sprayed on plant leaves. Young, growing caterpillars can get a fatal intestinal disease after just one bite of a sprayed leaf. They usually stop feeding quickly and die in a day or so.

A technique has been developed in Peru for multiplying populations of a related *Bacillus thuringiensis* that is effective in killing mosquito larvae. This raises an interesting possibility that the BT used to kill caterpillars could be multiplied in the same manner. (We have been told that some commercial BT preparations contain the toxin rather than live bacteria. Obviously such preparations would be inappropriate for this technique.)

Mike Fennema, a former ECHO intern now with Food for the Hungry in Cambodia, shared with us a correspondence he had with Dr. Humberto Guerra of the Instituto de Medicina Tropical Alexander von Humboldt, Universidad Peruana Cayetano Heredia,
A.P. 4314, Lima 100, Peru (e-mail: hguerra@
upch.edu.pe) concerning the work. Some of our readers have access to a laboratory where they might be able to investigate this.

"Ripe coconuts that appear to be free of fungal infection are chosen. The area of the 'eyes' is cleared of coconut fibers with a stiff steel brush. A large nail, fitted with a handle, is dipped in alcohol and flamed using a lit candle. This is then used to perforate the coconut, using a twisting motion.

"The inoculum, containing some 10,000 bacteria, is introduced through the hole, then the hole is closed with a piece of cotton and sealed using wax drippings from the candle. The coconut is left at room temperature for 48-96 hours." Because their goal is to control mosquito larvae, the coconuts are cut open and the contents dispersed into ponds.

"The inoculum is being prepared in the laboratory under aseptic conditions. A better-equipped bacteriology lab is necessary, and toxicity tests should be performed. It is not recommended to pass the culture from coconut to coconut because a fungal or bacterial contaminant could appear and the *Bacillus* culture be lost. The toxicity test we use is to determine the LD_{50} of each preparation against mosquito larvae."

Mike Benge, USAID, Washington D. C. wrote in response to our article on alley cropping (EDN 49-1). "Many of the alley cropping systems ran into trouble with root competition when started with cuttings. Cuttings develop extensive lateral root systems, not true tap roots; however, they may develop pseudo tap roots. This causes severe competition for both moisture and nutrients. Gliricidia is a case in point. IITA started the alleys with Gliricidia cuttings, but after a while discontinued because of competition. They began to plant seedlings instead, which did not develop the extensive lateral roots, and found that competition was greatly reduced.

"From my observations in the field, once a tap root is cut, often it will not regenerate. Rather it develops a more extensive lateral root system, and pseudo tap roots, which never reach the depth of a true tap root. This is extremely important in water-stressed areas. I suspect that aerial pruning in root trainers may have a similar effect; however, I have seen no research to prove or disprove this assumption."

Mike also gave us an update on the damage to leucaena trees by the psyllid insect in Asia. "The introduction of the parasitic wasp seems to have reduced the damage down to a somewhat acceptable economical level. A survey in the Philippines conducted by WINROCK ... determined that leucaena is still the tree of choice by farmers. The leucaena systems heavily damaged in the past are recouping and are productive again in most places. ... I understand that the International Institute for Biological Control in England recently received funding for the biological control of the leucaena psyllid in Africa using the parasitic wasp."

James Gordley in Panama responded to the note on using trenches to control potato beetles (EDN 48-3) with an unusual experience of his own in Pennsylvania, USA. "I was experimenting with raising potatoes under different mulches. I would lay old carpet in my garden after working the ground in the spring. Every 30 cm I would cut a slit in the carpet and insert a seed potato. To my surprise there were no potato beetles on the plants growing through the carpet, while the plants in the next row (without carpet) had beetles on them. This was true for 3 years in a row. This method also produced potatoes 2 weeks ahead of my other plantings which were sown the same day.

"Another method for beetle control is to run a handful of the insects in some water through the blender. Strain the juice and add 1/2 cup to 1 gallon of water. Spray this solution on the infected plants. Within 2 days there were no more beetles on the plants, and I saw many dead beetles on the ground. The 'beetle concentrate' can be frozen in small portions and then used as needed."

UPCOMING EVENTS

Temperate Zone Fruits in the Tropics and Subtropics. The fifth international symposium will be held May 29 - June 1, 1996 in Adana, Turkey. Write TZFTS Symposium Secretariat, Dept. of Horticulture, Faculty of Agriculture, University of Cukurova, 01330 Balcali, Adana, Turkey.

5th International Mango Symposium will be held September 1-6, 1996 in Tel Aviv, Israel. "The symposium will cover all aspects of the mango industry including research, extension, management and marketing. Main topics for papers: botany and taxonomy, genetics and breeding, biotechnology, physiology and reproductive biology,

diseases and pest control, propagation and nursery practices, horticultural practices, post-harvest aspects, shipping, marketing, and economics. Registration before April 15, 1996: US$390; then US$450. For information write P. O. Box 29041, Tel Aviv 61290, Israel. Tel +972-3-5175149/50. Fax +972-3-5175155. E-mail Prof. Shmuel Gazit at AGRI.HUJI.AC.IL@compuserve.com.

BOOKS AND OTHER RESOURCES

Fruits of Warm Climates by Julia Morton is an authoritative source for information on sub/tropical fruits from around the world. Possibly our most-used reference book at ECHO, this 505-page hardcover book has comprehensive information, excellent photographs, and practical growing hints for over 150 well- and lesser-known fruits and related species. It offers regional names, complete information on varieties, food value and toxicities, propagation, harvesting and storage, and medicinal uses, etc. of the various fruits. It is an indispensable resource for anyone who works extensively with tropical fruit production. Order from ECHO for US$75 plus postage ($5.50 within the US; $10 to Canada or Mexico) by credit card or check drawn on a US bank. Due to the weight and value of this book, we cannot ship overseas.

Multipurpose Trees and Shrubs: Sources of Seeds and Innoculants (Reviewed by Scott Sherman). In EDN 35-6 we mentioned what a great help another book, *Cornucopia*, has been to us in tracking down sources of hard-to-find food plants. This book, written by Peter G. Von Carlowitz and published by ICRAF (International Centre for Research in Agroforestry), is just as helpful in locating seed sources of MPTs (multipurpose trees) and shrubs.

Chapter 1 is a 40-page table listing: species name, seed suppliers and quantities available, number of seeds/kg, typical germination rates, and seed pretreatments. Chapter 2 is a country-by-country listing of information on the suppliers mentioned in Chapter 1: address, phone, telex, cable and fax numbers, type of institution (governmental, commercial, research, etc.), documentation available, currencies accepted, and forms of payment.

Chapter 3 is divided into thirds: an overview of nitrogen-fixing bacteria and other beneficial micro-organisms, a table of host species and related information and a listing of inoculant suppliers. Chapters 1-3 end with an annotated bibliography of related readings. Chapter 4 has tables to help match the right tree or shrub with the right climate and use. The rest of the chapter is a comprehensive listing of species profiles from ICRAF's MPT database. Available (US$25 plus US$10 for surface mail; airmail rate supplied on request) from: Head of Information, ICRAF, P.O. Box 30677, Nairobi, KENYA.

Future Fertility: Transforming Human Waste into Human Wealth by John Beeby addresses a question many development workers face. "The soil here is so depleted and so few inputs are available. Is it safe to recycle human waste into our fields or gardens?" This book takes a careful look at the topic of processing human urine and manure so it may be *safely* added to the soil to sustain productivity. For those of you in areas where human waste is currently unmanaged and causes the spread of disease, this book may be very helpful in defining treatment options you could implement. Nine different methods for recycling manure (aquaculture, algae, solar heating, composting, trees, grains, etc.) are outlined and compared based on purification levels, resources required, and the value of the finished product as fertilizer. This book will answer many of your questions about how to manage a waste recycling system safely and effectively. The 164-page book is US$18.50 plus postage ($4.50 within the USA; others write for exact cost) from: Bountiful Gardens, 18001 Shafer Ranch Rd., Willits, CA 95490-9626, USA.

We recommend two books on **natural pest control** as valuable resources to have in the field. Most of you have encountered traditional crop protection strategies or sprays made from local plants to control pest outbreaks in the field or in stored products. These books compile clear, practical details on prevention and remedies for plant protection. **Natural Crop Protection based on Local Farm Resources in the Tropics and Subtropics** by Gaby Stoll (188 pages) offers many preventive and curative measures used effectively by farmers around the world. Primary pests in field or storage of major crops are described with host plants, distribution, life cycle, damage pattern, and various control measures. The methods of crop and storage protection include thorough information on over 27 insecticidal plant groups and brief mention of other substances and techniques. Available in English, French, German, Spanish, and Thai. Single copies are US$29 plus postage from: Margraf Verlag, Postfach 105, 97985 Weikersheim, Germany.

Natural Pest and Disease Control by Henry Elwell and Anita Maas (128 pages) is a comprehensive collection of strategies used by farmers in southern and central Africa. The book includes guidelines for prevention, many remedies for common problems, and plant names in five regional languages. The information on action, targets, detailed preparation and application, other uses, and warnings for over 66 cultivated and wild plants in insecticidal/repellent sprays is hard to find in other sources. One chapter on "miscellaneous substances and methods" gives details on using ash, milk, noise, baking soda, traps, etc. to control pests and disease. ECHO has a limited supply for US$12 (postage paid); send a check drawn on a US bank or your credit card number, expiration date, and your signature.

A Guide to Spanish-Language Sustainable Ag Publications (90 pages) has English abstracts of 74 easy-to-read publications in Spanish on sustainable farming. Availability and reading level for each

document are listed. Send a check or money order for $10 payable to "U.C. Regents" at University of California Sustainable Agriculture Research and Education Program, Davis, CA 95616-8716.

Correction on address for VITA publications from EDN 49-4: P.O. Box 605, Herndon, VA 22070, USA.

FOR YOUR INFORMATION

Looking for help? Each year ECHO graduates six interns. These folks come to ECHO after college for practical training in agricultural missions or development. Their year of learning on ECHO's farm through hands-on experience with plants and techniques for growing food in the tropics is followed by a cross-cultural experience in the developing world. Some attend graduate school after their internship while others leave directly for the field. We think highly of our interns and want them to find postions where their gifts and training can best be used. If you know of individuals or organizations with staffing needs that might be met by an ECHO graduate, please let us know.

Two International Agricultural Research Centers merge. The International Laboratory for Research on Animal Diseases (ILRAD) in Kenya and the International Livestock Centre for Africa (ILCA) have merged. The new entity is the International Livestock Research Institute (ILRI) and will be located in both Kenya and Ethiopia. The addresses will be P. O. Box 5689, Addis Ababa, Ethiopia and P.O. Box 30709, Nairobi, Kenya.

ECHO DEVELOPMENT NOTES -- ISSUE # 50

17430 DURRANCE ROAD
NORTH FORT MYERS, FL 33917-2239 U. S. A.
PHONE 941/543-3246 FAX 941/543-5317
EMAIL 74172.370@compuserve.com

ADDRESS CORRECTION REQUESTED.