

EDN ISSUE 15, JUNE 1986

15-1 HOW CAN WE KEEP ANIMALS FROM EATING TREE SEEDLINGS WHEN FARMERS PLANT LEUCAENA?

The following is adapted from a discussion of this problem in the March 1985 issue of the Heifer Project Exchange newsletter. (Free from Heifer Project, P. O. Box 808, Little Rock, AR 72203 USA).

(1) The nursery must be surrounded by a fence. An effective and inexpensive fence for goats can be built by cutting thorn bushes and stacking them around the nursery. (2) Convince farmers to control their animals before the project starts. This will be more easily done if they are told and believe that the trees will later be a renewable source of food for their animals. (3) Use the "bare-stem" transplanting method to help the seedlings survive grazing by animals. Follow these steps:

Start the nursery at least three months before the rainy season, so that the leucaena seedlings will be at least three feet tall when the rains begin. Soak the seed bed thoroughly before transplanting, so the seedlings can be pulled out of the soil easily. Strip all but the top leaves off the seedlings. If the uprooted seedlings will not be planted for over 12 hours, pack the roots in mud to keep them from drying out. Plant a high number of trees per acre (at least 3,000). Goats will be more likely to eat only the lower leaves and move on to the other trees when the planting is dense. It is better to develop a certain area well and expand the reforested area each rainy season than to spread the trees too thinly. There are three reasons for the success of this method. (1) Because the seedlings will have almost no leaves until the grass turns green, goats and other animals are less likely to be attracted to them. (2) The seedlings can better survive grazing because the root system is already quite well developed. (3) When the leaves start to appear, the seedling is tall enough that the lower branches can be grazed and the upper leaves will allow the tree to grow and establish itself.

15-1 WHEN CRAB BURROWS CAUSE WASHOUT OF CANALS. David Ramse asked what he could do about this plague of his work in Nepal. We passed the question on to Dr. Bryan Duncan at Auburn University's International Center for Aquaculture. "I have had to worry a lot about crabs in my coastal pond work, and know of no easy preventive measures. One simply has to patrol ones dikes, canals, etc. and stop crab activity as soon as it appears. Here are a few 'home remedies.' (1) Introduce quicklime, pesticides or other noxious substances into burrows. (2) Introduction of fine rice bran into borrows is said to foul the gills and cause suffocation. (3) Use a stick with a metal hook on the end to pull the crabs from the burrow. (4) Let your imagination be your guide." If any of you have a proven method let us know.

15-1 HANDY RULE OF THUMB FOR SEED STORAGE CONDITIONS. ECHO's expanding seedbank needs a new room for seed storage. I called Bob Heisey with Peto Seed Company (supplier to the major retail seed catalogs) to see what kind of special equipment we should try to obtain. He said that if one is only saving seed for a couple years (not for many years, as in projects to preserve rare varieties) he can use this rule of thumb to store on open shelving in an air-conditioned room. The rule is that the temperature in fahrenheit plus the relative humidity should be less than 100. For example, if I can afford to keep a room at 70 F I would need to get the relative humidity to 30 or lower. [For those who have forgotten the formula, you can convert centigrade to fahrenheit as follows: $F = 9/5 C + 32$]. If the humidity of the entire room cannot be lowered that far, you can store seed in airtight containers together with a desiccant to absorb excess moisture. Effective desiccants include charcoal, powdered milk, rice or other material which you have noticed absorbs water. The desiccant should first be dried at very low setting in an oven. We will probably follow this rule of thumb and use sealed containers with desiccant as well.

15-1 FLORIDA COOPERATIVE EXTENSION BULLETINS ON CITRUS. Ed Noyes in Zaire wrote us about problems he was having with citrus, wondering if extension bulletins in Florida covered the topic. This led us to Mr. Thomas Marler in the Fruit Crops Extension office. He sent a listing of 66 bulletins on citrus and 38 bulletins on subtropical fruits. ECHO will send you a photocopy of the listing upon request. Here are a few titles: Common Problems of Dooryard Citrus; Florida spray and dust schedule; Citrus Blight Diagnosis; Cold Hardy Citrus; Citrus Irrigation Management; Citrus Propagation; Florida Citrus Varieties. Mr. Marler expressed his willingness to send up to five bulletins at no cost to our readers as long as requests were carefully limited to only those few titles you most need. (I can speak from personal experience that organizations are usually hesitant to send literature if almost every publication is requested.)

15-2 ROY DANFORTH REPORTS SUCCESSFUL METHOD OF TAKING FRUIT TREES FROM THE STATES TO ZAIRE. We mentioned Roy's large collection of tropical fruit trees in issue #8. It is even larger now. He collected many potted trees while in the States this past winter. "In all I bare-rooted and bagged 315 trees, threw them into trunks and carried them for 4 1/2 days. I'm pleased to report that not one of them died in transport."

Here is Roy's procedure. (1) Shake the tree to remove most of the dirt from the roots. (2) Dip the roots in a bucket of clean water to rinse off the remaining dirt. (3) Spray the roots with a solution of 50% hydrogen peroxide and water, which releases oxygen for the plant to use in transit. (4) Shake off excess water, then slip a baggie [plastic sandwich bag] around the roots only and tie it tightly around the trunk. (5) Severely prune back [those trees which are too large for your suitcase], though do not remove leaves from what is left. Spray the leaves with an anti-transpirant. [Roy used Poly-Trap, but there are many on the market. They form a polymeric film around the leaves and reduce the loss of water by transpiration. They are used commercially to treat seedlings before setting them in the field to reduce shock]. (6) Use no medium, such as sphagnum moss, for the roots because it is unnecessary and causes a lot of fuss with the plant inspectors. (7) Do not place bags on the tops, as this will increase the possibility of rot. (8) Lay the trees in the trunk, making certain they will remain stationary by careful positioning and use of padding. "I was worried about the temperature during our overnight in Paris in February, but it apparently had no effect." Roy is generous in sharing seeds and cuttings. You can write him at B. P. 1377, Bangui, Central African Republic [that's not a mistake -- he does work in Zaire].

15-2 MORE ON USE OF OIL TO CONTROL INSECT PESTS IN STORED GRAIN. In issue #14 we reported the use of African palm and cotton seed oils to control bruchid beetles in stored common beans. The April 1986 issue of Agricultural Science Digest summarized a report in Agriculture, Ecosystems and Environment showing good control of rice weevils in stored corn (maize). Shelled corn was shaken with peanut, coconut or palm oils at a rate of 1, 5 and 10 ml of oil per kg of grain, until the grain was evenly coated. Adult weevils were then introduced. Most were killed within a day and all were dead within a week at the 5 and 10 ml/kg concentrations. Few eggs were laid and fewer offspring hatched. After 60 days the 10 ml treatment was reinfected with adult weevils. Again nearly all were dead within one day, except for the palm oil treatment. (Palm oil gave the best results in the earlier study). The oil treatment did not affect germination of treated seed corn, nor water uptake during cooking. Let us know your results.

15-2 CORRESPONDENCE STUDY IN AGRICULTURE. I have been asked where someone can do college-level agricultural study by correspondence. Some courses are offered by the University of Florida, Gainesville, FL 32601 USA). However, the most exhaustive set of courses I have come across is at the University of

Guelph. The diplomas in agriculture and diplomas in horticulture programs "were designed for any adult, regardless of educational background. A diploma can usually be completed in three years without interfering with your employment." "Students with less than 10 years of school may not be able to work this quickly". Fees range from \$35 to \$140, and average perhaps \$80 (Canadian money, so multiply by roughly 0.75). These are, of course, oriented for temperate climates. Here are a few of the course titles:

Diploma in Agriculture. Principles and practices of soil science, introductory agricultural economics, principles of animal nutrition, agricultural mathematics, forages, pork production, plant nutrition, dairy goat production, introductory apiculture (beekeeping), livestock biology and 13 others. Diploma in Horticulture. Introductory entomology and pathology, elementary plant propagation, nursery management, elementary greenhouse management, advanced greenhouse management, plant nutrition, land surveying and leveling, urban tree management, and 26 others. Several of the horticultural courses are related to landscaping, which may be less transferrable to most Third World settings. For information, write Independent Study, University of Guelph, South House, Guelph, Ontario, Canada, N1G 2W1

15-2 CAN THE TRYPSIN INHIBITOR IN SOYBEANS BE OVERCOME BY GERMINATING THE SEEDS? We discussed treatment of soybeans to inactivate the trypsin inhibitor prior to feeding to animals in issue 10. Someone wrote suggesting that sprouting might have the same effect without the need to use a heat treatment. We asked Dale Haskell at the University of Florida to check the literature for us and came up with an interesting article that looks at various methods of preparing soybeans for food, including sprouting, in the Journal of Plant Foods, 1983, 5, 31-37, (1983).

Whole soybeans were soaked in water at 50 degrees C for 3 hours, then allowed to germinate for 3 days, with a daily spray of water. Seed coats were discarded (I presume to make them more acceptable in human diets) and beans were dried in a hot air oven. The trypsin activity dropped from 107.5 in raw soybean to 59.7 in the germinated product. In a feeding trial with rats, rats fed a casein control (a milk product with exceptionally high quality protein) gained 64 grams in 4 weeks, rats fed raw soybeans gained 20.5 grams and rats fed germinated soybean gained 42.8 grams. Unfortunately the article did not test soybeans that had been treated for use in commercial animal feed, as that was not its purpose. This information would be very helpful. What is my conclusion? Without more information, I would suggest that heat treatment is clearly preferable, but sprouting is a lot better than using raw soybeans.

15-3 FIGHT MILDEW WITHOUT FUNGICIDES. The latest issue of The Avant Gardner newsletter reports that ordinary baking soda (sodium bicarbonate) has both prevented and cured powdery mildew on strawberries, eggplant and cucumbers when sprayed weekly at the rate of 1/4 ounce per gallon of water. Powdery mildew is a fungus disease of plants that is most common when days are warm and nights cool. The leaves have a readily visible powdery coating on top. Its incidence is increased by high humidity. In India, powdery mildew was controlled on pea plants by spraying every two weeks with garlic oil. (These generous folks gave us blanket permission to excerpt from their newsletter for your benefit. Their address is P. O. Box 489, New York, NY 10028, \$15 per year)

15-3 A TIP FOR MAKING CHINESE CABBAGE HEAD IN THE HEAT OF SUMMER. About a month after transplanting, all but the eight outside leaves are tied up, just as you would cauliflower, according to the same issue of The Avant Gardner. We have not tried it. Let me know what happens.

15-3 SOME OF MY MOST HELPFUL BOOKS. In this series I am reviewing older books that I find especially helpful in answering your questions. This time I feature tropical and subtropical fruit.

The Manual of Tropical and Subtropical Fruits by Wilson Popenoe is a classic. If you asked an expert on tropical and subtropical fruit to give the first name that comes to mind among experts in the field, I suspect most would name the late Wilson Popenoe. Because this book was published in 1920, a few items such as the discussions of varieties will not be very helpful. However, most of the information is as relevant today as ever.

Perhaps the best way to describe the book is to say that after you have mastered a chapter, you will feel that you have a real "feel" for the tree and have a lot to say about it. Let me jot down key sentences as I leaf through the 15 pages on guavas to give a hint of the kind of coverage: "The guava is used primarily for jelly-making and other cooking purposes." "It is one of the least exacting of all tropical fruits in cultural requirements." (He then quotes from the first written account of the guava followed by a botanical description of the tree). "The guava succeeds on nearly every type of soil." "Plants should be set 10-15 feet apart." "It is the custom to propagate by seed, but choice varieties must be perpetuated vegetatively." "Both shield budding and patch budding are successful." "A simple method of propagation is to cut the soil 2-3 feet from the tree, severing the roots. Sprouts will soon make their appearance. When they are of suitable size they may be transplanted, giving a tree exactly like the parent tree." "The guava is subject to numerous insect and fungus enemies." "Unlike the preceding species, the strawberry guava is subtropical and can be grown wherever citrus succeeds." (He then discusses similar things about this guava and proceeds to more briefly discuss the Costa Rican and three other guava species).

The book deliberately does not discuss the banana, coconut, pineapple, citrus, olive or fig. Any other important fruit tree is probably mentioned. Some are discussed in great detail (70 pages on the avocado, 65 pages on mango, 25 on papaya, etc.). Many trees are discussed in only one or a few paragraphs.

The 474 page reprint can be ordered from the McMillan Publishing Company, Front and Brown Street, Riverside, NJ 08075, USA. The cost of \$23.95 includes shipping within the US. Add postage for international shipments.

15-4 THE SCHOOL GARDEN MANUAL. I mentioned in an earlier issue that Save the Children would be offering this book, but now I have a copy. Co-author Marney Smith says it is now available in French and Spanish as well. This book incorporates gardening into the school program so as to enrich the curriculum at very little cost while also teaching students about growing food, an activity which can be so important in shaping their lives. Section I suggests ways to start a garden where none had been before. The children's involvement begins in Section II where basic gardening activities are taught. Each topic includes basic material to be taught and at least two activities for the children.

Section III uses the garden to teach science. For example, one activity when discussing pollination is to divide the class into two groups: pollinators and flowers. Tell each "flower" what kind of flower he is (large - small, fragrant or not, etc.). Whisper to each pollinator what kind he represents (bee, butterfly, wind etc.). Have the two groups mingle until each pollinator has found its right flower. There can be more than one pollinator per flower. In the next activity the pollinators go outside and look for a real flower they would like, etc.

Section IV uses the garden to teach nutrition and section V looks more deeply into soil tests, cover crops, insect control, companion planting and water management.

Marney would be happy to send a copy to folks who can use it in the Third World. Specify language desired. This is still at the trial stage. You could be a great help to her if you would pass on your comments about how students responded. You may come up with your own creative activities that go over especially well with the students. If so, she might wish to incorporate them into the next edition. Write to Marney Smith at Save the Children, 54 Wilton Rd, P. O. Box 950, Westport, CT 06881 USA. (Be sure to keep their address. I cannot find it in the book).

15-4 THE SOLO PAPAYAS ARE GREAT, BUT.... We received a request from Honduras wanting to know where they could purchase several pounds of solo papaya seeds. Solo papayas have two (at least) special characteristics: (1) Each tree produces fruit, so you do not have to worry about whether a tree is a male or female and (2) the fruit are about the size of a grapefruit, about the right size for one meal and by far the most popular size in the U. S. market.

I understand the urgency to grow something on a large scale and take advantage of an export market. However, as a scientist I am always cautious about doing anything on a large scale until the new species or variety has been tried under local conditions. The solo papaya is at special risk, including the definite possibility of a serious crop failure. Though a failure might not occur right away, it would always be a threat. I called Dr. Carl Campbell at the University of Florida experiment station for more details.

Dr. Campbell said that papaya ring spot disease is a serious problem here in Florida and is definitely present in Honduras. Because the solo types are so popular on the export market, people are planting them in the Caribbean in spite of the threat of disease, but may have to cut them down and replant every year or two. They apparently think the superior market price is worth it.

There is a resistant variety, however, called the Cariflora. It was developed at the experiment station in Florida. Dr. List, the man in charge of this research, said there is heavy disease pressure in Central America, both with the ring spot and a couple other viruses. Solo papayas do not do well there at all. He has only seen virus-free solo papayas in one location in Central America (in Costa Rica). He felt our friend would probably not even get a crop. One man in Costa Rica who brought in many varieties to try had to cut down the solo varieties without a harvest.

Because these virus diseases seem to attack cucurbits (e. g. cucumber), it may be difficult to grow solo papayas if there are serious cucurbit virus diseases in the area. Ordinary solo papayas have been taken out of production now in Taiwan. They now grow only the Cariflora. It is about grapefruit size, neither as small nor as sweet as the solo. However, it is close to the general size demanded in U. S. markets.

Unfortunately he knows of no commercial source for seeds. He sent us a packet to increase. We can spare a very small packet for a few of you who would like to try the Cariflora. As usual there is no charge to those working with small farmers or urban gardeners in the Third world. If we run out we will put you on a wait list and hope the warm winters return to Florida so that we can get papaya harvests again. By the way, the regular solo papayas do great for us here in southwest Florida and just might for you as well. You can order seed inexpensively from the Richard Sakuoka, Dept. of Horticulture, University of Hawaii, St. John Plant Science Building, 3190 Maile Way, Room 112, Honolulu, Hawaii, 96822, USA.

15-5 COMING EVENTS. AQUACULTURE: Dr. Andy Duncan writes that a short course "Water Harvesting in Ponds and Integrated Aquaculture / Agriculture for Village Development" will be held at Auburn University (Auburn, Alabama) August 25-29, 1986. The course is designed for administrative and program staff of PVO's. No technical background is assumed. The purpose is to make development practitioners aware of the potential and provide sufficient information to make preliminary assessments of aquaculture projects. Water harvesting refers to collecting (harvesting) water, to be used as desired. Registration for most groups is \$50. Transportation, meals, and housing are extra. I attended this course a couple years ago and found it quite stimulating. **ORGANIC AGRICULTURE:** The International Federation of Organic Agriculture Movements will hold its annual conference in the USA in Santa Cruz, California August 18-21. Judging by the partial conference program, the conference will be similar to other scientific conferences (22 of the 31 papers appear to be presented by university professors, with most of the rest coming from institutions of various kinds). Registration is \$140 (\$165 after July 15). Write to IFOAM Conference, Agroecology Program, university of California, Santa Cruz, CA 95064, USA. Thanks to Grant McQuate at Kokokahi Hunger Mission Model for calling this to our attention.

15-5 SOME IDEAS TO HELP FARMERS MAKE MORE MONEY SELLING VEGETABLES TO THEIR NEIGHBORS.

We had an especially enjoyable visit from Joshua Tsujimoto. Joshua retired early after a career as a commercial vegetable grower in New York to become an agricultural advisor with World Relief in Bangladesh. Though he could think of some things that might increase yields, he faced a serious dilemma. Crops are planted near the end of the rains in the fall. Consequently, all growers come to market at the same time in the spring, causing a large surplus and forcing prices to unprofitable levels. If he helped them increase yields it would only cause an even greater oversupply.

His solution was to develop techniques to grow vegetables out of their normal season. Farmers who could come to market even a few weeks before or after the normal season would get premium prices and provide much needed vegetables when they were not available to the population.

Joshua begins by making very high raised beds just before the rains begin. This ensures plenty of oxygen will be available to the roots. Then he constructs a "rain umbrella". This is a shelter made from 1.25 cm (1/2 inch) thick bamboo hoops placed one meter apart on top of the bed and covered with a one meter wide sheet of clear polyethylene plastic. This protects the soil from puddling and erosion in the monsoon rains. The leaves of plants are also less susceptible to disease because they are not wet so much of the time. It is also a helpful mini-greenhouse where farmers can grow their own seedlings. (The erosion and heavy pounding of the rains make it difficult to start seedlings).

The same structure also serves as a "sun umbrella", unless the plants get too large. "As tomato vines became too large under the plastic shelter, we began to train them to grow outside on top of the 'umbrella'. Where the row was under a banyon tree the growth was still normal, but in the full sun the growing tips were stunted, leaves curled and puckered and showing symptoms which everyone had always assumed were caused by viral diseases. We now know it is caused by the intense direct sunlight. We are planting leucaena trees 3 meters apart in both directions to provide shade. Until the leucaena trees are large enough to provide light shade, the plastic structures can be redesigned to handle larger plants." When they are new it may be necessary to make them more opaque by painting the underside with muddy water, but soon the intense sun will make the plastic itself sufficiently cloudy.

The book Growing Vegetables in Fiji by Kirk Dahlgren that ECHO reprinted (\$4 plus postage of \$1 surface / \$3.50 airmail) has a chapter on growing vegetables under plastic. The main work there has been with tomatoes, but there are many possibilities. "A wide variety of vegetables can be grown in the off-season. Heat-tolerant varieties of cauliflower form tight curds when protected from rain and direct sunlight. Heat tolerant cabbage forms good heads under plastic. Lettuce forms large and relatively tight heads with no bitterness. French beans also grow well."

I was especially intrigued by the seedling starting pots Joshua makes from leaves. When I was a less experienced gardener I would dig seedlings up by the roots for transplanting. The resulting root damage set the plants back considerably. This damage would have been even more serious had I been planting them into intense tropical sun. Now I use the familiar 6-pack where the entire root ball can be removed and set in the soil without disturbing the roots at all. If the soil is kept moist the plant should not even wilt. Similarly, one can purchase peat cubes in which seeds are started and the entire container is planted in the soil. The leaf seedling pots serve the same purpose as the peat cubes. Joshua says this one simple trick can give farmers about a two weeks earlier maturity.

He uses a leaf from a banyan tree and curls it into the shape of an ice cream cone (see drawing and picture). If you do not have banyan trees, you can find some local leaf that will give the same shape, perhaps after cutting with scissors. The outer flap is pinned into place with one-half of a bamboo tooth pick. It is important that the new pots be nested into each other. This ensures that as the pots dry they will remain perfectly round. With a little practice a person can make 100 an hour. Sometimes people come to him with financial needs that he wants to help. He finds it a convenient way to pay them so much for making a few hundred of these pots.

When needed the pots are nearly filled with moist soil, leaving enough space to hold enough water to soak the soil when watering. The pot and all can be planted in the field. Be sure that the leaf is entirely covered with soil or it might act as a wick and pull moisture from the soil.