

**14-1 THE HAITI MIX FOR STARTING SEEDLINGS.** Many formulas for artificial potting soil give outstanding results when starting vegetable, flower or tree seedlings. The problem is that ingredients are expensive or not available in many locations. For example, at ECHO we start our seeds in a 1:1:1 mixture of peat moss, perlite and vermiculite. When Tom Post in Belize asked about using sugar cane for such a mix I asked Jerry Larson with Double Harvest in Haiti about their experience. In the process of growing millions of tree seedlings, they have acquired a lot of experience with what they now call the "Haiti mix." His comments follow.

The basic ingredients are 5 parts sugarcane bagasse, 1 part rice hulls and 1 part sandy loam soil. Before they are mixed the sugarcane bagasse must be well decomposed. The best indicator is the color. Bagasse with a light yellow color has decomposed very little and must not be used. As decomposition proceeds the color goes through shades of red to dark brown or almost black. A dark cinnamon red color verging on brown indicates that the bagasse is acceptable, but the darker color is preferable. It is important that no undecomposed bagasse get into the mix.

The decomposed bagasse is finely shredded in a silage chopper and mixed with the other ingredients. A heating and sterilization process is initiated by adding urea to the mix at the rate of 1 pound per cubic meter of mix. [Ed: If you do not have urea, I would imagine other nitrogen sources could be used. Even ordinary fertilizer could probably be used, but it would make control of nutrients in the final mix less precise]. There is usually sufficient moisture in the bagasse to "kick off" the heating process. Within 2-3 days the temperature in the center should be about 145 degrees F [62 degrees C]. Next the pile is turned inside out so that all parts will be heated equally. After just one more day the pile is flattened and packed down to stop the heating process. At this point the mix is in an unstable state and thorough packing is necessary if the heating process is to be controlled. Continued heating not only burns up nutrient value in the mix but, if allowed to continue unchecked, will chemically alter the mix and make it toxic to plants.

An effective method of packing is to drive over the flattened pile with a tractor. After that the pile can be left for several weeks or months with no damage. If the pile cannot be packed that tightly and if it is to be used within a short time span (several days), then it is permissible to have several men pack it by walking over it until it is as tightly packed as they can get it. Just before the mix is used, it is passed through a 3/8 inch hardware cloth to remove the larger particles. Five to 6 pounds of 12-35-24 fertilizer (depending on the stage of decomposition of the bagasse) is added per cubic meter along with 2 ounces of F-5-3 micronutrients. The mix should be used immediately because the fertilizer will otherwise cause it to heat up again and alter the nutrient balance. In this last stage, only as much mix as is going to be used each day should be prepared.

**14-1 SALT PROJECT (SLOPING AGRICULTURAL LAND TECHNOLOGY).** I have been hearing excellent reports of the work of the Mindanao Baptist Rural Life Center in the Philippines, especially their work with farming sloping land. Harold Watson, the director, sent us a 25 page description of the technique, exceptionally illustrated with drawings. We will send a photocopy to overseas readers at no charge. Ask for the SALT Report. Readers in developed countries please send \$1.75 to cover photocopying and postage expenses. Our thanks to Harold, as well as to Ken Turner and Peace Corps volunteer Joseph Profitt who sent us additional information on Harold's work. The SALT method has been used at the center since 1979. Its two-fold purpose is to protect hilly soil from erosion and to provide nutrients for growth of plants.

First lay out the land in contour lines using an A-frame. [See later item on how to build an A-frame]. Space the contour lines about 4-6 meters apart. Next plow and harrow a 1 meter band along each contour until prepared for planting. Plant two rows of *Leucaena leucocephala* on each band, during the rainy season, in furrows 0.5 meters apart and about 2.5 cm deep. If a large tree or stone is directly on the contour line, plant the double row around it, one row above and one below the obstacle. Soak the seed overnight in water to speed germination. [Ed: Many people place seeds in hot water then allow to soak without further heating over night]. Discard any seeds that float because they will not germinate. Plant seeds quite densely, about 1 cm apart, cover with fine soil and press down firmly. After germination, replant any spaces in the rows. Weed the seedlings until they are well established. To allow fast growth, seedlings can be gradually thinned out (every other tree) over a 3-4 year period. When the trees are large the final spacing should be 4-8 inches. This will require about 20 kilograms of seed per hectare, depending on the distance between the contour lines.

The leucaena can be left to grow until it becomes 4-5 meters high, at which time it will form a shade which will kill the grasses and eliminate the need for hand cutting to prepare for cultivation of the soil. If you must cultivate the land to plant crops in the 4-6 meter wide strips between the rows before the trees reach this height, you must plow alternately. In other words, one strip is plowed, the strip between the next higher two bands is left untouched, the next is plowed, etc. The unplowed strips will help hold soil that may wash down from above. When the leucaena is fully grown you can cultivate in every strip. Permanent crops such as coffee, bananas, and citrus can be set out at the same time as the leucaena seeds. The soil should not be plowed for these crops and only ring weeding should be used until the leucaena trees are large enough to hold the soil. Once a month cut down the continuously growing trees, but leave at least one meter of the stem. Pile the leaves and twigs at the base of your crops. This will provide both a mulch and nutrients. As you continue farming the land, gather excess straw, stalks, twigs, branches, leaves rocks and stones and pile them at the base of the trees on the uphill side as a barrier against erosion. Over the years this will build up strong, permanent, naturally green and beautiful terraces -- which will anchor your precious soil in its right place.

Every third strip is planted to a permanent crop such as fruit trees. The two intervening strips are planted to field crops like corn or cassava. The field crops should be rotated. For example, pineapple might be planted after beans have been harvested.

**14-2 HOW TO MAKE AND USE AN A-FRAME.** The A-frame is used to mark out level contours on a field. You will need two straight and sturdy stakes or boards about 2 meters long and a third about 1 meter long, 3 nails, a string, and either a rock or bottle filled with rocks.

Nail the two long boards together at one end with a single nail. Leave the nail sticking out about half a centimeter so the string can be tied to it. Next nail the shorter board to the other two to make an "A", as shown in the drawing. Tie the string onto the nail and hang the plumb at the other end of the string so that it will swing freely, but below the horizontal board.

Next you need to find where the string will be touching the horizontal board when the two ends are on level ground. If you are certain that you have a level spot you can just make the mark where the string is resting. Rotate the A-frame 180 degrees and set it back exactly on the same spot. If the string is not on the same mark the location was not level. A method for any terrain is to drive two stakes about 10 centimeters wide into the ground, spaced so you can hold the A-frame with one leg on each stake.

Mark where the plumb line touches the cross member, then rotate the frame 180 degrees and repeat. Place a large mark exactly half way between the two marks. This should be where the plumb line will touch the cross member when it is on level ground. To double check, drive the higher stake lower until the plumb line touches the mark, indicating that the frame is level. At this point you can rotate the frame 180 degrees and the plumb line will still contact the same mark.

To mark out a contour, place a stake into the ground at the starting point and put one leg of the A-frame next to the stake, on the uphill side. Locate the other leg of the A-frame where the plumb line crosses the level mark, then drive a stake by the leg, on the downhill side. This becomes the new starting stake. Continue in this way across the hillside. [This is based on a verbal description by Larry Sell in Honduras]. I should also point out that the fertilizer and mulch benefits are so great that a very similar system is being used in several countries, even on flat land where erosion is not a problem. There it is usually called alley cropping.

**14-2 INSECT PEST CAUSING SERIOUS DAMAGE TO LEUCAENA PLANTINGS IN THE PHILIPPINES.** Five of our readers in the Philippines have written about this problem. It is a good warning to others also that there is always danger in planting incredibly large areas to one species. The Nitrogen Fixing Tree Association (NIFTA) has published a two page analysis of the problem. It is caused by psyllid insects (*Heteropsylla spp*) or jumping plant lice, which have spread rapidly around the world in the past few years. The insects are native to the Caribbean and eastern Mexico, where they seldom cause severe damage because of natural predators. This suggests that introduction of predators [or even gradual natural build-up of local predators?] may be the best control. Some ladybird beetle larvae are outstanding predators, e. g. *Curinus abdominalis*. The insects are not spread by seeds. The most likely methods include high-altitude air movements, cargo in airplanes, or illicitly shipped live plants.

What can we learn? I would be hesitant to rely exclusively on one species of tree for a particular purpose. Leucaena may outperform most trees in your setting, but other species have exceptional qualities as well. (See review of Firewood Crops book in "My most useful books" section). In the long term, you are better off with a mixture. Also, you can plant more than one variety of leucaena. Folks who write to ECHO for seed are sent four leucaena varieties, for this very reason. Readers who are heavily involved in reforestation might wish to join the NIFTA and receive their occasional publications and bulletins. Write NIFTA, P. O. Box 680, Waimanalo, Hawaii 96795, U. S. A.

**14-3 MONTELLO LETTUCE IS WORTH A TRY WHERE HEAT IS A PROBLEM.** Our readers in the warm lowlands probably have a problem growing lettuce. Last September I attended the combined annual meeting of the Caribbean Food Crops Society and the tropical region of the American Society of Horticultural Sciences. One of the field trips was to visit a commercial lettuce operation. They were growing very nice lettuce for the hotel and other markets, even though the location appeared to be near sea level. The variety was Montello. The plants were grown under shade cloth in long narrow bags filled with artificial potting mix and carefully watered. They looked beautiful, though I did not get to open up a head. They may not be as tightly packed as iceberg lettuce grown in a temperate region, but the quality is apparently quite acceptable. Timing is crucial because the plants do go on to bolt. We saw one bolted planting that had apparently matured when the market could not take them all. Rhine Fecho, one of our readers who has started an Episcopalian agricultural school in Haiti, was at the meetings too. He told me that he was growing this same variety in full sun, in soil, in August near sea level.

ECHO has purchased Montello lettuce seed and will send a small trial packet to our overseas readers who wish to try it. As usual, there is no charge for Third World readers, but we ask that you report your results to us. (U. S. gardeners please send \$1.50). You should be able to increase your own seed. Bend heads into bags and shake off the mature seed. We have found that the fluff can be removed from the seed by placing it in a jar and stirring vigorously with a fork. Alternatively, harvest plants when 30-50% of the seeds show white fluff and dry for a few days. Seed can be stored in airtight containers in the tropics for 6 months if dried to 8-10% moisture. (One way to get seeds this dry is to leave them in a closed container with excess desiccant and keep replacing the desiccant with fresh until it remains dry. This is seen easily if you have a small amount of desiccant that turns color when wet. Lacking the indicator, you will have to use your judgement). In a cool dry place (refrigerator) it can be stored 6 years. We can also tell you where you can buy Montello seed if your trial is promising.

**14-3 USE OF VEGETABLE OILS TO PROTECT STORED BEANS FROM BRUCHID BEETLE ATTACK.** Steve Mason at Purdue University sent us this interesting article on research done at CIAT in Colombia, which was inspired by an ancient Indian method. African palm oil or crude (i. e. unpurified) cottonseed oil were applied to dry beans, *Phaseolus vulgaris*, at a rate of 5 ml of oil per kg of beans, and tumbled at 35 rpm for 5 minutes. They were then infested with bruchid beetles, *Zabrotes subfasciatus*, at 1 day and again at 75 days. After 6 months the adults were counted. The untreated controls averaged 251 beetles, the African palm oil had none and the crude cotton seed oil averaged 0.2 beetles per 100 g sample of beans. Treatment with 1 ml of oil per kg of beans was less effective (6.4 and 5.2 beetles per 100 g). It is not clear how the oils work. Dormant oil sprays on fruit trees are thought to interfere with respiration. Their action must be more complex, however, because other work has shown that insects completely deprived of oxygen still live longer than those treated with oil.

Other oils (purified cottonseed, maize or corn, purified soybean, crude or purified coconut palm) averaged roughly 75% reduction in the number of beetles, but this may not be enough for consumer needs. Cottonseed oil even reduced the number of beetles emerging when the oil was applied after the larvae had penetrated the seeds, but only from 650 to 387. The added oils did not decrease germination of the beans. Manual mixing of the oil and beans for 5 minutes in a glass jar was much less effective than tumbling, apparently because the surface of the beans was less completely covered. Crude oils are not only cheaper than refined oils, but also contain more antioxidants. These delay rancidity, which might affect taste. Of course the treatments are not toxic. Based on prices of oil and beans in 1978, the oil would cost 0.5% of the market price of beans. ECHO will send a free photocopy of the article to folks working with Third World farmers. Others please send 50 cents to cover postage and photocopying.

**14-4 TOGETHER MAGAZINE IS PUBLISHED BY WORLD VISION.** In response to the questionnaire in issue #13, many suggested that in addition to technical notes we include case studies, articles on how to work with communities and discussion of issues in the broad field of development. One reason I do not do this is that I have so little expertise in this area. The other reason is that Together is already doing the job. "Together is published quarterly as a service to those who minister to the poor and needy of the world in the name of Jesus Christ. It is intended to bring them encouragement, stimulus and practical help as they offer God's wholeness in a broken world." Here are some articles that have appeared in the past year. (I include issue number in case one strikes your fancy in particular and you want to request a back issue). "Seek the welfare of any city" (The shack of Aling Meding represents the urban world in microcosm) (4); "Women as producers" (their labor is often hidden in statistics) (4); "Water on the hilltop - a case study" (4); "The Sahel: a long-term commitment" (an experienced

geographer shares his insights on the current drought afflicting sub-Saharan Africa) (5); "Hints on leading a discussion" (A good group leader helps those who are silent to speak out) (5); "They must see God in me" (further insight on the Muslim-Christian dialogue from the Philippine diaries of a renowned missionary) (5); "Getting health care to those in need" (health is a community concern, rather than a hospital problem) (6); "Reducing fever in barrios" (a village woman teaches a young doctor a valuable lesson in medicine) (6); "Teaching and learning with cases" (teaching of groups can be enlivened through the effective application of case studies) (6); "Approaches to child care sponsorship" (sponsorship is under study everywhere) (8); "Phase out or fizzle out?" (knowing when and how to end project aid) (8).

Together is sent free of charge to those engaged in Christian ministry in the Third World. The cost in North America, New Zealand, Japan and Hong Kong is US\$25. (In Australia and Europe write to your regional office). Particular back issues can be sent as long as they are in stock. Write to Together, World Vision International, 919 West Huntington Drive, Monrovia, CA 91016 USA.

**14-4 PRUNING EGG PLANTS.** Warwick Kerr, head of the biology department at the Universidade Federal do Maranhao in Brazil, prunes his egg plants and African egg plants. The second crop, the farmers call it the "second life," is 30% greater than the first in spite of the death of 10-15% of the plants after pruning. Here is how he does it. When each egg plant has produced 20-30 fruits and the plantation looks old, he cuts the plants at a height of 30 cm., then removes the cut branches from the garden as far as possible or burns them. Finally he applies chicken manure, his cheapest fertilizer, irrigates and sprays the stalks with insecticide and fungicide. All plants that happened to acquire virus usually die upon pruning, so he collects his seed from the second crop.

**14-4 EXOTICA SEED COMPANY -- AN UNUSUAL CATALOG.** I have several occasions a year to turn to the Exotica Seed Catalog to find seed for tropical fruits. For example, not only do they sell guava seed, they have red strawberry, yellow strawberry, Hawaiian pink, beaumont, pear, Mexican cream, lemon-pear, Allahabadi white Indian and pineapple guavas. The papaya varieties include solo, sunrise, X-77, Mexican orange flesh, Mexican red flesh, seven varieties from India, and two mountain papayas from the highlands of Ecuador. Other listings include two kinds of mango that come true from seed, white sapote, black sapote, carob, persimmon, loquat, mulberry (black, white or red), pomegranate, black olive, several annonas, as well as many ornamental trees. Most seed packets are only a dollar. They do not contain many seeds, but that is fine for trial introductions. If you want larger quantities, ask for their wholesale list. The address is 2508-B E. Vista Way, Vista, CA 92083. Send \$1 if you want the catalog sent airmail.

**14-4 SOME OF MY MOST HELPFUL BOOKS.** Agricultural and Horticultural Seeds. I turn to this 531 page book, published in 1961 by the Food and Agriculture Organization, to answer such questions as whether one of you can produce your own onion or cabbage or tomato seed in your region and, if so, how. The book is in two parts. Part I covers general principles, such as development, evaluation and choice of varieties, agronomy, drying, cleaning and storage, quality control and evaluation and seed distribution. Part II covers specific crops (11 cereal crops, 6 drug crops, 6 fiber crops, 13 grain legumes, 8 forage crops, 10 oil crops, 9 tropical tree crops, and 22 vegetables. For each crop, typical subjects include climate and soil, planting and cultivation, nutrition and irrigation, pollination and isolation, diseases and pests, and harvesting and threshing seed. Order from Distribution & Sales Section, Food

& Agriculture Organization, Via delle Terme di Caracalla, 00100 Rome, Italy, or ask them (or ECHO) if there is an FAO agent in your country. In the USA, order from UNIPUB (\$24.00). Price will not be the same in each country.

14-5 Food Legumes. I turn several times each month to this 435 page book, first published in 1979, to find alternative names, main uses, preferred climate, possible toxicity, etc. Let us look at Vigna unguiculata (cowpea) for an example of their treatment. Seven major common names and three botanical names are given at the top, followed by 119 other common names and the countries where these names are used. The next 14 pages cover a detailed botanical description, origin and distribution, cultivation conditions, planting procedure, pests and diseases, growth period, harvesting and handling, primary product, yield, main use, subsidiary uses, secondary and waste products, special features, processing, and products and trade, followed by 13 pages of bibliography. Twenty-seven legumes are covered: adzuki bean, asparagus bean, bambara groundnut, broad bean, chick pea, cluster bean, cowpea, grass pea, haricot bean, horse gram, hyacinth bean, jack bean, Kersting's groundnut, lentil, lima bean, moth bean, mung bean, pea, pigeon pea, rice bean, runner bean, sword bean, tepary bean, urd, velvet bean and winged bean. The book is published by The Tropical Development and Research Institute. They will consider sending a free copy to requests from "public bodies in countries eligible for British aid." Write the institute at College House, Wrights Lane, London W8 5SJ, England.

14-5 Firewood Crops, Shrub and Tree Species for Energy Production, Vol I and II. The National Academy of Sciences outdid itself in these two books published in 1980 and 1983. Typically two pages are allotted per tree, one page of which is primarily pictures. A standard format is followed with each tree: Botanic and common names, main attributes, description, distribution, use as firewood, yield, other uses, environmental requirements, establishment, pests and diseases and limitations. Sources for information and seed are given. As was the case with their book on underexploited food crops, however, the sources are usually not set up to handle a lot of requests, especially as funding and research interests change over the years. ECHO hopes to have several of these in our seedbank someday, but has been able to purchase only a few to date. A free copy can be obtained by folks actively working in development by writing to BOSTID (JH-217D), National Research Council, 2101 Constitution Avenue, Washington, D. C. 20418, USA.

**14-5 COMING EVENTS** TRANSCULTURAL SEMINAR OFFERED BY MENNONITES JUNE 1 - 13. Eastern Mennonite College in Harrisonburg, Virginia is host this year for this annual conference that rotates between three Mennonite colleges. It is designed especially to help folks about to go overseas think through the application of their expertise in a transcultural setting. Students pick one of five areas of concentration or "workshops": agriculture, health, nutrition, education and general development. General issues are covered in the morning and the workshops in the afternoon. A few general session topics include: Subsistence agriculture and the tropical environment; The role of women in development; When helping your neighbor is political; The integration of faith and program. The registration fee is \$405. If meals and housing are desired, the fees are \$581 for registration, meals, and lodging with a double room or \$593 single room. Write to Dr. Joseph Shenk, Eastern Mennonite College, Harrisonburg, VA 22801.

2ND INTERNATIONAL PERMACULTURE CONFERENCE AUGUST 8 - 10. If you will be near the Evergreen State College in Olympia, Washington you might find this helpful. Japanese natural farmer Masanobu Fukuoka (author of The One Straw Revolution), Australian ecologist Bill Mollison and Land Institute director Wes Jackson will be joined by over 50 resource people to consider the topic, "Regenerative Systems for an Abundant Future." My understanding of permaculturalists is that they have taken organic gardening a step further to include design of the total system to ensure maximum use of the land with minimal intervention by man. For example, Wes Jackson heads a group looking at native, perennial grasses that might give reasonable yields of grain in the Midwest without annual replanting. For information write Permaculture Institute of North America, 6488 Maxwellton Road, Clinton, WA 98236, USA (phone 206/221-3979).

**14-5 WINGED BEAN SEEDS NEED TO BE SCARIFIED.** Alan Lee at the University of California at Davis had less than 50% germination a month after planting the winged bean seeds ECHO had sent him. "I dug up the ungerminated seeds and nicked them all a few times with the corner of a razor blade, then replanted them. Within a week several had germinated and I expect more."

To check this out we checked the viability of 19 winged bean seeds with our usual testing method. A month later only 10 had germinated. We discarded three that had molded and scarified the remaining 7. Within a week all 7 had germinated. A seed will not germinate until it has absorbed water. Scarification is a process to soften seed coats so that water can be absorbed. One can nick the seed with a knife or the edge of a file or hold it firmly and strike it across a rock or cement as in striking a match. Sometimes seeds are soaked overnight. Leucaena seeds are put in water that has just been boiled then left overnight. Many of you have had trouble with winged bean germination. We now highly recommend that everyone first scarify their seed. If you have other seeds that fail to germinate, it is possible the seed may still be OK. It may need to be scarified.

**14-6 TRAINING IN ANIMAL TRACTION.** Don Mansfield in Mali asked where he could get training in animal traction. We can recommend a good book Animal Traction by the Peace Corps (write for a free copy on official letterhead to Ms. Trish Heady, The Peace Corps, Room 701, 806 Connecticut Avenue, Washington, DC 20526). However, the subject is so complex that hands-on experience would be a great help. The Tillers Small Farm Program, which operates in conjunction with a "Living History" farm near Kalamazoo, Michigan, offers both courses and an internship in appropriate farm technologies. Students learn to work oxen and draft horses, help train a pair of oxen, repair and use farm implements (blacksmithing), assist in historical farm demonstrations and work with livestock and field crops. The program director, Richard Roosenberg, spent three years working with oxen as a Peace Corps volunteer in Benin. The program maintains a considerable interest in Third World applications. He said interns must commit to at least 10 weeks (the farm is open from mid-March to the end of November). Interns receive room and \$75 per week for the first 8 weeks, \$75 the next 8 and \$100 after 16 weeks. They accept 5-8 each year.

I asked about folks like Don who do not have that much time. They have several intensive courses in a series called "Animal Power and International Development": History and Potential of Animal Power (limited to 4 people, 6 days, offered 5 times, \$300); Fitting animal power to development needs (June 13-15, seminar setting, \$120); Training and use of oxen (July 21-26, hands-on, \$275); Problems of design, use and repair of implements (July 28-August 2, \$300). Prices include housing. All courses have limited enrollment. Write to Tillers Small Farm Program, Kalamazoo Nature Center, 7000 N. Westnedge Ave., Kalamazoo, MI 49007, USA; phone 616/381-0727.