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20-1 SUCCESS REPORTED ON HOMEMADE MOUSE TRAP. Barry Rands in Mali reports that his gardener recently caught 150 mice in one night with four traps in their garden. Here is what he does.

The top is removed from a 20 liter oil can and the open can (or similar size container or bucket) is set in the ground so the top edge is flush with the surface. The container is then filled with water to within 8 cm of the top. Sweepings from a millet threshing floor are sprinkled on the surface and around the trap to provide both camouflage and bait. The bait has to be replaced fresh each evening. Other materials that would float would probably serve the same purpose. The mice come at night to eat, drink or play (they are not sure why the trap is so attractive) and fall into the trap by the dozens and drown.

Three or four such traps set around the perimeter of a small (1,000 square meter) garden should be sufficient for rodent control, depending on the severity of the problem. Where containers are in short supply you can dig a 40 x 30 cm deep hole then line it with clay or cement to make it hold water. He has also successfully used a brew made from the pods of *Acacia nilotica* as a sealant.

When floating camouflage bait is not available, he has successfully used two pieces of cloth stretched over the trap with a 5 cm (larger if your rodents are bigger) gap in between. A bait such as millet, corn or other grain is then placed on the cloth and somehow the mice manage to fall in!

Barry emphasizes that this is not his idea, but is borrowed from local folks that have been doing this for years. He has popularized the technique by including it in his extension program.

I hope this photo reproduces well. It shows how effective the trap can be (and what a mouse problem Barry must have!). The picture shows the combined catch from 4 traps after one night. We have now had ours set up two nights and caught one rat each night.

I have just found reference to a similar trap in an AGRECOL book that I hope to review soon called Natural Crop Protection. They suggest floating a few peanuts and placing a generous ring of peanut butter 3 cm below the rim of the container.

20-1 SOME OF MY MOST HELPFUL PERIODICALS. "The Small Farm Newsletter" published by CUSO in Thailand is a local networking newsletter, emphasizing technical details of what various private and voluntary agencies are doing in Thailand. Editor Malcolm Cairns writes that the newsletter "was started as a means to share ideas, experiences and information concerning trees and intercropping between CUSO volunteers and Thai agriculturalists, but has now expanded its scope." Here are topics from the latest issue. Bryan Hamman reports on discussion at a conference he attended concerning whether some chemical fertilizers should be used along with green manures. A farmer gives his recipe using local plants for insect control. Problems and successes at getting nodulation on *Sesbania rostrata* is discussed at some length. A lot of space is given to updates by readers on the successes and problems encountered in their work.

Their budget could easily be overwhelmed if many of you write them. In light of this Malcolm wrote, "We decided that we would be willing to mail it to agriculturalists anywhere, but would need to cover our mailing and printing costs" of U. S. $6 in Asia and $15 elsewhere. "So that our readership is more than names on a list and to help keep track of who is doing what, we require new readers to drop us a

line giving a short description of relevant work. We hope to keep the newsletter at a grassroots level and strongly urge all readers to actively contribute to it." You can write to Malcolm Cairns; c/o Prachuabkirikhan Dairy Cooperative; Kao Noi; Amphur Pranburi; Prachuabkirikhan 77120; Thailand. Thanks Malcolm, and co-editor Julia Cooper, for letting more of us in on this grassroots newsletter.

20-2 WHAT WE HAVE LEARNED TO DATE ABOUT GREEN MANURE CROPS FOR SMALL FARMERS. Written by Roland Bunch, World Neighbors, Apdo. 278-C, Tegucigalpa, Honduras, Central America.
[Ed: In issue # 12 we featured an article by Roland on green manure crops. Much of this issue is dedicated to an excerpt of an update Roland has sent us on this important subject. Write us for a full copy of his update (no charge overseas, $1.00 photocopying and postage for U. S. readers)].

In spite of the advantages of green manures, their use has seldom become common among farmers in the Third World. They cannot afford to give up scarce cropland just to grow a soil amendment. If they do have the land, they cannot afford the labor. Nor are they generally willing to spend money to improve crops grown for subsistence, because they earn no money from them with which to replace what they have spent.

World Neighbors/Central America has found a number of ways to overcome most of these problems to the extent that farmers have accepted green manures faster than any other agricultural technology with which we've worked through the years. One program sold 65 pounds of seed last year to local farmers and 1500 pounds this year in the same area with minimal promotion.

There are six ways to produce green manure without reducing at all the land used for other crops. (1) Plant among traditional row crops. (2) Intercrop near harvest of the first crop timed so green manure will grow primarily during the dry season. (3) Where shifting agriculture is practiced, plant during the first fallow year to shorten the fallow period. (4) Plant under fruit or coffee trees. (5) Plant leguminous trees along soil conservation ditches on hillsides. (6) Alley cropping. In Central America our work has used the first four possibilities. We have had the most success with jack bean and velvet bean.

Jack Bean (*Canavalia ensiformis*) is an incredibly drought-resistant, hardy legume that grows well in extremely poor, droughty soils (and apparently less well in fairly fertile soils). There are two kinds of jack bean, one that climbs and thoroughly covers the soil, and another that has a bushy growth habit and does not climb at all. It begins flowering after 4-5 months, then produces seed pods continuously for at least the next year. It will grow through some 5-6 months of dry season if above about 600 meters and can serve to shade the soil during this time to prevent loss of organic matter. Under 500 meters it will often stop growing after about 3 months without rain and may even drop its leaves if soils are thin and temperatures exceptionally high. The stem will become somewhat woody, but only if left for seed and under fairly warm conditions.

Jack beans grow vigorously at sea level, and can be used as a green manure crop up to about 1600 - 1800 meters. It does not thrive in soils with excess water. They do very well in corn fields, but are preferred over velvet beans only when it is too dry for velvet beans to thrive. This tends to be the case where corn has been replaced with sorghum or millet due to insufficient rainfall.

The jack bean will be eaten by grazing animals, but is liked less than other green manures. Hence jack beans are preferable where animal damage is feared. Non-climbing varieties are proving to be very good for weed control and nitrogen fixation under fruit trees. It has virtually no natural pests or

diseases. Its leaves are sprinkled on leaf-cutter ant hills to eliminate them. [Ed: I am told that ants carry leaves into the mounds as food for the fungi upon which they live. Jack bean leaves reportedly kill the fungi. Dr. Warwick Kerr in Brazil writes that planting sesame near the mounds has a similar effect]. Jack bean should be planted in soil that has been cultivated within 3 years and weeded very recently (although at elevations below 500 meters or in sandier soils, cultivation may not be needed). We use 4-5 seeds per square meter in order to control weed growth. (In corn fields an important advantage of this and the velvet bean is that use of these plants may entirely eliminate at least the second weeding). Jack bean has even been planted in fields already intercropped with both corn and beans in Haiti (Bois de Laurence) without much adverse effect on even the beans. If planted in a corn or sorghum field, it should be seeded within 15-30 days of the primary crop, depending on climate, speed of growth of the other crop, etc. It can be planted with a dibble-stick or broadcast, though if broadcast it will take another 2 weeks or so to germinate unless soaked in water overnight before planting.

People can eat immature pods like green beans when they are about 7-8 inches long. In Southeast Asia the mature beans are eaten, but we have not been able to find out how. Cooking must be sufficient to eliminate certain substances in the mature bean that inhibit the assimilation of calcium by the body.

In summary, jack bean can be used in grain fields, under orchard trees or to shorten fallow periods, but is not as vigorous as the velvet bean and should be used only when conditions are too severe for the velvet bean to do well. Under borderline conditions, perhaps mixtures of the two would function best.

20-3 Velvet bean (*Stizolobium pruriens* or *Mucuna deeringiana*) is the most promising green manure that we have worked with in Central America. It covers the soil completely and then climbs as high as its support allows (up to well over 6 meters). It is highly palatable to animals and has found wide acceptance in our Honduras program areas as a coffee substitute. Especially encouraging is that there are at least 4 large areas where velvet bean use has spontaneously spread from village to village without any outside intervention (in Mexico to shorten fallows and in Honduras to intercrop with corn).

Velvet beans first cover the ground almost completely, then climb vigorously. Where corn stalks are present, it will eventually form a mat of leaves at about the top of the stalks, with little more than stems and pods underneath. Stems remain thin and nonwoody throughout the plant's life. The plant dies after it has set seed. [Ed: Seeing velvet bean growing to the tops of pine trees at ECHO prompts many to ask if it might not take over like kudzu in the southeastern USA. This might happen were it not that the plants die after seed set. It was a major U. S. crop for years, and I never heard of such problems.]

Sometimes velvet bean roots produce solid clusters of dark red nodules that are 4 cm. in diameter. We think that heavy nodulation occurs most frequently in infertile or sandy soils. Like jack bean, the velvet bean will volunteer heavily the second year if seed is allowed to mature and fall on the ground. In fact, farmers in Chiapas get good growth each year in their corn fields without bothering to reseed it. They harvest 4 T/Ha. of mono-cropped corn planted year after year on the same land under typical jungle conditions, using chemical fertilizer plus velvet bean.

About the only soils in which velvet bean has not done well for us are those that are waterlogged or have a pH of 4.5 or less. Like the jack bean, it needs to be planted in a field that is either sandy or has been cultivated within the last 3 years. Velvet bean will take a bit cooler climate than jack bean, but still does best at sea level and does poorly over 2,000 meters. In cool climates it will grow 3-4 months into the dry season, but is not as drought-resistant as jack bean.

The velvet bean is **presently (*later determined cautionary concerning consumption – bean contains L-Dopa*)** our species of choice, in most cases, for growing in corn fields, rehabilitating depleted land, and weed control. It has been used in Guatemala and parts of Honduras to eliminate serious weeds such as nutgrass (*Cyperus rotundus*), Bermuda grass (*Cynodon dactilon*) and imperata grass *(Imperata cylindrica*). I am not aware of what is required to do this, though I would guess that the grass must be cut back and the velvet bean then allowed to grow a full 6 months in order to choke out the weeds.

It is an extremely good, fairly palatable high-protein fodder for most animals, especially cattle, and is eaten by virtually all animals except, sometimes, chickens. Thus, like the lablab bean, it can be an important source of high protein fodder well into the dry season, when many domestic animals are losing weight for lack of food.

We were taken off guard by the degree of acceptance of the dry beans as a coffee substitute. Having introduced it as a coffee stretcher (to be used 50-50 with coffee), we found that people were soon drinking it straight. Use is so widespread after just one year that a group of women is roasting and grinding the bean and selling some 40 pounds a week under the name "nutricoffee".

Like the jack bean, velvet bean is native to Central America. However, there are two kinds. The more common one has an extremely irritating itchy powder on the mature pod. Villagers who know this plant will not want to plant the non-itchy-powder varieties until they've been shown that the pods are harmless. We would under no circumstances recommend that anyone use the irritating kind with small farmers.

Slugs damage velvet bean in warm climates (though much less than regular dry beans). Rabbits, leaf-cutter ants (its only serious insect pest here) and iguanas are other pests. In some locations rats used the velvet bean stems to climb up and eat the corn. Planting the beans later or cutting its tendrils when it gets too large has helped with this problem. It must be watched and cut back if planted near trees.

Everything said above about planting jack bean also applies to velvet bean. However, fine tuning is needed to determine when to plant velvet bean in local corn fields. This is affected by speed of growth of the native corn, climate, soil fertility and existence of problems with rats. One should plant as soon after the corn as possible to get maximum velvet bean growth and weed control, but not so soon that the velvet bean outgrows the corn or causes rat problems. Especially in fertile or heavily fertilized soils, the velvet bean grows very rapidly and may even need to be pruned once to retard its progress.

20-4 Corn crops growing where velvet bean or jack bean have been incorporated can often do extremely well without any initial fertilization with chemicals, but will often show signs of nitrogen deficiency by tassling time. Farmers in our programs in Honduras almost always add a side dressing of urea to these crops. In general we recommend this practice where fertilizer is available and affordable. Over the long run, one would think phosphorous would also be needed, but in the short-run neither visible symptoms nor level of yields would indicate much problem with this element. Quite likely the increased organic matter is increasing the availability of soil phosphorous enough that deficiencies just are not yet a problem.

In corn fields, the velvet bean produces an average of about 6-7 pounds of above-ground organic matter (wet weight) per square meter (30 T/Ha), but has produced twice that. The effect on subsequent plantings is roughly equal per pound to that of cow manure or half that of chicken manure, although this varies from field to field. When incorporated into the soil, the velvet bean often approximately doubles subsequent corn yields and when used as a mulch increases yields by about 35%. Even dry bean yields following velvet beans have shown yield increases of over 100%.

[Ed: Even though leaving the residue as a mulch has many benefits (erosion control, weed control, moisture retention), the greater effect on corn yields after incorporation might lead you to incorporate residues rather than leave them as a mulch. All nutrients probably become available in one season when incorporated, whereas they are more slowly released when left as a mulch, accounting for the greater effect. However, almost surely some or much of the remaining nutrients will benefit the second and subsequent corn crops. Roland and I asked during a regenerative agriculture conference at Rodale International for a perspective on this question. The consensus was that over several years the total amount of nutrients available for plants is about the same whether residues are left as a mulch or incorporated. We would welcome your input on this question. I tend to vote for a no-till approach except in famine situations where immediate yield is imperative.]

Farmers in areas with enough moisture for two crops of corn or sorghum have recently started doing the following. The green manure (velvet bean or jack bean) is intercropped with the first grain crop. After harvesting the grain they cut the residue and green manure down, leaving this on the surface as a mulch. The second crop is planted 20 days later with a dibble stick right through holes cut in the mass of dead velvet bean. There is usually a net saving of labor because planting and cutting of the green manure requires less work than the two weeding operations that are thus saved with the second crop. This is the sort of technology one dreams of, but rarely finds: net savings of labor, zero cash cost, decreased risk (the mulch gives some protection from erosion and drought), increased productivity, increased soil fertility and increased protein intake for animals or people.

In Togo velvet bean grew well and was incorporated into the soil 5 months before planting corn. There was virtually no response to the green manure. Our hypothesis is that the green manure was burned or leeched out. We are now testing whether under such conditions a green mulch (jack bean for instance) throughout the dry season will be able to reduce surface temperatures sufficiently to maintain organic matter. We have serious doubts about the claims that organic matter in tropical soils are impossible to maintain.

Recently villager nutrition groups have discovered that by toasting the velvet bean somewhat less than they do to make coffee, they have been able to produce a really passable hot chocolate. By grinding the flour finely, they have even been able to use a recipe for soybean cake to make "velvet bean cake". ***(See L-Dopa cautionary above)***

20-5 The Lablab Bean (*Dolichos lablab* or *Lablab purpureus*) is a legume very similar in appearance to the velvet bean, but even faster growing where soils are fairly fertile. It has not been as valuable to us because of its need for somewhat more fertile soils and occasional insect problems, but may well be important to us later on when the other green manures have raised fertility sufficiently. The lablab bean is almost as drought-resistant as the jack bean, is very shade-tolerant, and is among the most palatable of legumes for animals (definitely preferred over velvet bean or jack bean). Lablab beans grow well from sea level up to about 1,500 meters. They require well-drained soils.

Lablab beans start flowering after 3 months and continue most of the first year, producing seed as well as remaining green. If soils are deep enough and other conditions permit, it will grow right through the dry season. I have seen plants that survived 3 years in droughty areas of the central plateau of Haiti. [Ed: In the sandy soils at ECHO lablab beans get nematodes so badly that it is difficult to keep them alive an entire year]. It nodulates profusely, producing mostly white nodules. Whereas the velvet bean growth is reduced if it has nothing to climb, plants in thick stands of lablab beans will begin to climb up each other. Another difference from the velvet or jack bean is that the lablab bean can be cut off nearly at ground level and will grow again, although with somewhat less vigor.

Lablab beans are traditionally planted toward the end of the agricultural cycle in some villages in Honduras to provide dry-season pasture for animals. It is also edible, and in some places, such as Haiti and West Africa, is widely appreciated as a regular food. Young pods or immature beans can be eaten green (beans taste similar to a sweet pea -- a white seeded variety is best for this). Dry lablab beans can be substituted for dry beans in most recipes.

Where it grows well, the lablab bean has produced a phenomenal 11 kg per square meter (110 T/Ha) of above ground organic matter (wet weight).

Though we have had problems with insect attacks, its growth is so vigorous that it still usually grows as fast as the velvet bean. Because animals prefer it to almost anything else, lablab beans cannot be grown where animals run free.

In pure stands, lablab beans should be planted about 10/square meter. We have not found a good system yet for planting in corn fields because of its rapid growth, but it should be possible with heavy pruning (which it withstands well). The lablab bean requires either a recently cultivated or a sandy soil.

Continuing research needs. If you have been experimenting with green manures, please send me whatever information you have put together [Ed: Please send a copy to ECHO too]. I think the most important subjects we need to learn more about are (1) What legumes will work above 1,800 meters? (2) What additional plants will work at any elevation? (3) What green manures will work best under wet tropical conditions? (4) In what ways must these recommendations be modified for areas outside of the Caribbean basin area from which they have come?

Martin speaking now ... Thanks a million Roland. ECHO will send a small packet of any seed mentioned in this article. If you want to buy larger quantities we will try to find a source. We also have the "90 day" velvet bean that was grown in the southeastern part of the U. S. A. 50 years ago. At the time of the last corn cultivation farmers would plant this velvet bean. Both corn and beans were left in the field. Cattle were allowed to feed in the fields a couple of hours each day in the fall and winter, reportedly getting very fat. This variety is not sensitive to day length so produces 3 months after planting. The tropical kind only produces when days are short (flowering starts in November at ECHO). The 90 day kind has some of the itch-producing hairs Roland refers to, but not nearly as many as I have seen on the wild "pica-pica" in Honduras.

20-5 NEW ADDITIONS TO SEEDBANK

Two New Drought-tolerant Corns From Plants of the Southwest. Posole Corn, Zea maize, has "Large, plump ears on vigorous, drought-tolerant plants. The traditional variety of dry corn for making posole, one of the finest dishes of the Southwest." Buhrow's White Desert Sweet Corn, Zea maize, from same source. "A new cross of papago with a white corn to produce a sweet corn that will open pollinate between 90-100 degrees F. It is remarkably drought tolerant and has been known to bear when deeply watered only 3 times in a season. But your yield will be greater with more frequent waterings. Grows 5-9 feet with 6-9 inch ears. NOTE ON CORN: We bought this from a commercial seed company, so it should be disease free. If corn is important in your area, be watchful and destroy the plants if any new disease should ever appear. We will send a small packet to evaluate. Though you can save your own seed, it is best to have a minimum population of perhaps 200 plants in a field to prevent inbreeding. You can later order larger quantities from Plants of the Southwest; 1812 Second St; Santa Fe, NM 87501; U. S. A.

20-6 *Sesbania aculeata*, a Firewood Crop that will Grow Under Tough Conditions. Bob Burns in Bangladesh sent us a few seeds of this plant, also called *Sesbania bispinosa*, prickly sesban and dhaincha. According to the book Firewood Crops by the National Academy of Sciences, this is a quick-growing shrub that can produce a low-density firewood in only six months. In Vietnam it is grown in rice fields and its stems harvested for firewood before the rice crop is planted. It is a legume that nodulates vigorously. Its fibers are very similar to birch, one of the best trees for paper. Stems can be processed into a jute-like fiber, used for making fishing nets, sacks and sails. Other uses include for windbreaks, erosion control, cover crop and green manure. The leaves reportedly make good cattle fodder. It is well adapted to difficult soils. It will grow on saline and alkaline wastelands and wet, almost waterlogged soils, even in areas that often remain barren for want of suitable crops. No seed treatment is required. It grows so well that it is excellent at suppressing vigorous weeds such as *Imperata cylindrica*. (If you did not want the tree, I would assume it could itself become a serious weed pest). Until our own trees give seed, we can only share tiny packets from what we were sent. We will send packets of 10-seeds to get you started, and back order if we are out until our own harvest. (Limited to Third World orders due to small supply).

20-6 OTHER NEW SEEDS. *Albizia lebbek* for reforesting dry alkaline soils; *Guazuma ulmifolila*, vigorous, thornless tree for exceptional fuel, sent by Jim West in Ecuador; buffalo gourd*, cucurbita foetidissima*; Several seeds were sent by Natan Vardi in Israel: paprika (a big pepper, a bit hot), Capsicum frutescens; also Gamba sweet pepper, *Capsicum frutescens*; large red pepper, probably same species; cherry tomato; Egyptian spinach, *Corchorus olitorius*.

20-6 CAN YOU HELP US? The danger of snake bite is a fear shared by many of you. I want to do an article on using electric shock to treat snake bites or bee or scorpion stings. Some of you have tried it. Reports of your personal success or lack of it would greatly strengthen that article. In the meantime, I'll try to locate and talk with a scientist doing research in the area too. Reportedly application of D. C. current (e. g. from the coil of a small motor) within half an hour of the bite provides remarkable pain relief and prevents serious medical complications. I have not seen reports of the technique working where the venom is a nerve toxin, as with cobras. If you can't wait, we will send you a copy of the one article we do have, from Outdoor Life