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Edited by Martin Price and Dawn Berkelaar

ECHO is a Christian non-profit organization whose vision is to bring glory to God and a blessing to mankind by using science and technology to help the poor.

Issue Highlights

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Position Opening: Director of the Agricultural Resource Department at ECHO

ECHO announces the opening of the position of Director of the Agricultural Resource Department, to lead our ministry as we provide agricultural technical support to development workers around the world. The successful candidate is expected to have an advanced degree in an agriculture-related field with extensive international experience and proven ability to lead a team of professionals. The director will be based in Ft. Myers, Florida, and must be willing to travel internationally.

Interested candidates please send your resume to: Jim Butler (jbutler@echonet.org); Director of Human Resources; 17391 Durrance Rd; N. Ft. Myers FL 33917.

A Successful Approach to Field Cropping in Southern Africa

By Dawn Berkelaar

Foreword

By Dr. Martin Price

In 2005, ECHO's farm manager, Danny Blank, took a three-month sabbatical as a "roving agricultural reporter" for ECHO, visiting several countries in southeast Africa. Lance Edwards, a former ECHO employee now working in agricultural development in the region, accompanied him. Danny returned raving about the success and widespread acceptance of a method of farming called "Farming God's Way" (hereafter referred to as FGW).

FGW was being promoted by a former Zimbabwean farmer, Brian Oldreive, who developed a no-till system for raising maize and other field crops. In the last decade, Brian has been teaching this approach to small-scale hoe farmers. The method encourages faithfulness with all that God has given us—sun, soil, rain, time, seed and harvest—in order to experience the God-given potential of the land. The technique involves permanent planting stations, lots of mulch using crop residues, and careful management.

We invited Brian to speak at ECHO's November 2006 Agricultural Conference. His talk generated enormous interest. FGW is becoming so important in the region that we invited Lance, who now has two years of experience working with the method and observing farmers who use it, to share his thoughts about FGW at our 2007 conference.

At first we wondered about the title "farming God's way." It seemed a bit arrogant to think that of all the ways to farm, this particular one was God's choice. We recognize that this is not the intent, especially after meeting the method's incredibly humble promoter! In part the title comes from the observation that in creation, plants grow in areas covered by decaying organic matter (mulch), and without plowing.

But it is much deeper than this. Dr. Dan Fountain, who spent 30 years in public health in what was then Zaire, teaches a workshop twice each year on communicating cross-culturally to farmers who have little or no formal education. He makes the strong point that communication often fails and credibility is lacking if a teacher takes a purely secular approach to the teaching. Most likely the farmers believe that there are spiritual realities (they may or may not think of them as

God) behind everything. They can relate to a teacher who sees God behind everything.

So even though FGW includes detailed instructions for planting and growing crops, it is more than that. FGW is not just a technology; it comes from a worldview with an emphasis on a God-honoring lifestyle. It is now being taught, minus the spiritual dimension, by secular and governmental agencies (in these cases it is referred to as Conservation Farming). Some informal reports suggest that a much higher percentage of those who try it do not continue without the spiritual dimension.

In light of these factors, ECHO is including a hint of the spiritual teaching that is such an essential part of FGW as it is being promoted in southern Africa. The instructional material and DVDs go into much more detail.

It is difficult to summarize FGW in just a few pages. If you are interested, we encourage you to contact Brian Oldreive and read more of his material, or check the website at http://www.farming-gods-way.org/.

Background of FGW

Brian Oldreive began his November 2006 ECHO conference presentation by giving an overview of the problems in Zimbabwe and other countries in southern Africa. Africa is in dire need of good news when it comes to agriculture. Hunger and poverty are rampant. Maize yields in sub-Saharan Africa average 500 kg/hectare, making it very difficult to meet a family's food needs for the year (estimated at 1.2 tonnes per household per year). Soil erosion is a serious problem, with an average of 30,000 kg/hectare of soil lost each year. In addition, farmers often have a poor self-image and may be looked down upon in society. Many are moving to the cities. A cycle of poverty and debt begins that is difficult to break, especially with the high cost of inputs like seed, fertilizer, and equipment. Finally, standards are poor, often due to a lack of knowledge.

Despite large amounts of foreign aid, abundant natural resources, a favorable climate and good soils, sub-Saharan Africa has large areas where people are undernourished. Grain yields are erratic, with a very low average yield.

Oldreive began to question why there is so much poverty in Africa. He noticed that there is no plowing or deep inversion of the soil in creation. As a result, Oldreive studied and introduced zero-tillage. Then he became aware of "the beautiful blanket over the earth of fallen leaves and dying grass [and] realized that this was a very important element in God's creation. This blanket breaks the action of the raindrop, allows water to infiltrate and feeds the soil microorganisms." The importance of mulching was understood and quickly put into practice.

Though Oldreive had started out as a tobacco farmer, subsequently he and his family went to work at Hinton Estate, one of the largest privately owned cropping farms in the region (1000 ha). It was on the verge of being shut down. At Hinton Estate, Oldreive tested FGW principles by initially implementing them on two hectares, gradually increasing to include the whole farm. Soon "crop yields and profitability had improved so dramatically that Hinton Estate was able to expand [from 1000 ha to 3500 ha] by buying adjoining farms." Oldreive received distinction as "Maize Grower of the Year." Later he also achieved the nation's highest yield, and twice won an award for provincial wheat grower of the year.

Oldreive is quick to point out that farmers need to make a profit (i.e. income must be more than expenditures) in order for their enterprise to be sustainable. The FGW technology works. The great challenge is to implement it.

Certainly the need is great when it comes to agriculture in sub-Saharan Africa. But FGW begins with the premise that no technology on its own will be able to address the poverty in Africa. Before anything else, God needs to be acknowledged.

Figure 1: Pictures showing maize planted using traditional methods (at left) and using FGW principles (at right).

FGW Principles

Part of the vision statement for FGW mentions "an emphasis on sustainable agriculture as a model for life-transformation of individuals, communities and nations."

The FGW system includes (but is not limited to) the following principles:

1) Spiritual **training** (This category actually includes four main principles; more details about this are available from the FGW website, and on a series of DVDs that are available from ECHO's website at www.echobooks.org.)

2) Careful management and **faithful stewardship** of the land. Activities are done a) on time; b) to high standards; c) with minimum wastage; and d) with an attitude of joy. Doing the opposite of these demonstrates an attitude of selfishness. Brian Oldreive has written about the importance of being faithful with the little with which God has entrusted us. To begin with, we can be faithful with soil, rainfall, sunlight, heat-units, seed and manpower.

3) **Wisdom in caring for the soil**, which includes **minimum tillage** and the **use of mulch** (Figure 2). Oldreive encourages us to learn from creation, in which there is no deep plowing of the soil, and the earth is covered with a natural layer of mulch. From these two observations we see the value of minimum tillage (so that the soil retains its natural structure with plenty of oxygen, microorganisms and humus) and of mulching (to protect the soil from runoff and erosion). [The importance of mulching and of minimum tillage was recently written about in the article "Life Below the Soil" (*EDN* 96), so it will not be expanded upon here.]

Figure 2: A thick layer of mulch is extremely important!

4) **Wisdom in caring for the crop**. Seeds are planted and fertilized precisely and accurately. Weeding is done conscientiously at key times.

5) **Giving and generosity**. This is a fundamental key in reversing the cycle of poverty. If you do not give, you cannot expect to keep receiving. You cannot keep taking from the land without giving back to it. Concentrate on the question, "What can I give?" rather than the question, "What can I get?" Don't think in terms of money; the type and timing of God's blessings are in His hands. FGW includes a vision of communities providing for the needy in their midst.

6) **Hope for the extremely vulnerable**, who have few resources. Per ton of harvest, FGW requires less hand labor, fuel and/or animal power than conventional agriculture (though the labor input per hectare is higher).

Oldreive suggests several ways to give even if you do not have a lot of money. *Give* the land manure or fertilizer. If you have no manure, use soil from an ant [or termite] hill. Return crop residues to the land to increase the amount of mulch. *Give* your effort to do things well. *Give* your actions (e.g. hoeing). And *give* knowledge to others.

Faithful Stewardship

Let's look a little more closely at each of the elements included above in the section on faithful stewardship.

On Time

Timing in agriculture is critical. In Zimbabwe, Oldreive observed that maize yields are highest with a planting date on or before November 25, when sunlight, heat and rainfall are at their highest levels. In this case, plants will be knee-high on the longest day of the year. Each day after November 25 that planting is delayed, 120 kg/ha of potential yield is lost. The advantage to planting on time seems clear! According to Oldreive, "In 1997 at a big field day on our farm, a prominent agricultural scientist said that if we could get the national mean planting date for our small-scale farmers two weeks earlier, we would double the national crop yield without making any other adjustments at all."

With careful planning and time scheduling, time can be used most optimally. There are different optimal planting dates for many crops. This means that if you grow more than one kind of crop each year, you will not need to plant them all by exactly the same date. An emphasis on scheduling is required in order to be on time with planning, preparing and ordering supplies; at Hinton Estate, planning started eight months before the planting season.

We also need to have correct balances. "We must not be so driven by time and so busy that we lose sight of God…or so late with everything that we are poor."

At Standard

"At standard" refers to doing things well and in a timely manner.

Without Wastage

"Waste" refers to unnecessary loss. Be faithful with little things, and do not be wasteful. Creation demonstrates that God is not wasteful. Think of the water cycle, in which molecules of water are reused again and again. Think of how dead plants and animals are broken down to nourish the next generation of life.

We want to avoid wasting resources. For example, we don't want to waste the gift of the "first rain." When fields are left bare, the land receives far less moisture. Especially on sloping land, most rain runs off the field, carrying precious topsoil. However, with mulch in place, the majority of the rainfall is stored in the field and accelerates the timing and success of planting.

There are also other wastes to avoid. We waste our integrity and reputation when we are dishonest. Pests and diseases cause loss and wastage, but these are reduced as FGW is practiced. We don't want to waste energy; according to Oldreive, "FGW done wholeheartedly [and year after year] actually reduces the amount of labor and energy required."

With Joy

According to Oldreive, the great challenge in Africa is to get small-scale farmers to transfer the FGW technology and management principles into actual practice. He has found that if the vision is shared clearly and then if a farmer is shown

how to do a small portion of his crop very well (at high standard, on time, and without wastage), invariably a glimmer of hope comes into his heart. The farmer realizes that he is on the road to a much better yield and profitability. The hope produces joy, which in turn results in encouragement and enthusiasm, which provides increased strength for the task.

Success Stories

Grant Dryden is a principle teacher on the FGW DVDs, and works closely with Brian Oldreive. In an October 2007 report, he shared that in Malawi, rates of adoption for FGW are growing. In Kuselema, one leader "acknowledged they were expecting to receive seed and fertilizer but had instead received something far more valuable—wisdom." Dryden also wrote that many farmers doing FGW to a high standard were seeing nine-fold increases in yield of maize.

Megan Johnson, a former ECHO intern, learned about FGW at ECHO and recently had a chance to work directly with Brian Oldreive in Zimbabwe. In one letter, she shared the following: "I witnessed the impact of FGW firsthand last week after traveling with Brian to a village called Massembura. Here Pastor Simon has his cement home, car, bore hole and farmland. Seven years ago, when he started FGW, he had only 2 small huts and his land. It is September, two months before the rains come, and his land is prepared—planting holes dug and mulch placed.

"Across the road from his home live two old gentlemen on their homesteads (a grouping of huts alongside their farmland). They are widowers; thin, frail, toothless men in their 70's, who also have faithfully prepared their land according to FGW and are ready for the upcoming rainy season. Their homesteads are neat as a pin, complete with beautifully pruned bougainvillea bushes, mulberry bushes, a mango tree and a flowering trellis over the entrance to their compound. Looking across their farmland, you see rows and rows and rows of planting stations, perfectly lined up and covered with mulch….The yields on these farms have increased so that these men are now making a profit! As a result, they are now in the process of building a small orphanage for local children. Isn't that the way things are supposed to be? Blessed to be a blessing."

Megan also spent a month and a half doing agriculture work at Eden, an orphanage in Zimbabwe. She and Sammy, the vegetable garden supervisor at Eden, decided to plant several sections of fields according to FGW.

She wrote, "We cleared a 100 meter section of field and planted several sections with maize (one fertilized with manure, one with chemical fertilizer), tomatoes, cabbages, butternut squash, groundnuts, 2 varieties of beans, and [groundnuts]. We also planted watermelons in another location and another 100-meter section of field with maize. This was all done using the FGW principles of no-till, permanent planting holes (with fertilizer/manure placed directly in the hole rather than scattered across the field), and mulch cover.

"We've had amazing results so far and the fields look beautiful! The watermelons were planted into rock-hard soil that was part of an ant heap (containing a lot of clay). Looking at the condition of the soil, you would have doubted any little seedling could push its way up through that tough crust, but they did and those watermelons are the best looking crop we have!"

Megan has also been helping to design and introduce small vegetable gardens that could grow well using only household waste water for irrigation. She told about a teaching/demonstration session held at Eden.

"We had perhaps 15-20 people in attendance and there were five individuals in particular who were keenly interested and took a lot of notes. They jumped right in and helped to dig the holes, pour manure in and plant the seeds….After completing the demo gardens, we took the group down to the large vegetable garden to show them what we had already planted and how well it was doing. They were amazed to see how well these no-till, heavily mulched crops were prospering! A week or two later, a man named Paul came to ask Sammy questions about fertilization. He had already begun planting his field according to FGW! Sammy and I decided to take a trip out to his farm to see what he had done….When we got to his field, we saw the most beautiful sight. He had measured out his baselines, stretched out his planting string and had already dug the holes of a large portion of his field! It was a moment of great rejoicing for all of us—and in particular for Sammy—because this man had instantly taken Sammy's teaching and put it into practice at his home.

"Some of Paul's rows were a bit curvy and Paul was frustrated that they weren't keeping the high standard Sammy had spoken of in his teaching. We decided to help him lay out new baselines for the next section of field so that it would be straight, and then we helped him dig two new rows. It was such a privilege to stand in his field, encourage him for his faithfulness, [and] help him where he needed help."

Lance Edwards, a former ECHO employee, has worked in Mozambique for two years promoting FGW. He reports that people with whom he has worked were hesitant at first but are now begging for training and information.

FGW Step-by-Step Instructions

The way to start with FGW is to first become a learner. Plant a demonstration garden (Oldreive calls it a "Well Watered Garden") in a strategic location. The demonstration garden is planted on a 7.2 x 7.5 meter plot, and serves as a "billboard" in the community (Figure 3). Ideally you would start with this the first season (it is a manageable size, so can be done with excellence) and gradually expand the amount of land cropped according to FGW guidelines.

Note that FGW does not require tractors or other mechanized machinery. The only tools that are required include hoes, fertilizer cups, measuring sticks, strings and bottle tops, fertilizer or manure, and seed. Journals are also important;

encourage those you train to keep a journal so that they can record activities and determine which practices work best.

Figure 3: A demonstration garden, also called a Well Watered Garden. The 2004 extrapolated yield on this plot exceeded 11 tons/ha.

1) Land Preparation

The FGW field is prepared during the dry season. Do not plow or burn. Identify the land to be cleared. Mark off the area with permanent corners (e.g. a cemented stake or stone), so that in subsequent seasons you can locate the same "fertility stations" that you will be creating.

Clear stumps and weeds from the land. To do this, mark off a 1 m wide strip of land bordering the edge. Hoe the whole 1 m wide strip of land and then mark another 1 m and do the same thing (this is referred to as 'eating an elephant'; it makes a huge task seem less overwhelming because you will see progress as you work along one narrow strip at a time). Keep the field weed-free after this initial clearing.

Mulch the field as much as possible. Among other materials, you can use the grass growing at the edges of fields for this. Gather as much mulch as possible—having a thick blanket of mulch is critical for success.

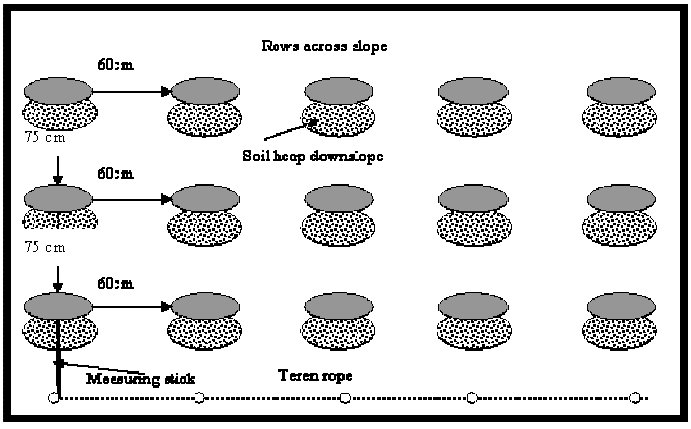

Figure 4: Diagram showing the layout of rows and planting stations for a FGW field.

One of the unique aspects of FGW is the use of permanent planting stations, also called "stations of fertility." These gradually improve year after year. The planting stations are carefully laid out in rows on the contour of the land, with holes spaced at 60 x 75 cm (see Figures 4 and 5). The holes should be as wide as a hoe, with soil heaped on the down-slope side of the hole. In southern Africa, the holes should be completed by the end of October. Dig holes for planting stations in the same way as clearing land, one row at a time. In this way you can estimate how long it will take, and plan your time accordingly. Accurate layout of the stations contributes greatly to the uniformity of the crop, and avoids giving an unfair advantage to one maize station over another.

A soil analysis will indicate whether liming is necessary (to increase the pH of the soil). If lime is needed, place it across the base of the hole. Holes should be dug 8 cm deep for chemical fertilizer, and 15 cm deep if compost and/or manure will be used as fertilizer. Soil from a termite mound can also be used as fertilizer. (Grant Dryden shared that with well-formed compost, it may not be necessary to cover it with soil. So holes can be dug to 8 cm (instead of 15) and covering is not necessary. 90 ml per plant station seems to be sufficient.)

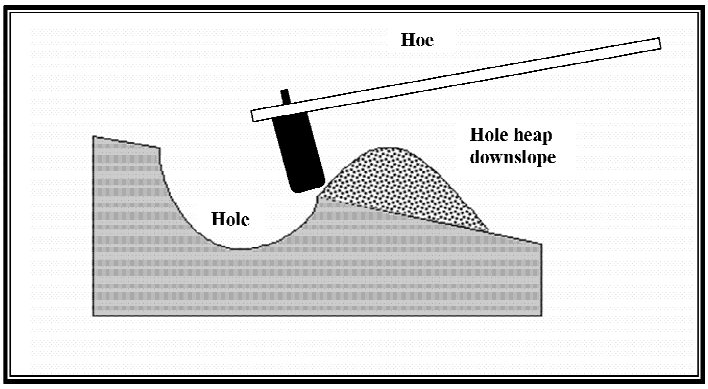

Figure 5: Opening a planting station/ station of fertility.

Fertilizer should be applied before the rains. For optimal yields, use a 12 ml cup of DAP (diammonium phosphate); or 43N:128P:43K (293 kg/ha); or a 500 ml tin of manure, placed evenly across the base of the hole. Cover the fertilizer with a shallow layer of soil. The thickness will depend on what type of fertilizer is used. If you are using chemical fertilizer, cover it up with three cm of soil so that few of the nutrients are lost to the atmosphere. If you add chemical fertilizer to your planting stations, you may need to loosen the soil several inches down. If you are adding compost instead, you will not need to do this.

Aim to have the holes and fertilizer for your planting stations, with mulch in place, a month ahead of planting. Then wait for sufficient rainfall (at the start of the rainy season) to begin planting. In Zimbabwe this usually means early November. Check the FGW website for information about when to plant other crops (besides maize) in Zimbabwe. For planting dates in other areas, check with local farmers or your local government agricultural extension agent..

Figure 6: A well-prepared demonstration garden.

2) Planting

Once the rains have started, plant three maize seeds to a hole (these will be thinned to two seeds per hole when the plants are still young and the soil is damp, for a total of 44,000 plants per hectare). Seeds in each hole should be planted in a straight row and covered carefully with soil (make sure there are no clods of soil or rocks placed over the seeds). Plant maize 5 cm deep (as deep as a matchbox is long).

Soybean and wheat are planted in furrows rather than in the planting stations. For soybean, dig furrows 75 cm apart and plant seeds a matchbox thickness deep, 2-3 cm apart within the furrow (for 35 seeds per meter of furrow). For wheat, dig furrows 20 cm apart. Plant seeds 2 cm apart within the furrow (for 50-60 seeds per meter of furrow). These furrows are consistently made along the same lines as the previous and following maize rotations.

When you plant, try to do the whole field at once so that you get uniform germination.

When maize plants are still small, each station is thinned so that you average two plants per station. This actually leads to higher yields than if you leave all three plants in the ground. Thinning the plants is often difficult for farmers at first. To help the idea make sense, you could plant two different plots using FGW methods; in one, leave all three plants at each station, and in the other plot, thin to two plants per station. Lance Edwards did this and commented that the men he worked with were amazed when they saw how much bigger and healthier the thinned plants were.

If fertilizer is to be added later as a top dressing, it can be added when plants are halfway to knee height (two weeks after emergence) and straight after thinning. It can be done again (for maize) just before it tassels. Place about 5 ml of fertilizer a minimum of 10 cm from the base of the stem, on the upside of the slope.

3) Potential Pest Problems

Pest problems that you might encounter are not specific to FGW. One potential problem is that rats and mice might dig up and eat the seeds. Two possible ways to minimize this are to plant as early as possible [once the rains start], and to put cobs of maize directly on the surface of the ground so that rats and mice don't instead dig for seeds.

Farmers are sometimes concerned about termites, but the termites are actually a blessing, not a curse. Feed them! They will eat dry stalks that are left on the surface of the ground, and at the same time create important air tunnels into the soil. They will rarely eat green seedlings, especially if decaying organic matter is available.

Chickens like to dig in mulch for food, and will sometimes cover seedlings in the process. This can be a problem. Fence them in (or out) where possible.

4) Weed Control

Weeding is extremely important. If weeds are removed when small, they will be much easier to get rid of. Try setting aside two hours a day for weeding. Most weeds can be hoed just below the surface to cut off the roots, but creeping grasses will need to be pulled out. Weed (with a hoe) while moving backward, so that you don't inadvertently replant hoed weeds by stamping them into the soil. Weeding should not be much of an issue if you hoe weeds when they are very small and if you have a thick layer of mulch on the surface of the field. Often three 10-day rotations are recommended.

5) Harvest and Postharvest

Once maize is fully mature, break off the tops above the cobs. These broken off parts can be used as a portion of the mulch. After the harvest, step on the stalks of plants at the base, so that they lie on the ground between the rows. Leave them on the surface of the soil to improve the mulch and to help reduce weeds. This process also breaks the life cycle of the maize stalk borer, because the borer pupates in the stem at the very base of the plant. If the stump is left upright, the pupa survives; if the stump is knocked flat, the pupa usually dies.

A final weeding just before harvest (while maize cobs are drying on the plants) is extremely important to minimize the amount of weeding necessary in preparing the field for next year's crop. The plants left in the soil at the end of the season produce the seeds that will be next year's weeds. If left standing in the field, just one pigweed plant can produce 600,000 seeds!

Postharvest control of pests in stored grain is important, to prevent losing much of the crop to insects or rodents.

Crop rotation with legumes is important to improve the soil's structure and fertility, as well as to break disease cycles. Aim for one third of land area to be under rotation (e.g. plant legumes on one third, maize on the other two-thirds). If you follow maize with soy or another legume (e.g. beans or groundnuts), you may not need to add fertilizer. Because soybean seed is planted closer than maize, you will dig a furrow instead of using the planting stations.

Conclusion

FGW seeks to align agricultural practices with patterns that are seen in creation—land that is not tilled, with a blanket of organic matter. FGW also emphasizes good management practices, and has proven greatly successful where it has been implemented wholeheartedly. Combined with the spiritual teaching, it is a powerful tool for change and transformation, as has been experienced already in communities throughout southern Africa. We encourage you to experiment with FGW, initially on a small scale with a demonstration garden. Let us know your results, and we will pass them on to Brian Oldreive and Grant Dryden!

References and Resources

Figures in the article are used with permission from Brian Oldreive and Grant Dryden.

A "Farming God's Way Training Manual" by Grant Dryden is available from ECHO's bookstore for $1.00 plus shipping. .

Also available from ECHO's bookstore: "Farming God's Way DVDs"; 5 disk set for $ 49.95 plus shipping. Disk 1: Introduction; Disk 2: Explanation; Disk 3: Implementation; Disk 4: Application; Disk 5: Extension.

A training conference for FGW is held twice a year. Details can be found on the FGW website, www.farming-gods-way.org. The next conference will take place March 3-7 in Harare, Zimbabwe

FROM ECHO'S SEEDBANK

Low-Toxin Grass Pea

By Dawn Berkelaar

Grass pea (*Lathyrus sativus*) is a drought-tolerant legume used as forage for livestock or as food for people (seeds are roasted, cooked into porridge or ground for use in bread). The plant thrives in poor soil, drought or flooding.

Grass pea can also potentially cause paralysis, due to an atypical amino acid in the plant that can damage a person's nerves. In the article "Detoxifying Desert's Manna" (*Science News Online*; July 29, 2000), author Janet Raloff explained: "When consumed in large quantities for just two or three months, the untreated seeds can trigger a disabling spasticity known as lathyrism. Unless affected people find other sources of food quickly, their condition could worsen, and they could eventually lose all use of their legs." Men between the ages of 18 and 40 are most vulnerable to lathyrism.

Now, ICARDA (International Center for Agricultural Research in the Dry Areas) in Aleppo, Syria, has bred grass pea cultivars that are practically toxin free. The process took 15 years and cost $1 million. The low toxin strains have yield, taste and environmental ruggedness similar to the original.

In some cases a lathyrism epidemic affects a whole community. In part of Ethiopia in the late 1990's, one in five people was left unable to walk. In Bangladesh in the early 1970s, up to 70,000 people were disabled (2 in 100 of them permanently).

Of people eating higher-toxin grass pea seeds, only a few develop lathyrism. Development of the disease may be linked to a deficiency of trace minerals. Livestock rarely show symptoms. E. Ann Butler, a legume specialist at University College London, "contends that people fall victim to lathyrism not because of ignorance so much as climate and economics." During droughts, water (to leach the seeds' poison) and fuel (to boil the seed) are scarce. Even treated seeds are not necessarily safe. Butler tested peas that had been pretreated (by soaking for 10 minutes in hot water), and found them not much reduced in toxin.

The amino acid of interest in grass pea is referred to as ODAP. It may give grass pea resistance to pests or to extreme climates. Peter S. Spencer, a neurotoxicologist at Oregon Health Sciences University in Portland, notes "the amino acid seems to masquerade as a signal molecule [also an amino acid], called glutamate, that's found in animals." It is similar to MSG (monosodium glutamate), which is added to food to enhance flavor. ODAP seems to over stimulate nerves, killing them.

Most grass peas contain between one and two percent ODAP by weight. Eating a small amount is harmless. Lathyrism typically develops when 30% of calories come from grasspea for several months.

Low-ODAP strains of grasspea were first developed at Agriculture Canada's lab in Morden, Manitoba. Researchers developed a strain with just 0.01% ODAP, but it didn't yield as high and it looked different from the original Indian line (for example, it was too large). The new strain was distributed to breeders in research centers in Africa and Asia, to hybridize with popular local strains. By 2000, it was still not available to farmers.

Breeders working at ICARDA crossed *L. sativus* with *Lathyrus cilliolatus*, a low-toxin relative from the Middle East. The best resultant strains produce just 0.04% ODAP but taste like the original grass pea. Some farmers are field-testing the new varieties, but ICARDA does not produce and distribute large quantities of seed. Since it is a subsistence crop, small-scale farmers don't tend to buy seed. They

either grow it themselves or receive it in barter. There was no existing central point for dissemination of seed and information. ICARDA hired sociologists, anthropologists, etc. to work with officials to establish networks for quick distribution of seed.

Clayton G. Campbell, a retired Lathyrus breeder for Agriculture Canada, points out that grass pea could be a good crop for farmers in developed countries, too. It has high protein content (28%, twice that of wheat). In Manitoba, Campbell obtained yields of 5000 pounds per acre, which is similar to field peas and three times that of soybeans. Grass pea does great in drought situations, yielding more than 1000 pounds per acre with only 2.5 inches of rain. But people are too worried about ODAP, even in low-toxin varieties. This is despite the fact that the root of Korean ginseng (*Panax ginseng*) also contains ODAP, in similar concentrations to *L. sativus*.

Lester Brown of the Worldwatch Institute in Washington, D.C., says low-toxin grasspea could provide a way to safely increase dryland food production, or to plant a second (cover) crop during the dry (usually fallow) season.

I contacted some of the researchers and research centers mentioned in the article, and asked, "How can you know that low-toxin grass pea varieties will not cross with high-toxin varieties in the same geographical area?"

Clayton Campbell responded, "Grass pea or *Lathyrus sativus* is a self-pollinating species. Therefore the pollen is not transferred between plants and you would not get out-crossing. The biggest concern is mixing of the seeds by the farmers when they harvest or thresh the crop. Extreme care must be taken or your seed source can quickly become contaminated. This is a large problem because in many areas farmers use the same threshing floor both for their own and their neighbors' crops."

Dr.Ali M. Abd El-Moneim, Senior Forage Legume Breeder at ICARDA, agreed that grass pea is a self pollinated crop, but commented that 2.0 to 25% out-crossing does occur, depending on location and honey industry. He added, "Our low neurotoxin lines have a marker gene that is the white flower color. Farmers can differentiate at morphological level between low and high neurotoxin genotypes. At the same time to maintain the genetic purity of low neurotoxin lines we plant them in isolated areas where no other high neurotoxin land races are planted."

El-Moneim shared, "In 2005, a very low-neurotoxin variety named "Waise" [was] released in Ethiopia and another variety, "Ali-Bar," released in Kazakhstan. A package of technology…has been offered to the farmers in Ethiopia. Seed multiplication is being made in collaboration with national programs."

ECHO recently received seed of ten selections of low-toxin grass pea from ICARDA. Members of our overseas network who work with small-scale farmers may request a free packet of about 50 seeds representing a mixture of these selections. You may then save and multiply seeds of the best-performing plants. We would greatly appreciate hearing about your successes or failures with these seeds. We will share your observations with scientists at ICARDA. To ensure a continued supply of seeds, ECHO will be growing out each of the ten selections on our demonstration farm.

UPCOMING EVENTS

Christian Community Development Conference

Mosbach, Germany
April 25-29, 2008

This conference addresses avoiding dependency and attaining sustainable change. The format includes keynote presentations, Bible studies exploring a Biblical worldview and sustainable change, and networking and prayer time. Participants choose one from among four in-depth tracks: 1) Basics: the fundamentals of Christian Community Development (English); 2) Basics: Einfuhrung in Christian Community Development (German); 3) Advanced: Worldviews—their role in development and sustainable change (English); and 4) Advanced: Programme Management—balancing donor requirements with community participation and ownership (English).

For more information, check the website at www.ccd-network.net or contact Akademie für Weltmission at ccd@gmx.net or ccd@awm-korntal.de.