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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.

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After 10 Years In Haiti Have I Done Any Good?

By Wayne Niles

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[Ed: This article is adapted from a presentation that Wayne Niles gave at ECHO's Eighth Annual Agricultural Missions Conference in November, 2001.]

I'll start by introducing my family, then give you a sense of my context and do a quick overview of my programs. Then we'll go to the heart of my article; we'll look at some activities in detail and see if I've done any good.

My wife Katherine and I are American Baptist missionaries. We have been in Haiti since the summer of 1990. We are both missionary kids raised in Congo and I worked as an engineer for ten years in the oil industry before deciding to get into agricultural missions. Katherine is a physician assistant and is busy running a church-based clinic but has spent much of her time looking after her three men—me and our two sons, Christopher and Jonathan.

Politically and economically, the ten plus years our family has been in Haiti have been rather tumultuous. There was a coup in October of 1991 against President Jean Bertrand Aristide, then four years of crushing embargo when gasoline cost $20 a gallon and neither tools nor parts could be imported from the US. Finally in 1995 there was a US-led invasion restoring Aristide to power followed by a couple years of "semi-occupation" by UN forces. Since then the country has muddled along with a dysfunctional government, weak police force, and little foreign aid.

It has been against this background that we have worked with the Haitian Baptist Convention, an association of about 150 churches resulting from a century of American Baptist missions in Haiti. My mandate is to witness to the love and saving power of Jesus Christ by helping Haitian Baptist congregations in the area of agricultural development. This is a tall order indeed, because each church seems to be in a different environment. Some are located on a semiarid plain, others in the mountains, and others in rain forest, all within a few hours' drive from our home.

Our program has five general thrusts: we do production research, new crop introductions, active extension, passive extension (defined below), and preparation of training materials.

Our **research** component involves learning to farm in Haiti. Every year, I have cropped the 5-acre farm where I live, learning much about the practice and economics of Haitian agriculture. Most of our extension teaching comes from our on-farm experience.

I've put a lot of time and effort into **crop introductions**, with little to show for it. I've tried all of the exotic seeds ECHO offers and also crops from commercial suppliers in the US, Australia, and Indonesia. Only a few of the ECHO seeds have "caught on" permanently. Jack bean (*Canavalia ensiformis*) and gliricidia (*Gliricidia sepium*) are two important ones I use all the time. Over the last three years we evaluated more than 40 species of tropical forage legumes on two locations, with four planting dates per year. Some winners in this work were Hairy Indigo (*Indigofera hirsuta*), *Desmodium rensonii*, and *Aeschynomene americana*. [Trial packets of each, as well as jack bean and gliricidia, are available from ECHO. Those working in agricultural development in developing countries may request a free packet of each.

Others may purchase them at $3.50 per packet (includes shipping)].

Another winner was a soybean brought in from India. All American soybeans I tried grew six inches tall and gave us a couple pods. The Indian soy grows normally and yields well here if planted before May or after August. A major problem I've had with all crop introductions has been seed viability. Many seeds don't keep even a year. Many of my seed stocks have died during furlough years or drought years. The Indian soybean is probably now gone because of the 2000 drought when the total rainfall from January through August was only four inches (10 cm). Then in November we had 18 inches (45 cm) of rain in 24 hours. I lost four consecutive plantings over two years due to weather; the viability of the seed I have now is less than 10%.

Our **active extension** work is conducted by a Haitian staff member, Edner Cesaire, and me. On invitation from a church, we meet with the congregation and discuss what sort of problems they have. We embark on a program of activities based on what they sense they need and what we can offer. Due to the diversity of Haitian production environments we need a diverse "tool box" of technologies to offer our constituents. Most popular is instruction on how to grow vegetables, since they have a high market value and short growing cycle. Demonstrations are popular. We do lots of basic training such as sharing how to establish and run a credit cooperative, how to grow yams or bananas or how to do micro-irrigation. Edner has a motorcycle and access to a four-wheel drive pickup truck. He is untiring, and as long as I can keep his vehicles running he is somewhere teaching folks something six days a week.

Passive extension involves folks coming to us for information or training. We do rabbit production seminars, well drilling seminars, pump making seminars, and whatever else is of interest to folks. I teach an agriculture mechanization course each year for the two universities in northern Haiti. It is a rule that the longer you are in a place the better known you become and therefore the less time you have to do what you want to do. I spend a lot of time fielding questions from folks who have come a long way to see me with a particular need or problem.

Finally, we have prepared many **training materials** to document and share what we have learned. We have produced training videos on animal traction, poultry production, rabbit production, and many other topics. Our written materials cover animal production, agricultural technology, the management of credit cooperatives, and a textbook on auto mechanics. These are all written in Haitian Creole.

So, in a nutshell that's what we've been doing for the last ten years. This article is an evaluation of sorts; I will look over some of these activities in greater detail and score them in four areas using an A to F scale. For each activity I will ask myself the following questions:

Is it helping anyone? F = no
A = green revolution!
Is it cost effective? F = waste of money
A = great return on investment.
Is it sustainable? F = requires constant outside support,
A = adopted beyond expectations.
Is it worth continuing? F = abandon it
A = continue investment/development.

We will look at our efforts in rabbit production, appropriate technology and poultry breeding, then wind up with micro-irrigation. When we're all done, I'll give myself an overall score that you're welcome to debate with me. Let's begin!

1) Rabbits

We began raising rabbits in 1992 for meat for our table. The embargo had caused the collapse of the poultry industry, which was dependent on imported soybean meal. We used the same system we used as kids growing up in Africa: wood cages, a tuna fish can for water, and lots of greens for feed (Figure 1). It turned out this was quite an innovation in our neighborhood. Years before, another missionary had introduced rabbit production, but used the classic American system of wire cages, special ball bearing waterers, and pelleted feeds. Everyone said our rabbits would eat their way out of the cages, but they didn't. They do gnaw at the wood occasionally to sharpen their teeth but you can always replace the wood. So we began producing rabbits (Californian and New Zealand males crossed with a grey local variety). Soon local demand for rabbits prevented our getting any to eat–we sold them as fast as they reproduced.

Figure 1. A rabbit cage made out of locally available materials. Photo by Wayne Niles.

It seems that when our neighbors saw that our system didn't take a large investment in equipment, they wanted to try it, too. There was also the status factor. When the rich missionary used an ugly, simple wood cage, then other folks were not ashamed to do so too.

Rabbits aren't something everyone can pull off. Rabbits require much more management than Haitians are accustomed to giving their other animals. They tether their cows and perhaps their goats; their chickens and ducks run free. Rabbits, however, not only need to be fed and watered, the keeper must

build a cage and even assist in mating the doe and weaning the offspring. I estimate that only 10 to 20% of those who try have the discipline to properly care for rabbits so that they live and thrive. After one day without water or a couple days with marginal feed, rabbits begin to die off. Nevertheless, for those who can do it, rabbits are more productive biologically and economically than any other animal Haitians can raise.

We sell a three-month-old rabbit for the equivalent of $5 US. A doe (mother rabbit) can produce 20 bunnies a year in four litters averaging five to a litter. That comes to $100 per doe per year. A goat sells for $30, a year-old calf sells for $75. Rabbits not only yield a higher income, but this income can be pure profit if they are raised entirely on cut and carry feeds. A person can easily manage four productive does in a couple hours work a day. I know a young man who has paid for all his schooling, clothes, and food, plus purchased bicycles using income from raising rabbits. As I mentioned, however, eight out of ten people who try usually give up.

Due to this high failure rate, I have never promoted rabbits as a major solution to Haitian poverty. I decided early on to just have rabbits year in and year out to support those who can benefit from them. I have thus maintained a small flock of five to eight breeding does continually since 1992. Every year or two I upgrade my stock with bucks from the USA. Keeping the genetic pool of the rabbit population in Northern Haiti diversified over the last 10 years is probably one of my greatest rabbit contributions to Haiti.

Many years it has been difficult to find feed during the dry season. The rabbits stop producing and some may die. During these times I feed them leaves from drought tolerant trees such as moringa, glircidia, leucaena, mombin, and calliandra. We also plant about a half-acre in jack bean, sweet potatoes, and grasses for feed (we feed the leaves of the jack bean and sweet potato plants).

Because making cages is the single greatest obstacle to many potential raisers, particularly women (who don't tend to do much carpentry), we have cage-building seminars for those who are interested. All it requires is a couple pounds of nails, a hammer, machete, and a source of bamboo. Most divert liberally from our design. Folks use whatever they have at hand: cardboard, pieces of old roofing material, chicken wire, old crates, and so on to make their cages. We provide basic guidelines: it should be an arm's length deep and wide, half an arm's length high, protected from rain where necessary, and situated at an appropriate height so that it can be reached but is protected from predators.

In the last two years demand for rabbits has grown tremendously, probably because the broiler industry is still dead in Haiti and free-range chickens face many diseases. People are not eating much meat these days. Over the last two years my neighbors and I have sold every rabbit produced and are selling them as soon as they are weaned. Consequently, I've encouraged all our local raisers to increase production by supplementing forage with wheat bran, which is a by-product of the recently privatized flourmill in Haiti. Using wheat bran, average litter size increases from five to eight and the number of litters per year can be increased from four to six. Because of the cost of the wheat bran, raisers don't make any more money but it greatly reduces the amount of feed required so more rabbits are produced with less work.

I'll end this section by noting that we have made a video on rabbit production. We also have a booklet in Creole titled "Raise Two Female Rabbits, Eat Meat Every Week" [Available from ECHO for $5.00 plus shipping; see page 8]. Our emphasis is not cash income but meat production for the table. Meat is becoming expensive and rare in the Haitian diet. The principal advantage of rabbits is that they are small and productive, so unlike a goat or cow, you can kill one any day you're in the mood for some meat protein. So have I done any good?

Is it helping anyone? D. At least it helps the 20% who can raise rabbits.
Is it cost effective? B. My rabbit sales nearly cover all costs.
Is it sustainable? B. Sustainable except for the need for new stock from outside.
Is it worth continuing? A. As a small-scale project, constant support is merited.

2) Appropriate Technology

Being an engineer and perhaps a bit lazy, it irks me to do something monotonous when there is a device I could build that will make it go faster and easier. It has been a constant disappointment to find that my efforts in appropriate technology are rarely appreciated in Haiti. During the embargo years, whenever I needed a labor-saving tool such as a planter or cultivator I had no choice but to make it myself since I couldn't order one from the States. I thought I was promoting local industry. If a demand developed for a tool, I could teach someone how to make it as a means of employment.

I've built and used a small winnower for cleaning small batches of seed for many years, and even sold one to a local farm. But most farmers just don't need it. Haitian women do all the winnowing with a "layo" and see no need for a more complicated device. Time is obviously not a constraint. [Ed: Wayne describes a layo as a woven object resembling a basket lid. It is about two feet across in diameter. Women in Haiti use layos to winnow grain. They toss the grain into the air so that the wind will drive away the chaff, but they also are able to catch by hand and remove heavier objects like sand and gravel.]

Peanut is an important crop in Haiti, and peanut butter sells well in the country. All peanuts are shelled by hand. Here, certainly, is an appropriate operation pleading to be mechanized. I've made three different designs of shellers and loaned them out to various peanut butter makers for evaluation. All evaluations are extremely negative: the machines break too many kernels, which will over-roast and ruin the color and flavor of the peanut butter. Even my staff has no tolerance for the machines when we are shelling for

seed. Every broken kernel is a major loss. Once again time is not a constraint; if it takes ten times as long but does a better job, it's worth it.

I wanted a push planter during the embargo, so I built one. It works well and is much more robust than the flimsy things sold in seed catalogues. I use it every planting season and even my field hands prefer using it to planting by hand. It certainly goes much faster and plants at a consistent rate and depth. But despite demonstrating it at local fairs and to all my university students in the agriculture mechanization course that I teach, I've never had a request for one.

The problem likely is that the push planter is appropriate only for a well-prepared seedbed that has been plowed and harrowed. Most Haitians have only a hoe with which to till the soil, and even those who use tractors or oxen-powered plows do not harrow. They don't need to, since planting is done by hand with a hoe that tolerates a very irregular field surface.

So I decided to make a jab planter that would be appropriate to typical Haitian planting conditions. I developed one that works very well. I have two designs, a lightweight plastic model for soft soils and an all steel one for rocky untilled soils. Using it, Edner and I planted three acres on a steep hillside in the time a team of four Haitians planted one acre using their machetes. I've discovered, however, that many folks just can't get the hang of using it. You have to jab, rock forward, and pull out, jab, rock forward, pull out; just like a walking stick. Folks have a tendency to jab, rock forward then pull BACK, which causes the tip to plug up with dirt. Despite hours of patient work with my older field hands they NEVER could get the hang of it. The younger ones (in fact, most folks under 50) have no trouble with it. How many requests have I had so far? Zero.

I could go on and on. In closing this section I note that labor-saving devices are relevant where land is abundant but labor and time are scarce. In Haiti we have the opposite: land is scarce but labor and time are abundant. My operating principle is that Haitians have plenty of time but little money. Hence if a wood rabbit cage costs nothing but takes two days to build and needs constant maintenance to keep intact, it is far more appropriate than an expensive steel cage. Most of my appropriate technology devices draw lots of interest from American visitors but complete apathy from Haitians. So have I done any good?

Is it helping anyone?	D. Little adoption.
Is it cost effective?	D. Their tools are cheaper.
Is it sustainable?	A. The tools are locally made.
Is it worth continuing?	C. Cautiously but not too enthusiastically.

3) Improved Poultry Breeding

I got into chickens when the ministry of agriculture asked me to produce 12,000 eight-week-old chicks for distribution to farmer groups. The objective of the endeavor was to upgrade local Haitian poultry flocks (though it should be noted that bringing in new unadapted poultry often results in a loss of local production because imported breeds lack the ability to set and hatch eggs). We raised the chicks to eight weeks and delivered them to various towns in Northern Haiti. Most of the chicks promptly died after delivery due to the shock of going from the protection of the chicken house with abundant nutritionally balanced feed to free range where they had to fend entirely for themselves.

This got me to thinking. Wouldn't it be cheaper to distribute fertile eggs to Haitian farmers in the spring when their own hens are setting on eggs? For the contract price the ministry of agriculture paid us per bird, they could have distributed several dozen eggs and still come out ahead. The advantage being, of course, that a local Haitian hen would then raise the chicks and teach them to scratch and peck and escape all their natural enemies. About this time ECHO ran a piece in *EDN* about Dr. John Bishop's Triple Production Red (TPR) chickens, so I wrote to ECHO about them.

To make a long story short, within a year Dr. Bishop came to Haiti with 200 TPR hens and we had great plans of multiplying this improved bird with the intention of distributing fertile eggs and chicks to local farmers. This project had the added benefit that they were bred to be "broody." Broody means the hens know what to do with an egg: sit on it regularly for 21 days until it hatches, and then walk around clucking and scratching to show her new charges how to get on in life.

By the time the birds were of laying age we knew we were in trouble: first they wouldn't lay eggs in the summer, and then they couldn't hatch their chicks. We tried all manner of nest configurations, seclusion, feeding, and so forth with little success. The hens were inconsistent. They would get tired of setting after a week or two and abandon their eggs. Others crushed the eggs. The ones that succeeded in hatching their chicks smothered them. At the end of the first generation our total was 36 chicks hatched from over 1000 eggs set. Those who purchased our fertile eggs had better success hatching them under local hens but they complained that only a low percentage of the eggs were fertile.

However, all the Haitians who saw our large TPR hens and roosters wanted them. It seemed we were on the right path, but facing typical development "adversity." So two years ago I decided to try to produce a hybrid population adapted to Haiti by crossing local birds with TPR's. I purchased a couple dozen scrawny local hens and ran them with a couple of the biggest TPR roosters we had. The idea was to select an adapted population based on size, appearance, egg production, and of course the ability to hatch chicks.

But the big TPR roosters tended to die for unexplained reasons. It took four roosters a year to keep two healthy ones mating with my hens. Worse, the roosters proved to be poor breeders even when they had a monopoly with the hens; a high percentage of the eggs were infertile.

Still, the hens proved to be good mothers and hatched the eggs that were fertile. We raised the chicks in movable cages to provide a "protected free range" environment. That way they

could learn to hunt and peck and be exposed to the natural environment while being protected from predators. Unfortunately, it became clear we were not just breeding for large size, but also for susceptibility to local diseases. Of the first generation, only 6 of 100 chicks that hatched survived to adulthood. The principal diseases were fowl pox and gomborro, a sort of AIDS for chickens that renders them defenseless to all other diseases. So we began vaccinating for fowl pox and gomborro and, of course, Newcastle's disease (against which all chickens need to be vaccinated). Our losses immediately decreased, but progress remained slow.

We collect all eggs laid each day and allow broody hens to set in a special setting cage. It keeps them completely protected yet gives them the freedom to get up and eat and drink as desired. When the eggs hatch, we let the hen walk around with her chicks for a week or two in another movable cage. We wean the chicks from their mother after two weeks so she will go back to laying again.

This system works fairly well, but required an incubator for eggs laid when no hens were broody. Since I had no power for an electric incubator, I decided to build a non-electric one. After several attempts and setbacks I finally have a couple of kerosene-powered incubators that work. My 180-egg incubator ran continuously from January to July of 2001 (Figure 2). The eggs must be manually rocked several times a day. Otherwise the only requirement is to add kerosene and water once a week and trim the wick every other week. It requires an internal 12-volt fan that runs off a car battery so it does require some electricity. [Ed: Wayne has written a booklet called "How to Build a Kerosene-Fired 180 Egg Incubator with 12V Air Circulation." Those working in development may request a free copy. For others, the document costs $5.00 plus shipping. Be sure to include a postal mailing address when writing to us! The document contains lots of pictures and is too large to send by e-mail.] I have a "still air" incubator that can handle 60 eggs and is totally non-electric, having no fan. I use it for small batches in the fall and as a hatcher for the larger incubator in the spring.

Figure 2. A kerosene fired 180-egg incubator with 12-volt air circulation. Photo by Wayne Niles.

My results so far have been mixed, with many discouragements. Disease pressure is still high. Every day I throw out a dead chick or two from the cages, even with vaccination and antibiotics. What's the use of developing a breed of chickens that depend on vaccines a peasant farmer can't get? But if I don't vaccinate, I'll not have any chicks at all. Then in August, a thief broke into the chicken house and stole half of my best hens and roosters.

I close this section by saying that I've kept on with this project because I've always felt it will help the poorest of the poor; the widows and single mothers who can keep a few hens but can't afford a goat or cow. Eggs are among the best protein sources for children, and free-range chickens are excellent protein collectors. Recently I've had a few encouraging signs. My hybrid population kept laying throughout the summer and many of them successfully hatched their own chicks.

So have I done any good?

Is it helping anyone?	F. Not yet.
Is it cost effective?	F. Not yet. $8,000+ spent so far.
Is it sustainable?	F. With vaccinations.
Is it worth continuing?	D. Probably not.

[Ed: The year after Wayne's presentation, his problems with gomborro were greatly reduced and he successfully hatched and raised 300 chickens. However, he said, "I would still give the project a very low rating because it has been so expensive and has a dubious sustainable long-term impact. Poultry are far more susceptible to disease than rabbits and require vaccines to survive."]

4) Micro-Irrigation

I got into micro-irrigation technologies within my first months in Haiti. Everywhere I went talking to Haitian peasant farmers, the number one priority was water. Water, water, water. As in most other semiarid tropical environments, crops here are constantly threatened by droughts. In 2001, for example, we had 18 inches of rain in January and 0.6 total during February and March. Three weeks with no rain in the tropics is a drought. One good irrigation in the middle of those three weeks can mean the difference between crop failure and a reasonable harvest.

It turns out that ground water is often less than 15 feet below the surface in areas of Haiti where agriculture is most intensive: the river valleys and coastal plains. Around Cap Haitian, where we live, most people have hand-dug wells in their yards for domestic water needs. These are costly and useless for irrigation, because most have only a few feet of standing water in them. A gasoline pump could pump them dry in a few minutes.

I began studying the appropriate technology literature for ideas and immediately found some good ones in the *Appropriate Technology Sourcebook*, which I had discovered in the ECHO library during a visit there in 1988. It is now available on CD. It is the ultimate reference for anyone working in development. The sections on micro enterprise,

health care, cookstoves, forestry and water supply are exhaustive and extensive. [Ed: The *Appropriate Technology Sourcebook* reviews 1150 different publications. CD-ROMs that include 1050 of the publications in their entirety can also be purchased. See the section "Books, Web Sites and Other Resources" on page 8 for more information about the *Appropriate Technology Sourcebook* and CD-ROMs.]

Using a three-inch (7.5 cm) pipe with teeth sawed into the end as a bit attached to a twenty-foot piece of one-inch (2.5 cm) pipe, I made an auger and drilled a hole to the water table by hand in a couple hours. Once in water, the hole kept caving in so I had to line it with four-inch plastic drainpipe. When the soil became too sandy for the drill bit to hold, the sourcebook recommended a bailer which is a pipe with a one way valve in the bottom: sand and water can enter but not fall out. Holes let the water (but not the sand) pass back into the well. Using this tool I drilled to 30 feet, at which point the entire setup got too long and ungainly. I quit and tested the well with a gasoline pump. My little well could fill two 55-gallon drums in a minute, more than enough for small-scale irrigation. More importantly, because the well had 15 feet of standing water, it never "ran dry" as did hand dug wells. News of this well, dug in only a couple days, that produced abundant water traveled fast in our neighborhood. I soon had requests to drill wells for other farmers. They paid for the pipe and provided labor, while I provided the tools and technical advice.

It quickly became evident that I could have a full time well-drilling ministry punching these little wells for peasant farmers. That was not my vision, so I began holding well-drilling seminars to teach farmers to drill their own wells. I also contracted several local welders to produce drilling tools. Over the years this technology has matured and developed. We learned to make more efficient augers copying those used by soil samplers. Using gifts from churches, I created a revolving fund to maintain a stock of well-drilling tools which we sell at cost. We conduct two or three well drilling seminars at my place each year, as demand requires. Women also are learning to drill these wells. Over the last decade, hundreds of wells have been drilled using this technology, many of which I never know about. I've discovered that there are people who make a living drilling wells using their own tools.

Once we had a simple way to drill wells, the question was how to get the water out. The obvious solution was to use gasoline pumps, but not everyone had funds to purchase one. So I began to look into low-cost pump designs that Haitians could build and maintain themselves. The design we used is based on one developed by a Haitian Christian inventor named Vixamar Dieudonne. He was making pumps out of rather expensive galvanized pipe. I asked him to design a pump made from PVC, which he did. We have since modified and adapted his design and taught hundreds of folks how to make his pumps. In a typical pump-making seminar we limit participants to using a chisel, hacksaw, hammer, and screwdriver. We divide the group into teams and naturally they race to see who will pump water first. It is a tremendous awakening for them to realize that they can build something that seems impossibly complicated at the outset.

The plastic pumps were appropriate for small gardens and domestic needs but couldn't irrigate an acre or two of bananas. We were in the middle of a crushing embargo where gasoline was approaching $20 a gallon. What about wind power? Our first wind pumps used sails made from rice sacks and pumped using our plastic pumps. They proved the feasibility of wind power. When the embargo lifted in 1995, we began building windmills out of steel using a design in the *Appropriate Technology Sourcebook*. The windmill we used is called the 12 PU350, and was designed in India by the Dutch development organization TOOL. The Sourcebook microfiche [or CD-ROM; see page 8] library has six different publications produced by TOOL staff concerning the design, development, and construction of windmills with steel rotors either 3.5 or 5.0 meters in diameter.

These windmills are excellent. I've built five and had no problems with the rotors or towers. The pumps, of course, are always needing repair because they do so much work. To make effective use of wind-powered irrigation a storage tank is needed, because the wind is often blowing at night when farmers are supposed to be asleep, not irrigating. I have three windmills with storage tanks varying from 3,000 to 6,000 gallons (Figure 3). The tanks are made of cement block like any house wall and sealed with a mortar high in cement. My boys and their Haitian buddies use them for swimming pools. Thanks to wind power I've been able to irrigate and farm at our place at very low cost during embargos and fuel crises.

Figure 3. A windmill behind a storage tank that is full of water. Photo by Wayne Niles.

Once again my vision was not to become a windmill manufacturer but to stimulate the creation of local capacity for wind-powered irrigation. This has not happened. I get dozens of requests each year to build windmills for individuals and groups but I always decline. I have sought and failed to find a local entrepreneur willing to take up the challenge.

Irrigation with gasoline power has been more successful. About eight years ago I decided to stock and sell rather

inexpensive gasoline pumps to support small-scale irrigation. I started with four pumps and a lot of spare parts. These quickly sold and from the proceeds I ordered four more. Over the years I've sold more than 50 pumps. I've sold eight already this year (i.e. by November 2001). These pumps cost about $200 and are composed of a three horsepower motor attached to a plastic pump. Though they are not very robust, I have two that have been in use for eight years. So with care, they can last for an extended period.

Integral to the popularity of these pumps are the foot valves and quick coupling we use on the suction end. We made the foot valves ourselves based on our plastic pump designs. The foot valves and screen protect the pump from damage from trash and facilitate priming. The pump is primed by shaking the suction line in the well. This saves wear and tear on the pump, as without a foot valve the engine must be raced to prime the pump. The foot valve also prevents losing prime when the pump draws air.

We had a lot of trouble with the pumps sucking air before we began using quick connect couplings (Figure 4). My field workers are not sophisticated mechanically and quickly ruined the screw-type couplings that came with the pump. This caused the pump to suck air and pump little water. Quick couplings completely eliminated suction leak problems associated with connecting and disconnecting the inlet to the pump. They are durable. We are still using the original ones purchased in 1992.

Figure 4. Quick coupling on a pump. Photo by Wayne Niles.

I found an economical source of two-inch suction hose and quick connections. We now sell pumps, foot valves, suction hose and quick connect couplings as a standard package. In development work there's no substitute to hands-on experience. If I hadn't used the pumps myself and worked out suction leak problems, local farmers would probably have given up on the pumps when they had suction problems.

A recent advance is the discovery that these little motors run more or less OK on kerosene. In Haiti, kerosene is a subsidized fuel used by the poor for lanterns. It therefore sells for half the price of gasoline and two thirds that of diesel. Every gallon of fuel burned represents several pounds of corn, beans or peanuts less in income. Though it is more economical to use kerosene than gasoline, the trade-off is that kerosene causes plug fouling and detonation. We have to change or clean plugs after every four hours of running. Detonation is a loud knocking sound made when the fuel explodes too quickly. It can ruin an engine if it occurs for extended periods of time. It can be avoided by running the engine at lower speeds rather than at full power. [Note: According to Wayne, "The engines must start on gasoline when cold. It only takes a small squirt into the air cleaner."]

We irrigate with two-inch pipe, three-inch layflat hose, or canals. Piping can be a major expense in irrigation and a pain to haul around. The system I like best is three-inch layflat hose with a 1/8-inch hole every foot (Figure 5). It works like a super drip system applying small amounts of water along the row. Before using this system I always had dry high spots and puddles in the low spots. The hose wets the entire row. My wells and pumps can support 75 to 100 feet of this hose. It requires less labor than using plastic pipe and saves on fuel because water distribution is more even.

Figure 5. Layflat hose being used for irrigation. Portable chicken cages are visible in the background. Photo by Wayne Niles.

For those who can't afford gasoline pumps, we recommend treadle pumps. Several years ago an organization called IDE brought in Gunter Barnes, the inventor of the treadle pump, to teach Haitian welders how to make them. So we now can purchase them locally for about $50 US. These pumps are a marvel of engineering: simple, rugged, and efficient. Gunter gave me the first one produced in Haiti to evaluate. We used it for two years to provide water for my oxen, then I loaned it to a vegetable producer. The pump revolutionized his production and income in one season.

This year Edner and I have supplied each of two widows in our local Baptist church with a well, pump, and irrigation hose. Our intention is to see if we can revolutionize their situation as well. Our experience has been very positive so far. The widows have sons or family members willing to help them. The main problem is that they pump so hard, something soon breaks. We are doing a lot of maintenance support until treadle pump adoption reaches the critical mass necessary to

become a local, sustainable, agricultural technology. So have I done any good in micro-irrigation?

Is it helping anyone? A. Lots of people.
Is it cost effective? A. In all its forms, I think so.
Is it sustainable? B. Well drilling and PVC pumps are; treadle pumps perhaps; others not.
Is it worth continuing? A. Yes, need research in well drilling, pump production, etc.

Conclusion

After ten years in Haiti, have I done any good? What overall score should I give myself?

I give myself an A+, 100%. Because the overall focus of my work is to witness to the love and saving power of Jesus Christ, which is a work of the Holy Spirit. It would be nice if all I did was wildly successful. But years after I've left Haiti, I won't first of all be remembered for the technologies I introduced. Rather, I hope I'll be remembered as someone who really loved others and showed the love of Jesus Christ in all I said and did. A friend recently terminated an email with the quote: "Witness at all times; use words when necessary."

For me that's what it is all about.

[Ed: In addition to the incubator booklet mentioned on page 5, booklets in Haitian Creole about rabbits and chickens , written by Wayne Niles, are available from ECHO: "Gade 2 Manman Lapen: Manje Vyann Chak Semenn" and "Ameliore Pwodiksyon Poul An Ayiti." They each cost $5 plus shipping. Wayne has a video on rabbits that he refers to as "The definitive video on rabbits in Haitian Creole"; and he also has videos in Haitian Creole about raising chickens and making an efficient wood-burning stove out of tires. Contact him directly at <Niles@starband.net> for more information about the videos or if you have questions about projects described here.]

BOOKS, WEB SITES & OTHER RESOURCES

Appropriate Technology Sourcebook and CD-ROM Library

Reviewed by Dawn Berkelaar

The *Appropriate Technology Sourcebook* by Ken Darrow and Mike Saxenian is a guide to practical books on village and small community technology. It is available in book form or on CD-ROM, and reviews 1150 publications from international and U.S. sources. These publications cover small water supply systems, renewable energy devices such as water mills and improved cook stoves, agricultural tools and implements, intensive gardening, nonformal education, small business management, transportation, small industries and other topics. The *Sourcebook* includes an extensive index.

The publications reviewed in the *Appropriate Technology Sourcebook* are compiled in the *Appropriate Technology Library*. ECHO has a copy of this resource, but we do not carry it in our bookstore. The library (a set of 27 CDs, also available [but more expensive] on microfiche) can be ordered from the organization Village Earth. According to their web site: "The *Appropriate Technology [AT] Library* contains the complete text and images from over 1,050 of the best books on all areas of village-level and do-it-yourself technologies...over 150,000 pages! In use in over 130 countries by Peace Corps Volunteers, development and relief organizations, engineers, and missionaries, the Appropriate Technology library is the most comprehensive, comp act, and cost effective information resource in the world!

"….The AT Library gives you all the benefits of a comprehensive appropriate technology library in the space it takes to store a shoebox. The AT Library gives you the knowledge to solve real-world problems such as; harvesting clean drinking water, making tools, growing your own crops, building and maintaining an irrigation system, preserving crops, reforesting a denuded watershed, starting a small fish hatchery, building a small-scale hydropower scheme, building and maintaining pumps, treating human and animal waste, utilizing solar energy, improving rural cookstove efficiency, constructing energy efficient structures, caring for the sick, nonformal education, preparing for a natural disaster – too many uses to list!"

I spent some time looking through the CD-ROMs. The easiest way to use them is to insert a CD into the appropriate drive; open "My Computer"; right click on the CD-ROM drive and choose "Explore"; and then click directly on the PDF file that you are interested in (titles of the files are listed in an accompanying booklet). I found the "Library Manager" program on the CD-ROMs difficult to use.

On the Village Earth web site, the list price for the Appropriate Technology CD-ROM Library is $495. However, discounts may be available for non-profit organizations or people living and working in a developing country. Individual CDs on specific subjects can also be purchased. The AT Library Instruction Manual can be downloaded from Village Earth's web site, and contains a list of the books and publications found on each CD. For more information, contact Village Earth at P.O. Box 797; Fort Collins, CO 80522; USA; Fax: (970) 491-2729; E-mail: atlibrary@villageearth.org; Web site: <www.villageearth.org>.

THIS ISSUE is copyrighted 2003. Subscriptions are $10 per year ($5 for students). Persons working with small-scale farmers or urban gardeners in the third world should request an application for a free subscription. Issues #1-51 (revised) are available in book form as *Amaranth to Zai Holes: Ideas for Growing Food under Difficult Conditions*. Cost is US$29.95 plus postage in North America. There is a discount for missionaries and development workers in developing countries (in North America, US$25 includes airmail; elsewhere $25 includes surface mail and $35 includes air mail). The book and all subsequent issues are available on CD-ROM for $19.95. A booklet that includes issues 52-79 can be purchased for US$8 plus shipping (in North America, shipping costs are US$4; elsewhere shipping costs are $5.70 for surface mail and $9.25 for airmail). ECHO is a non-profit, Christian organization that helps you help the poor in the third world to grow food.