



## AgriEnergy Resources

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## Former university research and Extension specialist confirms Renewable Farming principles

Farmers at the recent AgriEnergy Resources seminar were pleasantly surprised to hear a former university scientist, Dr. David Sasseville, reaffirm production principles basic to Renewable Farming, like these:

□ The numbers and balance of your soil's microbial population is one of the six major yield-limiting factors. "We as farmers have been following cultural practices which cause problems for soil microbes."

□ Sasseville quotes a research colleague, Dr. Robert Kremer: "The next great advances in agriculture will be the use of plant and soil microbes."

□ "Applied biological products can increase the diversity of beneficial soil microbes."

□ "When you get soil out of condition physically, it becomes out of balance from a microbial standpoint as well. I want a widely diverse population of microbes in the soil. In a biologically balanced soil, pathogens are kept in check."

□ "Calcium is an important plant nutrient, not just something to change soil pH. I like to see 2000 parts per million of available calcium in the soil."

□ "The deeper your oxygen level in the soil, the deeper your roots will grow. If you have a hardpan, I'd rip it to begin breaking it down."

Sasseville, a private consultant, is a former researcher and state Extension specialist for Missouri's University Outreach and Extension.

**"The pesticide industry doesn't like what I'm saying and doing,"** said Sasseville. He and a few like-minded researchers urge regulators at the Environmental Protection Agency to require pesticide producers to test and report the impact of their products on "non-target organisms" — primarily soil microbes, fungi and other soil life.

For example, field research by Dr. Kremer at the University of Missouri indicates that soybean fields treated with glyphosate, the active ingredient in Roundup herbicide, have measured significantly higher in levels of fusarium fungi. Sasseville cautioned: "We don't have enough data to determine whether these higher fusarium levels are detrimental." He cites this research as an example of how pesticides and fertilizers can impact soil life.

**Much of his consulting time is spent as an expert witness** on behalf of farmers in lawsuits against pesticide firms. Members of the Florida Department of Environmental Protection estimated that damages from the use of the fungicide Benlate is "in the billions" because soils have lost productivity, said Sasseville. "In a typical soil there are thousands of microbial and

fungal species. Where Benlate had been used for years, the microbial populations were altered. In one study, we found only 28 species." Benlate is now off the market.

"When you apply a fungicide, you can kill beneficial mycorrhizal fungi which colonize the root hairs of crops and increase the area for nutrient and moisture absorption," said Sasseville.

He told farmers at the seminar that the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), as amended in 1996, is now being interpreted by EPA regulators as protecting pesticide firms from lawsuits claiming damage from use of registered products.

**He expressed some surprise** at AgriEnergy Resources farmers' high understanding of biological farming concepts.

"You're exceptional among farmers," he said. He found by a show of hands that most farmers at our seminar test soils at least annually. "In Missouri, 90% of farmers test soils less than every third year," he said.

Sasseville encouraged farmers to tissue-test crops in addition to soil testing. The objective: evaluate how the crop is taking up nutrients. "I want to know what's in the soil, but I'm more concerned about what's in the plant," he said.

"That's why tissue tests are essential. The crop is the final judge of available nutrients."

# AgriEnergy Resources



## Spring thaw: Still time for last-minute soil tests!

Our Soil Laboratory staff is ready to give you a ready response to soil samples sent to us ahead of the growing season. Tests now can give you a closer indication of nutrients available to get your crop up and growing.

We also encourage spring tissue testing. The tissue to select for lab analysis is the petiole, or rib of the leaf. This is the "pipeline" which moves nutrients into the leaf, so it's a good way to find what's coming into the plant right now.

Visit with our laboratory staff for detailed information on soil and tissue tests. Accurate analysis at the right time could add yield, save fertilizer costs, or both.

At our February seminar, lab manager Gary Campbell encouraged participants to include micronutrient analysis in their soil tests. "Boron, copper and zinc are deficient in most soil samples coming to our lab," he noted.

## "Cows tell you real quick what's going on in soils."

AgriEnergy representative Ray Roettger says that bovine response to biologicals is why *"Working with pastures and dairy farmers is one of the most fun things I do!"*

He reports that "One Indiana dairyman on our AgriEnergy program is making \$800 more per cow each year than he did without it."

Cows know pasture: "They graze right up to the line where our pasture nutrient program ends."

This farm's program includes Chilean Nitrate, Drammatic Fish, SP-1, Algae Solution, Organic Blend T and fall-applied gypsum.

## Your first defense against insects and disease: Healthy Crops

Dr. Walker Kirby, a private crop consultant based in Rochester, MN, told farmers at our recent Renewable Farming Seminar: "Soil management to create a living, healthy root zone produces a healthy plant. A healthy plant resists disease, tolerates a higher population of pests, stays productive later into the season and rewards you with higher yields." One Renewable Farming premise is that insect pests focus on crops which are already sick or stressed. That may help explain why more Midwest fields are coming under attack from soybean cyst nematodes, aphids, spider mites, European corn borer, corn rootworm and even grape colaspis.

Kirby says, "I'm not a big fan of GMO crops, because when everyone goes that direction, the disease or insect becomes resistant."



## Ideas for healthier crops — from an organic farming consultant

Every season, more organic growers are proving they can cope with weeds, pests and crop fertility — and come up with yields close to conventionally grown corn and soybeans. And every season, more organic farmers are using organically approved products from AgriEnergy Resources. We know one Midwest farm family which is raising 168-bushel organic corn and selling it for \$5.60 per bushel, delivered to Lancaster County, PA. The family is asking \$20 per bushel for its food-grade organic soybeans!

With incentives like that from an expanding organic feed grain market, consultant Reggie Destree is fielding more calls from corn and soybean growers, even though his background is in organic vegetable production. One principle which Destree emphasized at our seminar: "Aphids will home in on soybeans under stress, with high turgor pressure in the leaf. Those beans are emitting frequencies which attract aphids. Aphids tend to bypass beans that are nutritionally balanced."

Destree emphasizes that a healthy plant is one of the best defenses against pests and crop diseases. One measure he recommends for improved root growth is AgriEnergy Resources' SP-1 biological product.



## There's a big payoff in caring for your farm's "littlest livestock"

A balanced, biologically "live" acre of topsoil weighs approximately a million pounds. Of this total weight, 929,000 pounds or 93% is inert mineral matter. Typically there's also about 7,000 pounds of plant residue and nearly 60,000 pounds of humus. The smallest portion, about 3,500 pounds, is living organisms: earthworms, bacteria, fungi, algae, actinomycetes and other microlife.

This soil life uses humus and other carbon sources to energize the soil's vital biochemistry for healthy crops. At our February seminar, microbiologist Kathleen Draper defined fertility in a fresh way: "A fertile soil is *characterized by the speed with which soil microbes make nutrients available to plants.*" Soil that tests high in NPK may still produce low yields if soil biological life is low or imbalanced. Kathleen told farmers, "Most Midwest soils are in starvation mode because of poor biological life."

# Healthy Soils, Healthy Profits

*These three farmers tell how Renewable Farming systems have improved their soil life, enhanced yields, and helped restrain costs over more than a decade of experience.*

**J**im Mitchell told farmers at our recent Renewable Farming Seminar: "I'm so excited about raising corn that I can hardly stand it."

That enthusiasm grew from 13 seasons of working with AgriEnergy Resources to build a fertility and production system that fits his farm and his soils.

He started farming in 1971 near Eaton, OH, at age 21. He rented 88 acres with soils so hard "I had to beat the soil probe into the ground with a hammer."

He tried minimum till and no-till. Finally in 1990, he started ridge-tilling. That winter, he also attended a Renewable Farming seminar and met AgriEnergy Resources founder Dave Larson.

"I asked Dave for fertility recommendations on all 1,100 acres I was farming at that time," said Jim. "The next spring, in 1991, Dave's only proposed change was to use 28% liquid nitrogen, not anhydrous."

He recalled that in 1992, "I became a chemist with AgriEnergy products. None of them came pre-mixed back then, like they do now."

Yields climbed for three seasons, then leveled off.

"I was still thinking of products, but still didn't have a total system," Jim recalls. With ridge-till, all his crop residue was remaining on the surface until the following spring. Research reported by the National Tilth Laboratory at Ames indicates that two-thirds of crop residue left on the surface oxidizes, rather than being digested biologically into humus. From 1995 on, Jim gradually refined a system to digest crop residue and break up deep hardpan. In 2004 it looks like this:

**1.** He selects early-maturity corn hybrids so he can start harvest in early October and apply Residue earlier. Jim also selects for stalks that digest quickly — "not Bt corn; you can't get it to break down fast."

**2.** He hires a custom applicator to spray his Residue program as soon as the combine leaves each field. "He leaves his floater rig at my place," says Jim. "Nobody else is hiring spraying in the fall."

**3.** He hires retired farmers to run his tractor and DMI 530B Eco-Tiger, a disk ripper, to work down stalks right after the Residue program is sprayed on.

"Let a retired farmer schedule his tractor driving around his nap time, and he will almost do it for free,"



Jim Mitchell

quips Jim. These readily available, experienced workers free Jim to focus on harvest.

Jim got an extra chuckle from his audience with this: "The ripper and Crumbler don't look like they're doing much to a stalk field. But I like to say that microbes digest those stalks before I turn around to look back."

**4.** The next spring, he hits fields lightly with a field cultivator and DMI Crumbler, then plants in what he calls an "unbelievably wonderful seedbed."

He applies a 10-inch band of Atrazine over the row, costing about \$1.50 per acre. Jim's planter is set up to apply liquid starter and biologicals in the furrow, beside the row, or both at once.

**5.** Jim showed his audience the math of how he earns \$100 per hour cultivating. *It saves the cost of relying totally on chemical weed control.* "I love to cultivate. Anytime you put air in the ground, it's an advantage."

He also side-dresses nitrogen with the cultivator, making the most of every nitrogen dollar. AgriEnergy's field trials show that cultivating a ridge up around corn stalks typically adds 5 bushels to yields.

**Another part of Jim's system is deep ripping** wherever needed, to shatter hardpan. "Three of my favorite tools are a soil probe, shovel and pocketknife," says Jim. He uses those to find the depth of any density layer.

Two other important tools: A precise meter to measure liquid fertilizer and biological products, and an electronic scale to weigh yields. Jim weighs every load coming out of the field.

With this Renewable Farming system, Jim Mitchell's yields continue to edge upward, with whole-farm averages of 180-bushel corn. Soybean yields have topped 60 bushels. His continuous corn yields as much as corn after soybeans. Herbicide and fertilizer costs stay in check. Weeds haven't figured out how to become "cultivator resistant."

Jim summed up the Renewable Farming system: "One definition of farming successfully is when your banker calls and invites you to farm his land, on your terms."

**Dennis Werner** of Valparaiso, IN, also began working with AgriEnergy Resources in 1991. Just two years earlier, he had left his accounting job and begun farming when his father retired from the home place.

"When I started, I promised myself not to change *Denn*

anything for two years. I wanted to learn how Dad had done things, then try to improve on them," recalls Dennis. "In 1991, we switched from fall chisel plowing to the Rawson Zone Till system on the whole farm. The first season with zone till, soil in one field was so hard I didn't have enough power to pull the Zone Till unit and planter. That year, we gave AgriEnergy a 65-acre field to work. They recommended the fall Residue program. By 1993, that field raised the best corn on our farm."

After Dennis began treating most of his fields with Residue, he has never had a problem pulling the zone-tillage units and planter.

Another early experience demonstrated the value of micronutrients. In 1991, Dennis also asked AgriEnergy for fertility recommendations on 80 acres of their *best* soils. The field always had great corn, but never over 40-bushel soybeans. AgriEnergy called for \$3 to \$5 per acre of *micronutrients*. By 1993, bean yields had risen to 51 bushels on this 80, then to 55 bushels in 1994.

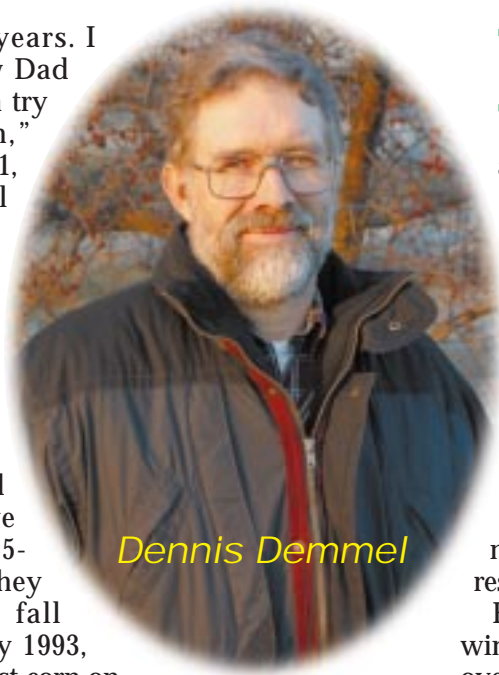
By 1994, Dennis was working with AgriEnergy on the entire farm. The transition had called for a series of changes over four seasons: Nitrogen rates trimmed back to a typical 120 units per acre, with half of it sidedressed instead of all applied preplant. Dry fertilizer to liquid. No anhydrous, 28% liquid instead. Herbicide rates cut 40%. Mostly high-calcium lime — dolomitic lime only on low-magnesium soils.

Dennis hires his father-in-law to incorporate his Residue program on corn residue with an AER-WAY and DMI Crumbler pulled in tandem. "He keeps up with the combine," says Dennis.

"With our fall Residue system, we can plant about two days sooner in spring," says Dennis. He's especially enthused about using the AER-WAY by itself on bean stubble because corn stands improve the following spring.

**Dennis describes his soils today as** "more loamy. There's no more crusting, even on our timber soils."

He says that over the years, "AgriEnergy Resources has been our confidence builder. They and our dealer, Dave Wuethrich, have been great to work with."



Dennis Demmel

**Dennis Demmel** started farming in 1983 near Ogallala in southwest Nebraska — a region of 17-inch annual rainfall and tight soils.

With pivot irrigation, ridge till and a biological approach to improve microbial soil life for more than a decade, he has lifted his top irrigated corn yields over 200 bushels per acre despite below-average rainfall the past two years. This Perkins County farm is the source of our Winter 2004 newsletter chart which shows that he's raising corn with only 0.6 to 0.7 pounds of applied nitrogen per bushel of corn harvested. Irrigated corn is in rotation with wheat, sunflowers and soybeans.

Before he applies his fall Residue program through the pivot system, he shreds stalk residue and rebuilds ridges with cultivator ridging wings. This mixes residue with soil but retains enough surface residue to reduce wind erosion over the fall and winter.

For wildlife habitat and further protection against wind, he has added field windbreaks to dry land fields over the years. These also reduce summer moisture losses due to evapotranspiration of growing crops.

He has used ridge tillage since 1987 as a way to minimize wheel traffic over his tight soils, and warm up the seedbed zone more quickly in the spring. "Ridge till also improves uniformity of seed depth and moves weed seed and volunteer corn out of the row."

#### **He also likes cultivation instead of herbicides.**

Cultivation reduces costs, builds up ridges, and increases soil aeration. The Demmel farm has lower costs compared to University of Nebraska budgets for conventional irrigated corn. One major difference: A \$40 per acre savings in herbicides and insecticides.

With ridge till, Demmel moves a lot of soil, but soils remain smoother than conventional tillage. "With our smooth fields, I can rotary hoe up to 15 miles per hour. Neighbors ask if I'm wearing a seat belt. But it's not a problem," says Dennis. Weed problems have eased over the years of gradually rising soil activity, and species have changed. "We still have lambsquarter as our major weed," he notes.

Demmel uses a zone fertility management program that relies on soil testing of zones, defined by elevation changes, rather than grid sampling. This results in about four zones per field that are tested once in four years and treated with dry amendments such as lime or gypsum and micronutrients at varied rates between zones to "level the playing field." AgriEnergy's products are used annually at uniform rates across full fields.

Another biological soil builder on the Demmel farm is intensive use of cover crops. Forage peas have been used as a plowdown on dry land fields. He seeds sweetclover in standing irrigated winter wheat, then lets it grow after harvest until it's time to plant the next crop the following May. And he broadcasts 6 pounds per acre of annual ryegrass into irrigated sunflowers with a seeder on his cultivator at the final cultivation.

Soil tilth and permeability has improved over the years, reducing runoff from rain and irrigation.



Dennis Demmel