

How fall soil testing can pay big dividends

Here's our choice for the highest-profit time you can spend before harvest and immediately afterward: Pulling soil samples for tests to *fine-tune your 2004 fertility plan!*

Fall testing offers several benefits, Soil Lab manager Gary Campbell told farmers at the AgriEnergy Resources Seminar:

□ A "snapshot" now shows what nutrients your crop had available, or was short of, for its final yield.

□ If you sample representative soil types in each field ahead of harvest, you can also scout the finishing crop for signs of nutrient deficiencies, insect damage or disease.

□ Getting fresh test results this fall gives you time to fine-tune your fall and spring fertility program. With fertilizer prices rising relentlessly, you could save thousands of dollars in unnecessary fertilizer, and avoid nutrient-related yield loss next year.

□ Gaining an accurate fertility analysis can refine your seed choices for 2004, especially on corn hybrids.

In addition to strong-extract tests which estimate the total of each nutrient present, we provide Morgan Extract reports which estimate what a plant root can actually extract.

When you're measuring calcium, magnesium, phosphorous and potassium, you need to know more than how much is present. *How much is actually available to the crop?* Low *available* potassium can cut

corn yield 40 bushels. Low *available* phosphorus can cost you 15 bu. of soybean yield.

A conventional ammonium acetate test may show a high analysis, but can't tell you if the element is mostly tied up in the soil and not available to crops. This is why conventional soil tests on a grid-sampling basis have proven difficult to correlate with yields.

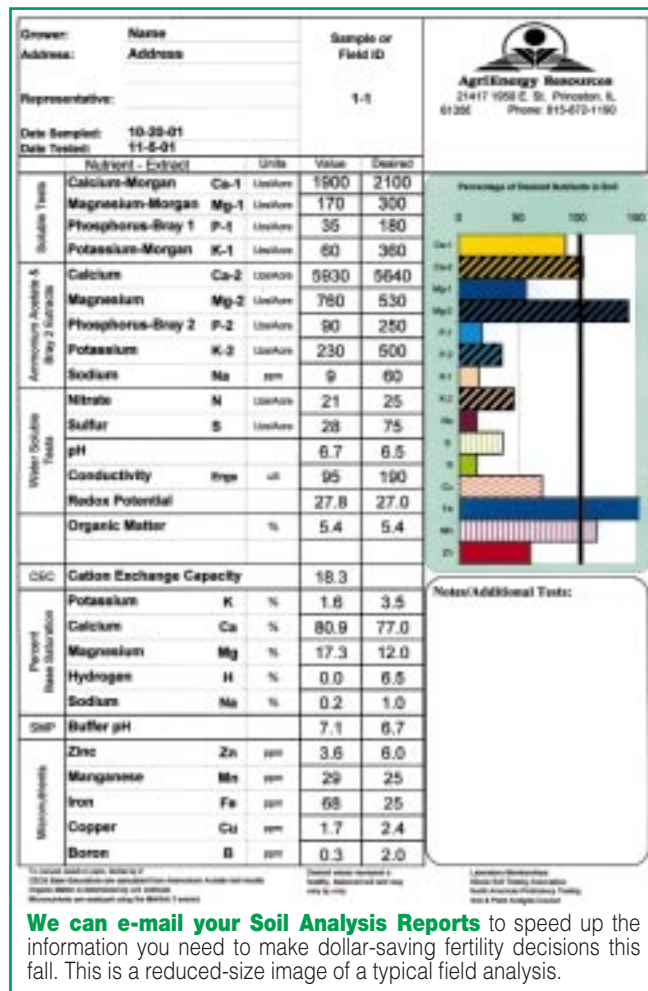
We've also done extensive research using distilled water as the extract solution. This is helpful in diagnosing problem fields where the "mining assay" test methods may show adequate nutrients, but yields don't respond. The water soluble test is also valuable in compacted soils and those with high pH or high calcium.

We can test a soil sample with distilled water extract, Morgan or Bray 1 (weak extract) and total exchangeable analysis (strong extract) for a clear picture of Ca, Mg, P and K.

AgriEnergy Resources has built and staffed one of the Midwest's most capable and sophisticated Soil Labs for several reasons. It's a valuable scientific tool which helps us design and test our products.

And it's an effective way we can help you maximize profits from your fertility program regardless of what sources you use.

But beyond that, our lab is helping document the cumulative profitability of restoring biological life in your soil. A living soil recycles crop residue more rapidly. Higher humus holds more water for higher Nitrogen efficiency. Richer populations of soil microbial life do a more effective job of unlocking nutrients so they're available to crops. *We're eager to help you gain those benefits!*



We can e-mail your Soil Analysis Reports to speed up the information you need to make dollar-saving fertility decisions this fall. This is a reduced-size image of a typical field analysis.

Typical Residue programs

Next year's success starts this fall! Rapid decomposition of residue this fall builds humus, increases nutrient availability, decreases phytotoxicity in the spring, and makes for easier tillage and planting. Examples of residue programs are as follows:

Residue Program

Residue	Gallons/acre
Residue	2
AgriCarb	0.5 - 1
ThioSul	0 - 3
28% Nitrogen	0 - 10

Organic Residue Program

Organic Residue	Gallons/acre
Organic SP-1	2
Molasses	0.5 - 1
Fish	1 - 3
Humic concentrate (if allowed by your organic certification agency)	0.25 - 1

See our website for sample submittal forms, or contact Gary Campbell or Christy Hanson in our Soil Lab for your soil analysis needs.



This letter brought to you by your AgriEnergy Resources consultant



Home office: 21417 1950E St., Princeton, IL 61356 Website: www.agrienergy.net
Phone: 815-872-1190 Fax: 815-872-1928 E-mail: info@agrienergy.net

AgriEnergy Resources

AgriEnergy Resources

7 benefits of cover crops in corn-bean rotations

Midwest farmers often wish for a "third crop" to inject into their corn-soybean rotation to interrupt insect and disease problems.

AgriEnergy Resources summer seminars offered an in-depth look at ways you can use cover crops to gain relief from insect attacks like this year's onslaught of aphids, rootworms and corn borers. We can only highlight seven benefits of cover crops here, but you can get details from your AgriEnergy Resources representative:

1. Grow nutrients to cut your fertilizer costs. Hairy vetch adds 180 lbs. of N for corn. Legume cover crop roots pull up P, K and micronutrients.

2. Cut pollution from nutrient loss. Oats and rye reduce leaching losses of N. Fall cover crops capture fall-applied fertilizer, release it to next year's crop with minimum loss.

3. Reduce erosion. Winter cover blankets soil against wind erosion and the explosive force of raindrops. Nitrogen-rich organic matter from legume covers improves water infiltration.

4. Cut fuel, irrigation costs. Better tillage holds moisture; ground works easier with less power.

5. Reduce weed pressure. Rye, a grass, suppresses broadleaves with an allelopathic effect. Cover crops also shade out weeds.

6. Break up insect cycles. Cover crops encourage beneficial insects and soil organisms which attack pests such as nematodes.

7. Increase soybean yields. A rye cover crop stimulates soybean yields — sometimes dramatically.

A deep, live aerobic zone paid big in this year's drought

Too much early rain. Drought in August. That's the prescription for serious yield loss — unless you've built a deep, absorbent root zone like Floyd Koke has in Mason County, Illinois. He farms sandy knolls and bottomland of the Illinois River. Agronomist Ken Musselman visited Floyd's fields Aug. 21. Corn was green and healthy. Just across the lane, a neighbors' corn showed "a very noticeable increase in the degree of firing and crop deterioration," reports Ken.

Floyd says, "I've farmed all my life." He's 73, so he has had plenty of time to see changes in his soil. He has used AgriEnergy Resources' biological fertility products since 1986.

Some of Floyd's perspective: "My ground holds moisture longer now. We don't have to irrigate as much. I'm pleased with yields, even though we use less fertilizer than normal. I can tell a difference in the color of the ground. And we have earthworms, even on our lighter sandy soils, where we never used to see them. On the lower and heavier bottom ground, you can see how all the earthworms have really worked and granulated the soil."

Floyd is an example of how patience, careful management, and a biological approach to farming pay off every year. But yield *consistency*, through flood and drought, help avoid serious losses in a stressful season like this one!

Aerial photos of fields now could return dividends later

What's helping *parts* of many Midwest cornfields stay green and healthy, while other parts turn brown and die under 90-degree days with no rain? Soil type is an obvious reason, but there's another potential problem you can fix in the future: A compaction layer blocking roots from tapping into deep moisture. The tightest compaction layers often accumulate in sandy patches of a field. Fine particles sift downward and pack into a four-inch thick pancake that roots can't penetrate. This year's dry-weather stress offers one of the clearest pictures of your compaction layers. A \$50 airplane ride and 50 shots from your digital camera can give you *dramatic evidence of which parts of fields need ripping, tiling or other management to reduce future crop losses under stress.*



Here's a fall management checklist for more profit in 2004

✓ Pull composite soil samples for AgriEnergy Resources lab and send them in before the harvest rush. ✓ Line up delivery of fall Residue program; plan for early application (custom application if necessary) and fast incorporation of residue after corn harvest. ✓ Clean liquid fertilizer tanks, replenish filters, check tank capacity, line up delivery of fall fertilizer needs. ✓ Investigate the opportunity for an on-farm trial with cover crops... visit with your AgriEnergy Resources rep about a cover-crop program. ✓ On pastures, line up fall fertilizer application for more lush and productive forage next spring. ✓ Scout fields with a spade and pocketknife, digging deep enough to check soils for depth of aerobic zone and presence of density layer that has been curbing yields. Check corn and soybean roots for insect damage and rooting depth.

This fall, start turning tough crop residue into cash

Corn growers are finding that the corn borer resistant stalks of Bt corn are also *slower to decompose into humus* unless you assist their breakdown with a biological “digester.”

This spring, some Illinois farmers couldn't get field cultivators through last year's Bt stalk residue. To work up a seedbed, some even bought a tandem disk — a tillage tool they hadn't used for years.

Fortunately, we're familiar with the management and biological means to melt down four tons per acre of Bt corn residue fast enough so it can feed next year's crop — instead of competing with it.

Kathleen Draper, microbiologist at AgriEnergy Resources, told participants at our Aug. 14 seminar how to maximize profits from one of our most widely used biological products, *Residue*, to speed breakdown of Bt cornstalks — or any type of crop residue.

First, count the benefits of accelerated biological conversion from raw residue to helpful humus:

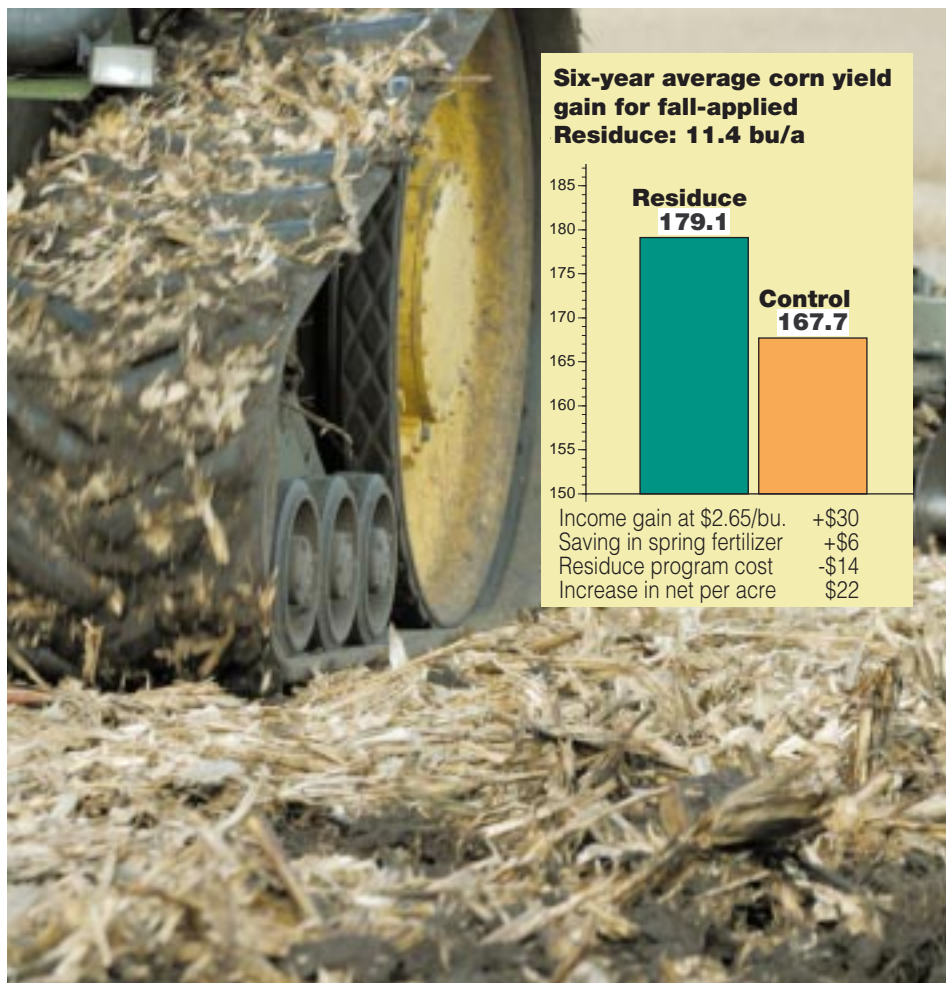
1. Feeding the following year's crop.

The NPK value alone of four tons of corn stover is 80-30-190. The equivalent of 80% of nitrogen typically applied on corn remains immobilized in the residue.

Natural biological breakdown is the only way to recapture those nutrients for crop availability. You want the digestion completed fast, before the following crop starts requiring heavy nutrient uptake.

2. Building humus to capture and hold precious moisture. Raw stalks may help wick rainfall into the soil, but it's humus which sponges it up for late-season release to root hairs. Yield benefits of humus are really clear this season: Too much early rain and not enough August rain mean that a deep, absorbent aerobic zone with high humus is paying off with bigger yields.

3. Reducing chemical carryover. An active soil digestion process with a wide array of fungi, bacteria and other organisms also breaks down applied chemicals that can quietly steal yields from next year's crop.



4. Reducing insect and pathogen pressure. For example, corn borers overwinter in stalks. Decompose the stalk, and you destroy the source of next year's borer damage.

5. Early stalk breakdown reduces allelopathic toxins on germinating crops. Organic acids produced in the early stages of decomposition can hinder seed germination. Also, organisms breaking down residue can divert nitrogen and other nutrients from a crop if the breakdown is occurring during high nutrient demands by the growing crop. A fall Residue program helps avoid both of those crop stresses.

Here are management ideas which Kathleen recommends as effective for converting corn stover of any type to humus:

1. Shatter or at least crimp the stalk with the combine. You can probably save a separate shredder pass by using aggressive combine

rolls (such as Pixall Knife Rolls) or spinning shredder blades under your combine head (such as a Harvestec corn head).

In Europe, where soggy fall weather makes late tillage difficult, the majority of farmers' corn heads are equipped with such shredder blades.

Shattering stalks and spreading them evenly with your combine helps jump-start the biological process during mild early-fall temperatures. Plant decomposition continues until the soil is frozen.

2. Soon as possible after harvest, apply a complete Residue program to speed stalk digestion.

Microbes can quickly colonize the more easily digestible, higher-nitrogen inner stalk material. As the fungi, bacteria and actinomycetes multiply, they gradually attack the tougher cellulose and lignin of the stalk rind.

Soil organisms first consume sug-

ars and amino acids in the stalk. Fueled with that energy, they devour starches, proteins and cellulose. The tough, complex lignin is the last component they attack.

In general, the crop components with the highest ratio of nitrogen to carbon are easiest to digest.

This order of breakdown is the reason you'll benefit from applying the recommended nutrient package with Residue. A little added nitrogen and sulfur triggers a bloom of crop-digesting organisms.

"The sooner you can digest crop residue, the better return you'll get by feeding your crop the following year," says Kathleen.

3. Mix corn residue into the aerobic zone of your soil.

If you no-till, make sure residue is shredded and spread evenly on the soil — with a spray of Residue and nutrients over the top.

Under no-till, fungi typically do more of the digestive work. They look for food above the surface, and can thrive on nutrients with a fairly low ratio of nitrogen to carbon.

One visible clue to active biological breakdown is the webs of actinomycetes colonizing the residue. These organisms wrap around stalks and nothing washes them off. That rich, earthy odor is another clue that actinomycetes are active.

The multiple species of bacteria in Residue are chosen for their effectiveness in crop digestion. "They clean up everything," says Kathleen.

Many growers find that after they build up soil life and use a regular Residue program, effective conversion of crop residue can save a significant portion of the Nitrogen, Potassium and Phosphorous needs.

A few of our AgriEnergy Resources clients who have lifted humus levels and deepened their aerobic zone are seeing spring nitrogen tests which show *no need for side-dress nitrogen* on corn.

On the AgriEnergy Research farm, where we've use a biological fertility approach for years, our soils show a humus index of 42.8 using the Luebke humus test, versus 16.4 on neighboring comparable soil types.

Bill Preller's "recipe" for raising 600-bu. corn

Today's crop genetics hold the yield potential for 600-bu. corn and 250-bu. beans, Bill Preller told farmers at our August seminar and field day. He adds, "We could achieve those yields if we could completely convert raw crop residue to humus *on time* to grow the next year's crop."

Bill is Global Platform Manager for Soil Management Equipment at CNH Global. In that role, he's responsible for developing soil management equipment at Case IH, New Holland and DMI.

"We don't call it *tillage* equipment anymore," he says. Bill describes the math of converting this year's residue into next year's yield results:

✓ **For conservation compliance and protection against the impact of raindrops**, you need only 1.5 tons of well-distributed crop residue on the surface between harvest and planting. A 200-bu. corn crop produces 4 tons of stalk and leaf residue, so 2.5 tons should be mixed into aerobic soil for digestion into "living organic matter" — humus.

Some no-till devotees want to store all stalk and leaf residue on the surface. That can work if the soil is biologically active, has excellent tilth and there's vigorous earthworm and nightcrawler life. "If any of those conditions aren't there, it doesn't work," Bill told our farmer audience.

✓ **"Humus is what gives your soil the best pore structure,"** says Bill. Your goal is a soil with a wide range of sizes in pore space — like a sponge. Pore space for air and water should compose up to half of soil volume. These pore spaces, plus a high humus level, enhance the active exchange of oxygen and carbon dioxide with the atmosphere, build high water-holding capacity, and help roots penetrate deep into soil.

Bill points out the impact of four implements on water infiltration:

Rain infiltration per hour on similar soil with four tillage methods

Paraplow	.67
Moldboard	.29
Chisel	.25
No-till	.19

Corn growing champion Francis Childs follows these principles on his northeast Iowa farm. A few of his corn hybrid demonstration plots topped 500 bu. in 2003.

✓ **Humus has a narrow carbon:nitrogen (C:N) ratio; about 10:1.** A dry corn stalk averages 50:1. To build humus, you need to provide nitrogen and other nutrients to soil fungi and microbes so they can digest raw residue and narrow the C:N ratio. To digest 1 ton of corn residue, soil organisms need 22 lbs. of available nitrogen, 7 lbs. of phosphorus and 3 lbs. of sulfur. This is why AgriEnergy prescribes a blend of nutrients mixed with Residue, our biological product which accelerates residue digestion.

✓ **Building water-holding capacity into your soil is critical,** says Bill. Corn will need a million gallons of water for a 200-bu. yield. That's 37 inches of moisture

per acre. Each half-pound ear requires 44 gallons. Each 18 kernels of corn require 1 gallon of water.

Deepening the humus-rich aerobic zone, where most roots live, from 5 in. to 10 in. dramatically increases the soil's effective water-holding "sponge."

Even so, most regions of the Corn Belt average less than 37 in. of annual precipitation. That means consistent 200-bu. corn must tap deep into *subsoil* moisture. Some kind of tillage will probably be needed to shatter the typical density layer, which retards deep rooting. Freezing and thawing won't do it: There's little water in the compaction layer.

Bill notes that more than a century after the passage of thousands of steel-wheeled wagons on the Oregon Trail across the Midwest, "Soil under those old wagon wheel tracks has 50% lower water infiltration and 50% lower air permeability."



Bill Preller