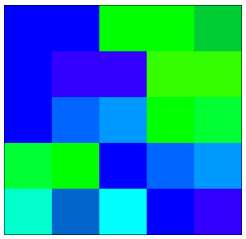
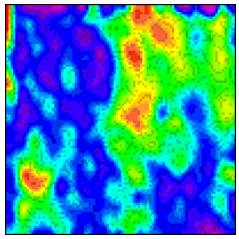
On-the-Go Soil Data Collection
Map-Based Application
Solo™ Surveyor™/Solo™ with ESP™ Sensing
Soil Doctor® Systems

"For those times when you need a map to get the job done."

Prescription Accuracy demands attention to Detail. Even today, when writing about soil variability --some still call grid sampling by plots as large as 2-1/2 Acres as "farming by the foot". Yes, it makes grid sampling methods *sound* as precise as detailed soil sensor surveys, but it's the 21st century! Everyone should know better by now.





The Soil Quality (CEC and topsoil depth) map on the left shows 25 composited sample grids of 2-1/2 acres each. The map on the right shows 7,250 samples/acre from one simple drive through the field with a Soil Doctor system. Like above, grid sampling can miss all the high productivity areas and most of the low productivity areas, while still eating up time and money. It provides only five levels of data, while one-step **Soil Doctor Rolling Electrodes** detail **fifty times more field variability.** *There is no comparison.*

You decide how much detail to use. With a Soil Doctor system, you can use it all or smooth it out with your GIS or mapping programs for the slower map-based applicators.

How good is the data I collect with a Soil Doctor system? Soil Doctor® Soil Sensing Technology is a scientific advancement to the exploratory, basic research conducted over the last fifty years by the United States Deparment of Agriculture. After CTI introduced its technology to domestic midwest agriculture in 1987, USDA/DOE initiated major programs in Iowa, Missouri, Illinois, California, Nebraska, Texas and Idaho. Their findings prove and support scientific principles underlying CTI technology use for soil surveys.

CTI patents for on-the-go soil sensing technology incorporate electrochemistry, complex resistivity, and even simple conductivity -- for post traverse GIS analysis for assay of soil properties, soil fertility& chemical levels.

This breadth enables you to create post-survey treatments that rely on certified sensed soil data. You add the data to your GIS or mapping program, combining it with the other data you use to make your treatment decisions.

What Soil Electrical Properties will a Soil Doctor System Measure? Depending on the operating method selected under software control, any modern Soil Doctor system will measure soil conductivity, soil solution conductivity, soil particle conductivity, and soil permittivity. Measurements can be made with either D.C. or A.C. excitation in both steady state and impulse train transient conditions (e.g., for electrical charge/capacitance effects), using two electrode or four or more electrode methods, permitting simultaneous measurement of electrical properties at multiple depths. Measurements may be calibrated on-the-go or assisted by post traverse spatial calibration information.

What can Soil Doctor data do for me? Calibrated Soil Doctor system data can determine soil type, organic matter, cation exchange capacity, clay content, texture, topsoil depth, soil moisture, calcium, potassium, as well as phosphorous and nitrate nitrogen levels to help you and your analysis arrive at the best prescription by the square foot.

Are there cheap imitations of Soil Doctor technology on the market? CTI was the first to employ moving electrode arrays, but also the first to file with the United States patent office. Imitations have been offered, but they weren't cheap in price and there are considerable limits to their use, not just in the benefits farmers have been able to derive, both also in law. Only a Soil Doctor System owner (protected by CTI's U.S. patents) may: Map simple soil conductivity with coulters (2,3,4 or more); Correlate the map with lab soil sample data; Blend in his yield data map experience, and Derive a prescription treatment map. **If you don't own a Soil Doctor system, and want to base your prescriptions in any way on ground-engaging electrode data, you'll be missing much more than just field benefits.**

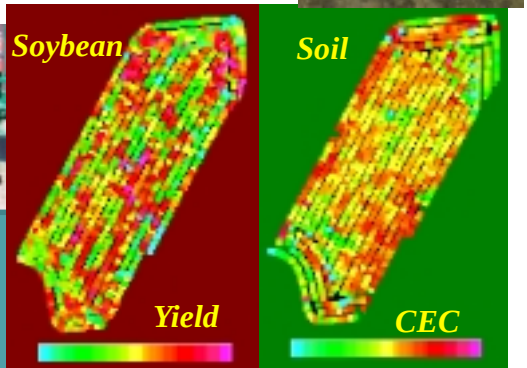
Both Field and Office Operations are Easy. A simple installation procedure adapts a set of coulters to any implement, and our automated PC software creates dated data files based on your field name assignments. **Only Soil Doctor systems have ESP™ (Extra Sensory Perception) for direct assay of pH, Nitrates, P and K on the go.** Recorded **text files** can be automatically mapped, at any time, without operator interaction using Microsoft MapPoint. Or the files can be exported for use in other GIS.

After your analysis is complete, Soil Doctor software will import a prescription treatment map in **ESRI shapefile** format. An optional high-speed Soil Doctor applicator will faithfully execute the map, or you may use the shapefile and rely on any other map-controlled applicator on the market today.

Rolling Electrode™ Soil Sensors

Two, Three, Four, or Six Coulter Electrode Arrays

Now with Extra Sensory Perception!
ESP™ Sensing of pH, NO_3, P and K
Direct Reading -- not Correlation!



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The Only System World-Wide that Actually Does Farm-by-the-Foot

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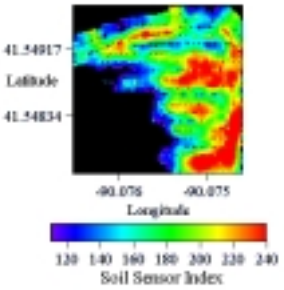
Soil Doctor Systems Set the Standard. No other technical approach in precision agriculture has established a track record for reliably providing our nation's farmers with tangible benefits. Only Soil Doctor systems have proven that when fields are accurately surveyed and provided foot-to-foot application accuracy as well, benefits to farmers and the environment are more than just "logical". Tangible Benefits are the reliable result.

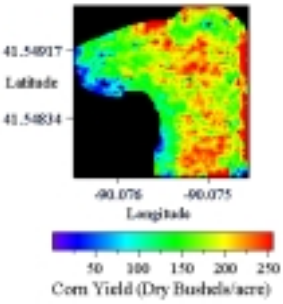
Sometimes you can't use One-Step real-time sensing and application. That's when One-Step Data Collection, followed by mapping analysis, is the answer. How you use the mapped data to apply products and treat your fields is up to you. You are heavily involved in the equation.

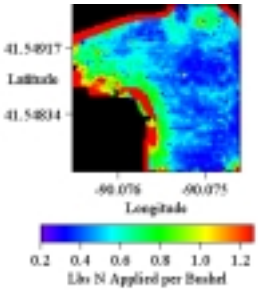
A Mapping Challenge. The maps below are an example of the results of using a Soil Doctor real-time applicator. CTI will supply a **FREE** real-time Soil Doctor applicator to anyone purchasing a Soil Doctor system for data acquistion only, but only IF the customer conducts statistically replicated side-by-side comparison trials of his mapped prescription treatment, a normal flat rate, and a treatment using the fully automated Soil Doctor system.



The composite soil sensor index, or Nutrient Potential of the Soil, measures the variations of soil nitrates, soil organic matter, and topsoil depth, revealing productive areas that require little added N.

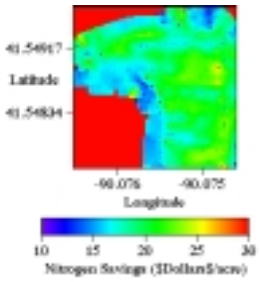
End of season corn yield correlates very well with the spatial distribution of the measured nutrient potential. The areas of highest nutrient potential are also the areas of the highest yields.





The Traditional recommendation is: **Apply 1.2 lbs N/bushel!** Soil Doctor technology enables significant spatial reduction in N use. Only the edges of the field, adjacent to wooded land which blocks sunlight, approach the conventional, higher application practice. **And, Soil Doctor® Technology *can even respond to overrides from operators or additional data sources, like the shady boundary.***

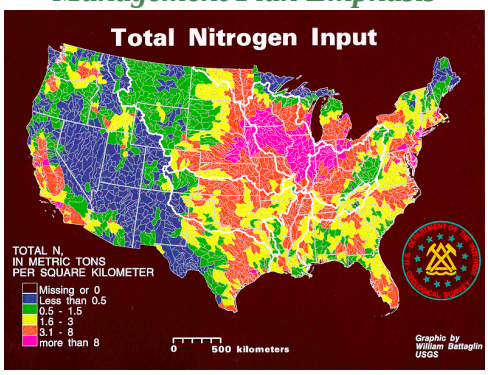
Left to traditional (U. of Illinois/Fertilizer Industry guidelines), this farmer would have saved absolutely nothing, applying an unnecessary flat rate of 160 lbs N/ acre.



The above map demonstrates the savings derived. It is a considerable economic advantage, unique to Soil Doctor technology, alone.

Producers know that yields vary by soil type. Yield monitors, GPS, and Mapping confirm this fact. Within soil types, however, the dominant factor controlling yield has been proven to be soil nitrogen status.

Management Plan Emphasis



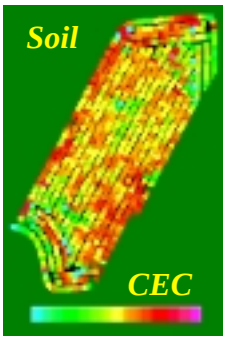
The latest farm bill brought with it the need for management plans to mitigate the effects of excessive use of both nitrogen and phosphorous. Nitrate and phosphorous, moving in very wet years from fields--through watersheds--to the Mississippi River, have contributed to the generation of a Hypoxia region (a zone of low oxygen concentration) in the Gulf of Mexico. Presently, this depleted area is about the size of New Jersey. Federal legislators reside near the discharge from Pennsylvania's Susquehanna River valley, where heavy N and P losses from Dairy manure have been blamed for the decline of the Chesapeake Bay. If fertilizer and manure had been voluntarily applied in a more efficient manner, then there would be no need for federal legislation to restrict N & P application. Now is the time to rely on technology that will not only enable environmental compliance, but improve your bottom line. Your land stewardship will be recognized by compliance monitors, landlords, and local citizens.

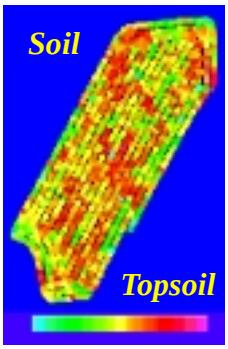
Get the Most from the Time you Spend with Precision Agriculture

Start with Soil Doctor Technology

Learn about your variability, and then decide what to do about it. Field soil surveys can be completed quickly, often with field equipment you already own. You can get the information you need while working a field. Or you could make an extra trip through the field dedicated to collecting information. For this you could rent the service of a test bar, or setup your own with rented electronics.

You can rely on Soil Doctor data. With detailed variability information in hand, crop consultants, compliance representatives, or CTI can readily help you to get an effective management plan in place. Plans can include better soil sampling guided by detailed soil varibility information, variable rate application, or simply better attention to spatial treatment needs. Below are two of the most popular data items collected and mapped in both the spring and fall.





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CTI technology is protected by patents issued and pending, both domestic and foreign, including U.S. Patents 6,138,590 (in review) and U.S. Patent 6,484,652. CTI patents cover on-the-go soil sensing technology, incorporating electrochemistry, complex resistivity, and conductivity -- serving immediate application, post traverse GIS analysis for assay of soil properties, soil fertility& chemical levels; and enable certified, real-time or post-survey treatments that rely on sensed soil data.

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