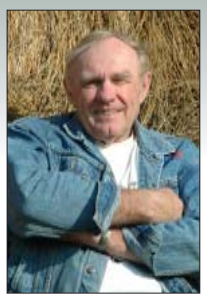

TOWARD A SUSTAINABLE Future

Rethinking soil

The art of land doctoring is being practiced with vigor, but the science of land health is yet to be born. — Aldo Leopold

Soil scientist Hans Jenny reminded us that soil was not a thing, but a web of relationships. Rattan Lal, president of the Soil Science Society of America, recently reaffirmed that insight in an article he wrote for the *Crop, Soils, Agronomy News*. Reflecting on our tendency to describe crop residues as "waste" (especially in our current rush to use these residues for ethanol production), Lal warned that this was

> … *a dangerous trend because crop residue is not a waste. It is a precious commodity and essential to preserving soil quality. In addition to controlling erosion and conserving soil water in the root zone, retaining crop residues on the soil is also necessary for recycling nutrients, improving activity and species diversity of soil micro- and macro-fauna, maintaining soil structure and tilth, reducing nonpoint source pollution and decreasing the risks of hypoxia in the coastal regions, increasing use efficiency of fertilizers and other inputs, sustaining biomass/agronomic yield, and improving/maintaining soil organic matter content.* (*CSA News*, Volume 52, No. 5, May 12, 2007)

This comprehensive evaluation of the importance of crop residues to soil health brings to mind the writings of Sir Albert Howard, Lady Eve Balfour and J.I. Rodale who, over half a century ago, lamented our simplistic soil management methods. They argued that simply inserting a few nutrients to achieve maximum production (what Howard called the "NPK mentality") was, in fact, a kind of "banditry." Without proper maintenance of health of the entire soil complex, the soil's "stored fertility" is plundered, and jeopardizes future generations.

We have thus far largely avoided the fulfillment of such predictions because we have used cheap synthetic inputs to mask the effects of the loss of stored fertility in the soil (at least so far as maintaining yields is concerned). As Leopold observed, we have excelled at "land doctoring" but we have invested very little into the "science of land health."

Since the inputs that facilitate production with little regard to soil health are derived from fossil resources, we may soon find the predictions of Howard and others coming true. The principal fossil resources that have created this productivity – oil, natural gas and groundwater – are now in a state of depletion, so it is imperative that we attend to the science of soil health.

We know from extensive research that when soil is managed to enhance soil quality, practices such as returning crop, livestock and other residues (preferably composted) to the soil, and crop rotations (particularly with green manure crops) will improve soil health. Such practices reduce the need for synthetic inputs and improve water absorption and retention, which decreases the need for irrigation. Now more than ever it is critical to reinvigorate the science of soil health if we wish to maintain productivity in the face of serious resource depletion. We have ignored soil health far too long.

The recent discussion by the Iowa State University Agronomy Department about a possible new Soil Science Institute is not only a great idea but a necessary one. Hopefully the vision of the institute is focused on a science of land health.

The case for a Soil Science Institute in Iowa

Soils produce plants to feed humans and animals and are critical for our hydrologic cycles and water quality. Soils hold rainwater, decrease flooding and store water for use by plants. Sunlight is converted to heat at the soil surface, so soil serves as a regulator of climate. Soils that are rich in organic matter and certain clay minerals (like those of Iowa) serve as the earth's filters and remove many of pollutants.

The most recent average erosion estimate for Iowa is 5 tons per acre. That means every year, on average, 10,000 pounds of soil per acre move from one location to another. So, for an average corn crop of 200 bushels per acre, about a pound of soil moves for each pound of corn produced. For an average soybean crop of 50 bushels per acre, this means about 2 pounds of soil moves for each pound of soybeans produced. Iowa soils are geologically young, having only recently been disturbed by human activities. Today, many of Iowa's soils remain incredibly productive, thanks largely to the organic matter they contain. This organic matter was created and stored over several millennia by Iowa's tall grass prairies.

Although the organic matter in Iowa soils is no more than 50 percent of what it was when the soils were first tilled, an average acre of Iowa soil will still mineralize 150 pounds of nitrogen through the decomposition of organic matter. Corn production requires about 275 pounds of nitrogen per acre. Only about half of that nitrogen comes from fertilizer or manure; the rest comes from nitrogen mineralized in the soil. Soil organic matter provides an unseen nutrient source for Iowa farmers and allows them to use the crop production practices they currently employ.

We believe there is nothing more important to Iowa and its future than our soil and have begun discussing creation of a Soil Science Institute to better focus our science for managing and maintaining Iowa's most valuable resource. — *Kendall Lamkey, chair, ISU Department of Agronomy*