FFF Review

Don't Bale or Burn. Build!

Residue you burn will be lost as the valuable building block for enriching soil organic matter, which can double your productivity.

We mustst wonder if the farmer realized how precious that corn residue was before he baled it. Or does the farmer who burns his residue know what he is destroying when he burns his field?

Why is this residue so precious? The answer is simple. What may appear to be little more than waste contains 45 percent carbon.

Carbon comes in many forms, but the carbon in corn residue is in the form of an organic compound—mostly cellulose, maybe even some starches and sugars. This carbon is not like the carbon found on your cooking grille or the coal used to power plants or the graphite in a pencil. No, these forms of carbon are lifeless—only soluble in molten iron. They are useful only to burn, forming carbon dioxide gas.

The carbon in corn or other crop residue is life giving. It's not like the carbon in baking soda or limestone or water softeners (these are carbonates). Most certainly the carbon in residue is not like carbon dioxide, which is truly a waste product produced from burning wood, coal, oil, etc. The carbon from residue is special. Maybe not like the pure carbon of a diamond, but special. Chemists, brilliant as they are, never have been able economically to synthesize cellulose, starches, or sugars (carbohydrates) from carbon dioxide, carbonates, or pure carbon. We know these carbohydrates are necessary for the existence of livestock, birds, and humans. They provide the energy that triggers the tens of thousands of chemical reactions that take place in our bodies.

When a farmer plants a seed in the soil he is counting on the miracle of nature called photosynthesis to produce carbohydrates out of the carbon dioxide in the air. The necessary ingredients are sunlight, water, carbon dioxide, plant nutrients, and, of course, the green leaf, which is nature's processing mechanism. In the end, thousands of tons of carbohydrates are harvested in the fall. But the big kicker is the environmental benefit. One 9 billion bushel U.S. corn crop, for example, will absorb about 800 million tons of carbon dioxide, and produce by photosynthesis about 500 million tons of cellulose, starches, and sugars!

Table 1. Composition of organic matter, Stevenson, Iowa, 1982.

Carbon (C)	58.0%
Nitrogen (N)	5.3%
Phosphorus (P_2O_5)	1.7%
Sulfur (S)	0.7%

Table 2. Building organic matter with residue.

Yield	Tops	Roots	Total	Nutrients required			% O.M. increase
				N	P_2O_5	S	
bu/A	tons/A	tons/A	tons/A	lbs/A	lbs/A	lbs/A	per yr 0-6"
200	4.7	2.4	7.1	114	36	16	.18

The perfect food

We feed grains such as corn, wheat and other crops to animals and people. But it doesn't end there. For every pound of corn grain, for example, there is also left about 1.5 pounds of stalks, leaves, and roots or what we call residue. This residue is a perfect food for micro-organisms teeming in the soil because it is in the combined form. When certain nutrients (such as nitrogen, phosphorus, and sulfur) are added to the residue, these micro-organisms reduce this residue to stable organic matter. Biological processes also add life to the soil. There is significant change in water-holding capacity, tilth, aeration, and water infiltration rate. In addition, the soil contains a host of nutrients that can feed the corn crop. Did you know a teaspoon of soil contains more microbes than there are people in the world?!

So the question remains: does the farmer know the value lost when he bales or burns his residue? Does he understand he can use residue to build organic matter? That he can double his soil productivity and thus double his yields in 10 or 15 years? Does he understand that when he removes residue from his field his soil

productivity will decrease—yields can drop 5 to 10 percent?

Simple mathematics

When a farmer burns his crop residue he has, in effect, reversed the process of photosynthesis, turning combined carbon back into the atmosphere as carbon dioxide gas.

When he bales it all, he forfeits the opportunity of allowing soil micro-organisms to turn carbon into a stable organic fraction in the soil and build soil productivity. Actually, the process is similar to the digestion of residue in the rumens of livestock, where the residue would go if he baled it all.

In Table 1, approximate analysis in an Iowa soil shows that not only nitrogen, but phosphorus and sulfur are necessary for the efficient conversion of residue into stable organic matter.

Notice next in Table 2 how a 200-bu/A corn crop will not only produce 4.7 tons/A of dried grain (0% moisture) but also 4.7 tons/A of stalks and leaves, and 2.4 tons/A of roots. Properly managing and supplying this 7.1 tons/A of residue with sufficient nutrients could result in soil organic matter increasing by 1.8 tons/A. This would raise the soil test level in the 0 to 6-inch zone by .18 percent per year!

If deep tillage can move this newly formed organic matter into the deep profile, it will be possible to build a productive soil 15 to 18 inches deep, making possible extremely high yields. The entire process is called a term that is becoming increasingly familiar: maximizing soil productivity (MSP) to maximize yields. An informational packet is available through the FFF office, 785/776-0273.