Field Ecosystems:
Principles & Practice

by Matt Hagny

TECHNIQUE

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While we are often oblivious to it, some basic relationships govern vegetative patterns and water/nutrient cycling in the soil. Whether we want to admit it or not, our fields certainly are subject to the laws of chemistry, physics, and biology. Understanding these principles can guide our management as we progress to more efficient cropping systems.

Brazilian agronomist Dirceu Gassen has often prodded us to better understand: "Think like a plant. Think like a bug—what does it need to grow?" We might ask the same thing of the field ecosystem: where do losses occur? Where must we intervene repeatedly to keep it from doing something we don't want? Where does it *not* behave like a native grassland or forest?

Photo by Doug Palen.

Long periods of stubble maintenance are costly. Meanwhile, the residue disappears and nutrients escape from the system.

In many regions of the world, winter is relatively warm, and snow cover or frozen soils are encountered only a few days of the winter (if at all). Summer frost-free periods span quite a number of days, and average temperatures relatively high. In many of these areas, significant precipitation can occur in every month of the year. Consequently, adapted plants can grow in most (or all) of those months. Surface residues and soil OM decompose year-round. Nutrients 'leak' from the system in all months. Essentially, the biological and chemical processes comprising the ecosystem are fairly active all during the year, in contrast with cooler regions where those slow to a snail's pace during several months of frozen winter. This can and should influence our management choices.

Yet so many producers in these warm regions only have a crop growing during a few months of any given year. *We spend the remaining months battling weeds and watching the soil cover disappear.* The more astute agriculturalists might realize that nutrients are also being lost from the system, since nothing is recapturing them (mineralization exceeds uptake by plants + microbes).

For example, take the rotations used at Gettysburg, SD: often something like s.wheat >>w.wheat >>corn >>soybean. Sometimes corn is stacked, sometimes sunflowers substitute for soybeans, but you get the idea. Now look at common rotations for no-till producers at Great Bend KS, 600 miles to the south: perhaps w.wheat >>w.wheat >>milo >>soybean. Maybe

Problems are created by too long a time with little or no vegetation, and by too little plant diversity over time.

sunflower is substituted for soybean, but essentially it is the same rotation, yet with 45% more precip during the year and 17° F warmer during winter. The warmth partly offsets the moisture, since evaporation is higher, so cropping intensity might not be as far off the mark in terms of balancing soil moisture as the moisture figures indicate. Yet the decomposition rate will be quite high, which worsens the moisture inefficiencies (less mulch) and creates the opportunity for soil degradation. Long non-crop periods also drive up weed control costs. The situation gets worse farther south and east, into still warmer and wetter climes. What can be done? We must understand the problem, first.

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