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The Thrill of Competition

by Matt Hagny

Win, lose, or draw, Gabe Brown has fun testing himself against every new challenge. While so many people lament the supposed lack of opportunity in agriculture, Gabe sees things quite differently: "People don't realize how much money they can make in agriculture. We always thought making $10 – 20 an acre on a wheat crop was doing great. Some of the things I grow net $200 – 250 an acre, and they're not high risk by any means."

Gabe isn't one to brag—not at all. His point is simply that there's a trove of good returns to be had in cropping and livestock, if only we will open our minds to the possibilities. "People get stuck in a rut. They always plant the same things. They're afraid to try anything new. But you can't do what dad and granddad did and expect to earn a good living with expenses being what they are today."

Gabe is hardly one to get stuck in a rut. More like he's careening down the highway while pulling off maneuvers not for the faint of heart. And he's actually enjoying the ride!

What sets Gabe apart? Gabe, along with his wife, Shelly, and two college-age children, run an integrated cattle and cropping enterprise on the outskirts of Bismarck, North Dakota. Sounds quite typical so far? —there's almost nothing ordinary about it. Gabe has been a longtime practitioner of planned (rotational) grazing in cells or paddocks. Most of the crops he plants are for grazing or forage. He double-crops (this is central North Dakota!). He cover-crops. He plants *mixtures* of species for grazing and covers. He grows things you've never heard of. And he's always—*always*—looking for any way to make more profit with less investment (of time or money),

Photo by Jay Fuhrer.

Gabe's corn into killed alfalfa. Manure that was spread a few months prior has decomposed already. The corn can be harvested for grain or several types of forage. Lots of options, just the way Gabe likes it.

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Photo by Jay Fuhrer.

Field peas with hairy vetch, one of Gabe's favorite cropping cocktails. The peas usually are green-chopped, then the vetch often regrows to provide more forage.

and to take advantage of whatever idiosyncrasies exist in the marketplace for feed, grain, seed, or stock.

The unorthodox methods and business savvy have paid great dividends—Gabe has enjoyed tremendous financial gains over the last 7 years, which (not coincidentally) is roughly the length of time he's had his system in place. "A lot of people don't try to manage the livestock and cropping as a *whole*. This concept really made a positive impact on our bottom line."

Not much is typical of Gabe's personal history either: "I grew up in town—I'm not from the farm. [After college] I worked in the financial field before my wife and I decided to rent some pasture in '84 to run a commercial Angus herd. All of that was with borrowed money." By the late '80s, he had started rotational grazing and rented some cropland, although the crops were a very distinct enterprise from their cattle back then. Gabe did what was the norm for the area, growing grain crops of spring wheat, oats, and barley—with tillage, of course.

A discussion with a friend in northern N. Dakota in '94 led Gabe to go to no-till. "It just made sense—plain and simple. At that time, the moisture conservation seemed like the most important advantage. Also, it cut down on time spent in the field, which was important since I still did some off-farm work in the early '90s." Gabe—never one for half-measures—decided to quit tillage, cold turkey. They sold all their tillage equipment that year and bought a 15-foot JD 750 drill. "No-till was proven enough [by 1994]. I haven't looked back. No regrets."

Gabe recalls, "Like many starting out in no-till, I didn't realize the importance of rotation. I had no rotation," referring to his prevailing practice of wheat, oats, and barley, with scant diversity and no conscious rotation. He tried field peas that first year, and steadily increased his acreage of field peas in subsequent years. Things were about to get interesting.

"I love the challenge. I like to see how I stack up against the best, even though I know I will be put out of business if I fail the test."

Change, Or Exit . . .

In '95, the day before Gabe was planning to start harvesting, a storm brewed. The machete of hail took out 100% of the crop—all 1200 acres of wheat. *He had no insurance.* (No one could ever remember it hailing in that area, so essentially no one carried hail insurance.) In '96, he was hailed out *again*, 100%, and

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No-Till on the Plains Inc's Mission: To assist agricultural producers in implementing economically, agronomically, and environmentally sound crop production systems.

Objective: To increase the adoption of cropping systems that will enhance economic potential, soil and water quality, and quality of life while reducing crop production risks.

the remnants weren't even worth baling. So much for historical truths! While Gabe did have hail insurance for '96 to blunt the pain, it didn't negate the loss. In '97, a severe drought wiped out the crop, and he didn't combine a single acre. By this time, he was growing alfalfa on more of his cropland, as well as green-chopping peas for haylage (ensilage) and haying much of his barley. Still, the economic hemorrhaging was severe. In '98, they were once again hailed to the tune of 80%. They were heavily leveraged, and the banker wasn't willing to risk any more. However, the banker didn't foreclose, either. Browns had another chance, but what could they do without capital for crop inputs?

"When you lose four crops in a row, you're challenged," Gabe comments matter-of-factly. Instead of crumpling in the face of adversity, the unusual situation prodded Gabe to think even harder about how to generate more income with severely crimped inputs, and how to manage risk. Crops for grain seemed less likely with each disaster and the severely reduced capital available, so he started conjuring ways to harvest as many crops as possible with his cattle. This led to strategies such as doing more field peas expressly for forage using the Arvika variety, and then double-cropping to sudangrass or some other forage crop yet that summer. Gabe then began mixing hairy vetch (*Vicia villosa*) with the forage peas, with the plan for the vetch to regrow after the chopping, although this doesn't happen if the summer is warm and dry. The peas make 8 – 14 tons/a (wet basis), and he can still legally collect $48 – 50/a in LDP! All this return—without any herbicide or fertilizer inputs—makes forage peas something of "a no-brainer" according to Gabe, who calculates a net profit of over $300/a on pea/vetch forages in good years.

"If I green-chop, I can get by with less herbicide."

Gabe also ramped up his alfalfa production dramatically during the lean years, which again is a mixed strategy. "All the best hay gets sold for cash. The poorer hay gets run through the feedlot." Currently, they put up 5,000 round bales a year, so they are pushing hard.

Gabe started out growing corn in '96, which he seeded with his drill. After a few years, the District Conservation office started renting a no-till planter that Gabe used, and eventually he began hiring his neighbor (who owned a planter) to install the crop. Over the years, Gabe kept expanding his corn acreage. He now puts corn in for a year or two following alfalfa (killed with glyphosate in late July the year prior), which, along with manure, keeps fertilizer costs extremely low for the corn (his accounting puts manure application at $1/ton, half of which is allocated to the feedlot enterprise, and half to the corn crop). The corn makes good use of the nutrients in the manure, and the weeds are easily controlled in RR corn (elsewhere in the rotation, Gabe often goes a couple *years* without applying *any* glyphosate). Do high seed costs for corn present a substantial risk? — "The cattle are my insurance policy," meaning that he takes earlage (ensiling the ears only) and grazes stalks if the crop is poor.

Mixed Strategies

Starting in '02, Gabe began planting winter triticale along with hairy vetch, which is grazed as long as the fall permits (sometimes till Christmas), then green-chopped in the spring, or taken for grain if the seed market is good. If the vetch fails to regrow after triticale is chopped, Gabe will generally double-crop the field to a mix of pearl millet and turnips (or pearl millet and sunflowers) for late-summer grazing. Similarly, oats silage is promptly followed by pearl millet mixes.

Cicer milkvetch interseeded with tame grass. The grasses are much healthier when they acquire some N that 'leaks' from the legume plants (as root hairs slough, etc.). The second photo shows the difference, since the bromegrass in the fenceline didn't get interseeded with milkvetch and was so N deficient it never headed.

Photos by Jay Fuhrer.

Another gambit Gabe started in 2000 was planting red clover along with barley. Six pounds of red clover seed gets metered onto the surface ahead of the drill openers (placing the barley seed), with the barley chopped for green forage, and the clover regrowing and grazed later. If he gets lucky, the red clover even survives the winter to provide more hay or grazing opportunities.

While professing to have no set rotation, Gabe does strive to maximize the synergies of crop sequences while making allowance for moisture conditions and differing harvest choices. The overall pattern on his long-term cropland goes something like: w. triticale + vetch [grazed, then chopped, then grazed again] /dc pearl millet + turnips [grazed] >>field peas [chopped] /dc cowpeas [grazed] >>corn [grain] >>corn [earlage + grazed] >>barley + red clover [chopped + grazed]. If the second corn crop is harvested for grain, the tract will go to field peas the next spring since the grain comes off so much later than the earlage.

Photo by Jay Fuhrer.

The custom crew green-chopping barley at Brown's.

While Gabe's grain yields on corn taken to harvest have been outstanding, he got skunked in the '06 drought, and took all his corn for silage. "I want a very flexible rotation. Nature sometimes throws us a curve ball like this past year, and we have to be able to react appropriately. . . . I just hate taking corn stalks for silage—they're too valuable as litter [mulch]. But we really had no choice this year [but to take silage]. After the silage was off, we got in there and seeded winter triticale and hairy vetch right away, and got nice growth—so the fields aren't totally bare."

Gabe claims that not much design goes into his rotations, laughing, "I'm just winging it." However, he thinks more deeply about rotations than he initially admits—he expresses concern about having sufficiently lengthy rotational breaks, and comments on needing to keep a watchful eye on diseases and productivity as he gets into 2d and 3d cycles of some 'rotations.'

"All the decisions really boil down to: 'How will it affect profitability, and how will it affect the resource?' —I will never sacrifice soil health to make a profit. I can't do it in good conscience. We take our resources very seriously."

The Beauty of Cocktails

Gabe's thinking on 'cocktails' (mixtures of species for grazing or cover crops) goes back to the mid-'90s when he and Jay Fuhrer of NRCS were speculating on what to do to improve a bromegrass + wheatgrass pasture. "The college experts said to put some nitrogen on it, but I don't like writing checks for fertilizer. So I asked Jay if a legume would do the same thing." They batted around ideas, and finally decided to plant different species on the separate paddocks and compare production. They tried a number of things, and concluded some of the best results were from adding Cicer (SIGH-ser) milkvetch (*Astragalus cicer*) and alfalfa to the grass mix. The perennial milkvetch is a non-bloating rhizominous legume that does well in the hot, dry part of the year when alfalfa grows little. Together, the species dramatically improved production, to 186 lbs/a/yr of cattle weight gain in one of the better years.

This got Gabe to doing more of the mixes, both for perennial pastures and for the annual forage crops. A couple of Gabe's fields are amongst the fringes of the city of Bismarck and can't be grazed, which is where he plants what would be traditionally called cover crops (no grazing or other harvesting). Up until this year, he has used only pure stands of a given species. After Gabe heard Ademir Calegari's presentation at the '06 Winter Conference, the Burleigh County Soil Conservation District (of which Gabe is supervisor) decided to test numerous species and mixes in his area. With a mere 1.7 inches of moisture for the whole season (March to mid-August), and starting with zero available soil moisture below 4 inches (Gabe had excavated a pipeline to a 7-foot depth that spring and says it was dry the whole way down), most of the single-species (pure stand) cover crops produced 1,200 – 2,100 lbs of dry matter—not bad for super-arid conditions. However, the cocktails of 5 to 7 species produced 4,800 lbs of dry matter! No one was predicting *that*. Gabe also notes that many of the species grew again with the arrival of rains in September. However, he has concerns about what some cocktails will do to his rotational breaks, and recognizes the need to plan more carefully.

A Resourceful Businessman

Gabe's ingenuity manifests itself in other ways, such as his creative business arrangements. For instance, all of his green-chopping is hired out to a neighbor, who happens to be the same one who plants Gabe's corn. In turn, this neighbor rents Gabe's 1590 drill. Gabe thinks this is great, since he has his hands full without running a chopper, and dislikes owning extra equipment anyway.

Gabe and Shelly eventually invested in a Gelbvieh stock herd, and host an annual bull sale. A non-ag acquaintance recently asked if it was a competitive business, to which Gabe replied, "Extremely." When pressed as to why he stayed in such a dog-eat-dog business, Gabe said, "I love the challenge. I like to see how I stack up against the best, even though I know I will be put out of business if I fail the test."

In another twist, Gabe has entered into a business arrangement with a ranch in Montana wherein he supplies the bulls for that cow herd in exchange for the bull calves, which after weaning are fed to maturity back at Gabe's. This gives Gabe a chance to sell more stock at his sale, while spreading some production risk. In yet another play, he's doing custom grazing for others, hedging against a downturn in the cattle market—"You gotta have some options."

"Bare fields just drive me nuts. It's a waste. You need to have a root system growing all the time."

Lately, Gabe's been eyeing the possibility of harvesting more corn for grain since the price is relatively good and set to become even stronger with the opening of two local ethanol plants. Gabe relishes the possibility of selling corn for $3/bu and buying the distiller's mash for what he figures is the feed equivalent of corn at $1.67/bu (the 50% dry mash sells for $35/ton currently). "We'll do whatever makes us the most money. . . . Everything on the place is always for sale. It's a business."

Photo by Jay Fuhrer.

Gabe's red clover thrives after the barley crop is chopped, and will provide additional forage opportunities. The living roots of the barley and clover absorb some of the force from the wheel traffic during the chopping operation, and the clover regrows to provide soil cover.

Resource-Friendly Cattle

Gabe's expansion has recently involved renting CRP with expired contracts and putting the land under his intensive management. Poor cropland coming under his management often goes to alfalfa for a few years. Yet Gabe is stretched about as far as he can without any hired help, currently with about 4,000 acres in the operation. He considers himself "a small operator" and states that he's "got to make more efficient utilization of acres"—when Gabe sets the bar, he sets it *really* high. He further remarks that he has no desire to get much bigger, preferring to improve profitability on existing acres instead.

Gabe's cattle operation revolves around "being the least-cost producer," which drives him to graze as much as possible. "Some people would point out that there's more waste when grazing [versus feeding in a yard], but we need that litter on the soil surface anyway—so it's not really waste. And, we don't have to burn expensive fuel to harvest, haul, and feed it. I would much rather graze a crop than to hay it or green-chop." Because their land is far from contiguous, they have to haul cattle sometimes—"It cuts into profitability a little"—but apparently is quite minor in the scheme of things.

Still, the North Dakota winters provide plenty of reason to have some feed stored as hay or ensilage. Gabe prefers to green-chop a fair amount, since the chopping occurs within 24 hours of swathing, which reduces weather damage. And, there's no need to wait for dew to dry in the morning. Also, the chopping occurs about 2 weeks earlier in the season than haying, which eliminates weeds more effectively. "Point-blank honesty, here—if I green-chop, I can get by with less herbicide compared to haying. . . . Even though the chopping involves hauling wet feed, it still is more efficient than haying in terms of acres per day. For some decisions, I also look at the amount of time involved. If I had to hay everything, we'd never get it all done." He further

"I never want to stop learning. That's what makes this business so much fun!"

notes that it's much easier to hire someone to chop silage than to bale hay, and the cattle do better with some wet feed in the ration.

Paddocks or fields are grazed intermittently, for as little as 3 days or

Photo by Jay Fuhrer.

Gabe's winter triticale, ready for grazing. Gabe's mantra is keep something growing vigorously at all times!

as many as 20. Individual paddocks are often grazed only once a year, but sometimes twice. Each paddock of perennial species is grazed at different times from one year to the next, to ensure the health of all desirable species, whether warm-season or cool. All these decisions are made with careful monitoring of the vegetation's condition. Gabe measures everything he can—protein being supplied by the grazed vegetation, nutrient levels, soil OM, rates of gain, and so on. Gabe says, "All the decisions really boil down to: 'How will it affect profitability, and how will it affect the resource?' —I will never sacrifice soil health to make a profit. I can't do it in good conscience. We take our resources very seriously, even if this land may be paved over someday."

Gabe makes that credo a reality, if productivity is any measure of soil health. His rates of gain continue to improve, and he is paring N fertilizer use considerably. Even when grazing isn't possible, Gabe insists on growing cover crops. "Bare fields just drive me nuts. It's a waste. You've got to have something growing. People worry about moisture storage, but that's often not an issue. You need to have a root system growing all the time—you've got to keep feeding the soil organisms."

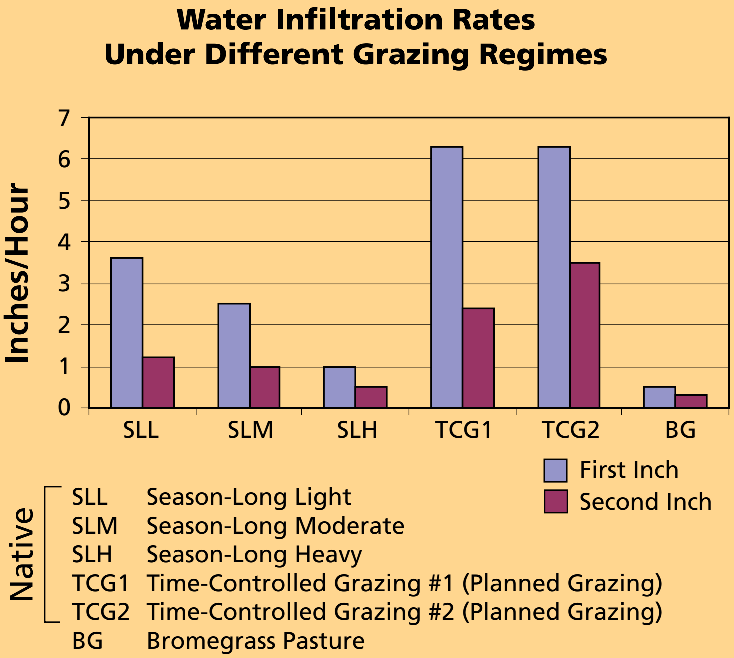
"A narrow mindset is a big problem in this business."

Outsider's Advantage

Not having a farm background has often given Gabe an edge. "I had to learn everything, but it left me more open to change. I'm willing to try anything, if the numbers make sense." He continues, "There's a lot of things I don't know, but I'm willing to ask questions. I never want to stop learning. That's what makes this business so much fun!"

Gabe's farming career has been "a roller coaster," noting that he almost lost it all in '98. Yet he came back with a vengeance, having gained enough in 7 years that "I could retire now—that's how profitable it can be. . . . Adversity breeds success." (If you're as tenacious as Gabe, that is.) "It wouldn't be any fun if it was just handed to you."

It's more than tenacity, though. And casting a wide net sure helps. Gabe's take: "You've got to keep an open mind. A narrow mindset is a big problem in this business. You gotta be willing to take some risks. You can't be afraid of failure. . . . We try to fail at something every year. Otherwise, we're just not trying enough new things."



Long-term effects of grazing system on vegetation as measured by infiltration rates. This was not a controlled study; it included several producers near Bismarck, ND (the season-long sites were all from the same producer), although all measurements were from the same soil type and landscape position, taken during late May. Initial soil-moisture levels were similar. All systems had been in place for at least 5 years when infiltration was measured. All were native rangeland, except 'BG,' which had been "abused" in a wheat >>summerfallow tillage system for many years until being put into bromegrass a number of years prior to this study. For the native rangeland sites, those under rotational grazing (Time-Controlled Grazing) were a mix of cool- and warm-season grasses and forbs, while the season-long grazing had resulted in considerable invasion by cool-season Kentucky bluegrass. TCG sites were at about 50% recovery from their last grazing event. Infiltration rates are averages of 3 replications by single-ring method. Study by Hal Weiser, soil scientist with NRCS at Bismarck, ND, who notes that similar results (considerably better infiltration under rotational grazing versus season-long stocking) have been found by various other studies.

Excuses, Excuses

(Yield Potentials Are Far Greater Than You Imagine)

by Wayne Smith

TECHNIQUE

Wayne Smith is an agronomy consultant (and beef farmer) based in Albany, Western Australia.

Wayne Smith has been a driving force in repealing the (self-imposed) limits of grain cropping, and now cattle production. His effectiveness at increasing productivity and profitability is well established in Western Australia, South Australia, South Africa, and farther abroad. Further information can be found at www.agronomy.com.au. (The units of measure in Australia are mostly metric nowadays, although Wayne has kindly reverted to imperial for the readership in the USA.)

The 'Yeah, but' Syndrome☺

How do you know that you are farming as good as you possibly can? Do you average 58-bu/a wheat crops on 10 inches of moisture (including what moisture is already in the soil at planting)?

Did you know that for most farmers, rainfall is *not* the main factor in determining your profit? It's true that more rain, especially if it is nicely distributed throughout the season, does help your profit enormously, but that is still not the biggest factor in determining your profit. One quick test to prove it: On your yield maps from data gathered at harvest, your wheat yields may range from 10 – 100 bu/a. Does rainfall account for that variation? Of course not. Similarly, there is usually at least twice the yield difference between the best and worst farmers in a locale, and again, rainfall does not explain the yield differences.

If you are like Australian farmers, we have budgeting consultants who keep on pushing the line of cutting costs to increase profits. They keep on hounding and hounding that you must not farm to a potential. Cost control is what counts!

Sounds fair enough. It is just a pity they have missed the point. Bear with me for a moment while I explain.☺

Have a look at the two photos on this page. There is only a fenceline between them. Both, of course, got the same rainfall.

The financial consultant for the guy on the left says, "Things are really tight. That dry start to the season really cost you (again) and you need to cut costs. There is just not enough margin to make a profit if you spend too much." Sounds fair enough, doesn't it? It was a terribly dry start to the season and more rain would have made a huge difference. Blind Freddie can see that. His wheat yield was around 5 bu/a.

But, have a look at the photo on the right. Same soil type, same rainfall. Different farmer. Yielded around 52 bu/a. Ten times the yield difference, and a sizeable profit instead of a big loss!

However, the 52-bushel crop was well below what it should have been—it was still zinc deficient. The potential yield was at least 67 – 70 bu/a. For your interest, Blind Freddie's crop was starving for sulphur (sulfur) and zinc. They were the two main reasons for the low yield.

Blind Freddie suffers from what I call the 'yeah, but' syndrome. You probably muttered a few "yeah, buts" when reading the above examples.☺ The excuses ('yeah, buts') hold you back from being as profitable as you should be. What you think is impossible actually *is* possible, and is probably being achieved by some farmers already.

Photos by Wayne Smith.

The sorry-looking wheat in the left-hand photo made 5 bu/a. Another bad year? The handsome wheat crop in the photo on the right made 52 bu/a. More rain? No, only a fenceline separated the two!

I'll give you another example. If you only had 7.5 inches of rain (starting from zero moisture in the soil), what wheat yield would you expect? What if your soil was also white beach sand that couldn't hold more than 1.5 inches of moisture in the top 3 feet of soil? With these constraints for 2,000 acres of wheat, a longtime no-till farmer in Western Australia averaged 45 bu/a. That was better than our potential yield calculations. We used to think that type of yield was impossible. Not anymore.

You should have heard the "yeah, buts" when people saw that farmer's crops, though. All sorts of excuses about it's cooler where he farms than on mine, it's milder in winter, the soil is deeper, or he can afford to use more fertiliser than I can. Excuses, excuses!

What Is Possible?

Profit is king, but if you do not have an eye on what is truly possible, you will not achieve the profit that is waiting for you. For most readers, I believe you are nowhere near your potential profits because you do not know what is possible, nor why you are not achieving it. I use an excellent quote from T.S. Eliot in my thinking about agriculture: "Only those who risk going too far can possibly find how far one can go."

With 5, 10, or 20 inches of moisture during the growing season (rainfall plus what existed in the soil at sowing time), your potential wheat yields would be ~ 5 bu/a, ~ 43 bu/a, and ~ 118 bu/a.

I don't know if you have a potential yield formula in the USA, but we do in Australia and it has been vital in prompting us toward increasing our yields and profitability. It is called the French & Schulz model, named after the researchers who first published it. Potential yield using their formula is the rainfall from sowing to crop maturity (plus what moisture is in the soil at sowing), take off the moisture lost by evaporation, and then multiply that number by 7.55 bushels/acre/inch of moisture. I.e., the yield potential formula in bushels/acre would be: {[moisture in soil + rainfall (in inches)] – 4.33 inches} x 7.55 bushels/acre/inch rain. 7.55 bushels/acre/inch is (was) the maximum amount of grain that can be produced for that amount of moisture passing through the wheat plant, which was determined in glass house experiments where no soil evaporation was permitted. (In the equation, the 4.33 inches of evaporation was determined separately, an average of hundreds of field measurements in tilled systems in southern Australia.) I mention 'was' because new varieties now surpass that 7.55 bushels/acre/inch potential easily, and new GM and 'synthetic' hexaploid wheats that are coming are currently at least 30% more efficient again. Trials of these varieties have been yielding 45 bu/a on 5.5 inches total rainfall (see photo). What you think is impossible really *is* possible.☺


Photo by Tim Reeves, CIMMYT.

Synthetic hexaploid wheat on the right compared to the control standard wheat variety on the left. With only 5.5 inches of available water (soil and rainfall) for the length of the crop's life, the left yielded just above zero, while the right yielded ~ 45 bu/a.

The original formula was based on cultivated soil and evaporation was generally 4.33 inches during the wheat-growing season (but could be up to 8 inches/year). However, after we moved into no-till and kept most of the stubble on the soil surface, we were only losing ~ 2.33 inches, or less, which gives us an extra 15 bu/a potential yield. But do not get lost in the detail. The whole aim of the equation is to point out what is possible, not to make it fit to the yields you are currently achieving.

I remember the early days when that French & Schulz formula was first made public. Heaps of ridicule and arguing about water going straight through our sandy soils and not being available to the wheat, or heavy rain running off the paddock (field) and not being available, or hotter and windier areas having much greater evaporation losses, etc. . . . These days, I don't hear those excuses anymore because we know from first-hand experience that we can have whole fields exceed the French & Schulz potential yield on a regular basis. We had lots of 'yeah, buts' why it would not work, but these have turned out to be empty excuses. The theoretical maximum potential quickly became yet another milestone, felled relatively quickly by ingenuity and better applied knowledge. Yet the original French & Schulz formula served an important role in spurring us to try harder.

My main point is that if you do not keep an eye on what the potential is, you may not try hard enough to achieve it. What you currently think is impossible will one day be possible, or may even already be achieved by someone. So if you received 5, 10, or 20 inches of moisture during the growing season (rainfall plus what existed in the soil at sowing time), your potential yields would be ~ 5 bu/a, ~ 43 bu/a, and ~ 118 bu/a, respectively.

Did I hear some "yeah, buts"?☺ Some excuses may be valid; most would not be. When I saw wheat crops in Kansas with Matt Hagny in April of 2006, nearly every paddock was showing copper- and/or zinc-deficiency symptoms, and sometimes sulphur deficiency also. We know that your crops would be suffering at least 20% yield losses when deficiency symptoms can be found so easily.

If you do not know what your potential yield is, then you will judge your performance by how you compare to everyone else. But what if everyone is farming poorly?

Where I started as a researcher back in 1987, farmers in 16-inch or higher annual rainfall areas had never achieved more than 30-bu/a wheat crops. Two years later, many started averaging 60 bu/a. The main change was adding legumes and other broadleaf crops to the rotation, since the root disease take-all (*Gaeumannomyces graminis*, an Ascomycetes fungus) was *the* main yield limitation in those days. Get that under control, and 60-bushel crops became very easy to achieve. Further improvements came with stubble retention and improved nutritional programs for the wheat crops. The highest yield known so far in that area was in 2005 when a farmer averaged on one field ~ 150 bu/a. Yet I have a newspaper clipping from 1988 in which three 'leading' farmers in that region say that 60 bu/a was impossible, even in a perfect year.☺

So when you know what is possible, you can start working out why you are not achieving that. Until you start achieving yields close to the potential, your 'decisions' are more important to your profit than rainfall. A lot more important.

What Is Your Crop Saying?

I consider it crucial that you, or at least your agronomist☺, learn plant language. You need to know what your plant is telling you. Is it showing it is copper deficient, or zinc deficient, or is it as happy as it can be?

Until you start achieving yields close to the potential, your 'decisions' are more important to your profit than rainfall. A lot more important.

In my experience, including trips to the USA, many invalid excuses are used to say why a crop is showing some leaf markings, or is not tillering really well, etc. The excuses are often that there was some winter injury, or a hot wind, or (even worse) it always looks like that. "That is normal, isn't it?" is a common question.☺ The answer is 'no.' When you have crop nutrition and other things right, and the crop is not droughted, every leaf should be green to the tip and the plant should be green to the bottom when the heads start to emerge.

There are two important nutrition foundations: The first is soil pH; the second is trace elements. In much of Australia, soils are extremely acidic, which becomes a serious problem for many of our grain crops below 4.7.

Photo by Wayne Smith.

Photo showing distinctive copper-deficiency symptoms in Kansas wheat. The uppermost fully expanded leaf on the left is 'tipped' with a twisting of the dead tissue, while the next leaf down (on the right) is green to the tip—this is telltale copper deficiency, and nothing else induces this particular pattern. (And, no, it's not freeze damage.)

Liming these to a pH of 5.0 is the *first* step toward growing a decent crop.

I was always told trace element deficiencies are not a problem in the USA. That is not what your wheat crops are telling me, and the deficiency symptoms are unambiguous if you know them well. As Matt Hagny can verify, tissue tests further indicate that trace element deficiencies are common in Kansas. Maybe they are a problem where you are, too? (*Editors' Note: Trace element deficiencies do get some attention in many areas of the USA, but generally not on the Great Plains. However, the evidence is mounting that trace element deficiencies are more common than most people realize, and becoming more prevalent*.)

Broaden Your Horizons

In 2003, a year that had a wettish winter and nice spring for us in Western Australia (WA), I was showing some South African farmers around. I showed them some slightly waterlogged wheat growing on the crappy white, gutless sands we have. It was early spring and I mentioned the crop was suffering a little from waterlogging but if the weather was good, the crop could yield 60+ bu/a. They thought that was a great joke. Later on, they showed me photos and videos of their crops that looked to me like 90 – 100-bu/a wheat crops. They looked fantastic. However, they said the best yields for them were only 33 – 35 bu/a.

This greatly puzzled me. Their crops could grow the bulk (vegetation), they did not suffer from hot dry finishes to the season as were typical in WA, their soils were very fertile and much nicer looking than our crappy sands, and they did not suffer late frosts in the spring. They just kept telling me that their results were normal and that there was no way this wheat crop I was showing them was going to yield more than 30 bu/a.

Photo by Wayne Smith.

If you've done a good job of growing the crop, including adequate nutrition, the crop will be the same healthy green all the way to the bottom of the plant when the heads exsert, and every leaf will be green to the tip.

Well, we did get a nice spring and my client averaged, not just on that field I showed the South Africans, but across that whole farm, 97 bu/a.☺ One year later, one of those South Africans averaged 82 bu/a, simply by correcting trace element deficiencies. The reason why they were so far behind what they should've been achieving was that they could not read what their plants were telling them. What the South Africans saw as normal was way below what was possible. A 33-bu/a crop was as good as it got in their experience. They were too insular in their knowledge. They needed to broaden their horizons. They never once worked out what the theoretical potential yield was. If they had, they would have quickly seen that they were far from being efficient farmers and had a long way to go.

(Please don't take the following personally, but I hope you see the point I am trying to make.) Back in 1989, on a four-month study tour to the USA, I happened to be at a restaurant table adjacent to a New York ABC-TV news reporter. We got to chatting and I mentioned an observation to him, which was that it was very hard to hear on the news what was happening in the rest of the world unless your President was visiting that country. He just smiled and said: "Well, if you stand on the beach, you can see 22 miles to the horizon. That is where the world stops."

Another observation is closer to home for you. During that 1989 visit to the USA, I was offered to do a PhD by a state university professor of agronomy because he was amazed at how much I knew about lupins (a legume grain), a crop that they were researching. I declined the offer. The reason I knew more than the researchers was that Western Australia is the world's biggest producer of lupins. But more than that, we had grown up researching all the problems and why one species was better on one soil type, and what nutritional factors were needed to solve low grain yields. What amazed me was that his whole research team was U.S.-focused. It did not seem to enter their thinking that others somewhere in the world might have already solved the problems they were researching.

Photo by Wayne Smith.

Barley green to the bottom.

What you are currently doing may not be the best practice in the world. Most of your pasture and wheat-growing areas have huge room for improvement in profitability, and *it will not come from cutting costs.*

This is why everyone needs to broaden their horizons. What you are currently doing may not be the best practice in the world. As someone from the outside looking in, I can see most of your pasture and wheat-growing areas have huge room for improvement in profitability, and *it will not come from cutting costs*. The gains will come from finding out what your potential grain yield, livestock yield, or livestock carrying capacity is, and then working out what things are stopping you from achieving it.

Do not fall back to 'yeah, buts' (excuses). If someone is already doing it, it is not impossible. Don't say, "Yeah, but my area is different." Instead, get curious and ask questions and find out how they are doing it.

There is more profit waiting for you than you think. Happy farming!

Cattle Potentials

As with cropping, so too with livestock: You need to work out what the potential is to know how well you are going. Do not compare yourself to others in your area because everyone might be doing the same wrong things.☹

For example, in my area, my parents have a small (hobby) beef farm. It is very wet and boggy in winter, and dry in summer. Typical stocking rates for the district are 1 cow & calf per 4 to 5 acres. Rainfall is 27 – 31 inches per year, a very high-rainfall area by our standards.

Too many people cannot read plant language and do not realise their plants are starving.

My parents' farm, including the peat bogs, is about 24 acres in size. If we did what the district average was, we would only have 5 to 6 cows (plus their calves) on the property. Currently we have 30 mated cows, 6 mated heifers, 28 calves, and a bull, and *excess* forage, and, no, we don't feed them any grain, and hay is only used occasionally for roughage. I am aiming to have 40 cows and 40 calves by next year (2007), but the theoretical potential is more than 60 cows & 60 calves. Some might suspect this is overstocking and damaging the land, but, due to the methods used, it is having the contrary result of actually *improving* the pasture. (More on this in a moment.)

So in essence, the district is producing only one-tenth of what is possible! Boy, you should hear the "yeah buts" when they come to look at our farm.☺ All the excuses under the sun, and rarely does anyone see themselves as the reason for their poor production. Our neighbours all get the same rainfall, but our decisions determine what our plants can do with it.

There are some rough calculations for carrying capacity with cattle on pastures, but the figures are malleable. For example, two cows at the same weight consume different amounts of pasture if one is maintaining its weight and the other is growing at 2 lbs/day. Roughly though, our potential in a 16-inch rainfall area is about 1 cow & calf per acre. A 24-inch rainfall area has carrying potential of about 1.7 cows & calves per acre, and a 31-inch rainfall area can carry ~ 2.25 cows & calves per acre. This is calculated on C3 grasses (e.g., ryegrass) and clovers. The potentials are substantially higher when perennial C4 grasses are in the pasture such as kikuyu (the best perennial pasture grass I have seen so far). I have more to say on kikuyu later.☺

Photo by Wayne Smith.

Wayne's cows on ryegrass + kikuyu pasture. Rotational grazing and other good practices have allowed him to increase stocking and production ten-fold over the area average.

As a side note on dairy farms, ten years ago it was thought that ~ 1,000 lbs/acre/year of milk solids (butterfat + protein) was the limit. The best dairies soon beat that easily. Then, five years ago, 1,400 lbs/acre of milk solids was thought to be the limit. Today, though, the best dairies are achieving more than 2,000 lbs/a milk solids, and one dairy is achieving ~ 2,600 lbs/a. But, the theoretical potential is actually ~ 8,000 lbs/acre/year. If you did not know what the potential was, you would not know how much further you could go.

Timing of Clipping a Grass

As a consultant it is very easy to double most producers' livestock carrying capacity of their pastures without any extra fertiliser. All that is needed is to go from a standard stocking regime to a rotational grazing system. This is based on what we call a "3-leaf ryegrass system" (and applies to both annual and perennial ryegrass), but it is the same for fescue and bromegrass as well. Similar effects are seen in most plants that are grazed, although the growth stages may be slightly different.

Changing to a rotational grazing system can double your stocking rates and your profits.

An established ryegrass stem or tiller *after being grazed* goes through the following stages: The first new leaf formed gets its energy from stored carbohydrates in the base of the stem and roots. By the time the second new leaf is expanding, it starts to return carbohydrates to be stored in the stems and roots. By the third new leaf's expansion, the plant is at its maximum energy content per unit of weight. By the fourth new leaf, the original first new leaf is past its peak productivity and begins to senesce (die) in ryegrass, and the fibre content of that leaf increases while its energy is moved to the newest leaf. So the total fibre content of the plant starts to increase while the amount of energy in the plant starts to decrease per unit of weight.

The third new leaf produces more weight than new leaf one and two together. If the plant is grazed at the first-

Photo by Wayne Smith.

On this pasture of ryegrass + clover, some fertiliser was spilled in a streak across it. Notice anything unusual?

new-leaf stage, it takes twice as long to produce another leaf compared to a plant that was bitten at the third-new-leaf stage. *The fastest recovery comes by grazing the ryegrass at the third-new-leaf stage*, and it is ideal to have all the plants bitten within three days. Any longer and there is a significant risk the first new leaf that is trying to emerge will be eaten.

This is what happens in set stocking systems: Some areas keep getting eaten before the plant can fully recharge, and other areas are not grazed before they reach the more fibrous stage and begin to lose quality. Grazing at the later stages also compromises the plants' ability to quickly regrow (they were investing in lignins and reproductive structures, and must change course to regrow vegetatively) and therefore produces less biomass for the year. This is why just changing to a rotational grazing system can double your stocking rates and your profits.

Feed the Plants!

The next increases are to do with nutrition. Similar to crops, too many people cannot read plant language and do not realise their plants are starving. Too many people also concentrate too much on cutting costs instead of knowing what the potential is and then working out what level of inputs and management is the most profitable. It is cost per unit produced (a pound of beef) that is important, not cost per unit of land.

It is cost per unit produced (a pound of beef) that is important, not cost per unit of land.

Have a look at the photo above. This is from one of my clients in a 14-inch annual rainfall area. Only 8 – 10 inches falls in the growing season and is what we call a medium rainfall area. Average stocking rates are around 1 cow (or 1,100-lb steer) per 6 acres, which is what the clients were originally at.

Typical pastures are clover and ryegrass where phosphate, sulphur, and potassium fertilisers are added at low rates every year. All the nitrogen for the ryegrass is expected to come from the clover. Adding nitrogen fertiliser was considered not profitable with the common reasoning that it is cheaper to get free nitrogen from the legumes in the pastures.

The photo is of some spilled urea as the truck drove across a pasture. What can you learn from the photo? Even the clover has responded enormously to the urea. This is a warning that the Rhizobial bacteria in the clover's root nodules are functioning only marginally, quite possibly due to molybdenum deficiency. (*Editors: Western Australia soils are geologically quite ancient, and notorious for being deficient in all nutrients.*)

Learn anything else? Does it not show you what amazing pasture production is possible if you would only feed it what it needs? The rest of the pasture is starving, but is typical of the district. Yet if they considered that the true potential is 1 cow and calf per acre instead of 1 per 6 acres, they would spend more time working out why they are not achieving it. They think that one cow per 6 acres is normal and as good as it gets. Now, though, they realise they have been doing things very wrong.

Unless you know what the potential is, you will never succeed to the level of profit that is waiting for you. Aim at nothing, hit nothing. You know the saying about if you always do what you've always done . . . .☺

The next *Leading Edge* will include a superb article by Wayne Smith on 'reading' deficiency symptoms of plants.

Kikuyu

For a pasture plant, you want a species that invades everywhere, survives all conditions, and is very palatable and nutritious to livestock. I was amused during my last visit to Texas when I was talking to ranchers about what is in their pastures. To me, conditions there would have been ideal for kikuyu (in its native land, Africans pronounce it as "ki [as in 'kick']-koo-yoo," though in Australia we incorrectly pronounce it as "kye-koo-yoo").

I was informed kikuyu is a declared noxious weed in the U.S. I couldn't help but laugh when told that. Kikuyu is the most amazing pasture species, especially if there is summer rain and soils are deep. It is a declared noxious weed for some of the very reasons you want it for a pasture species.☺ It does survive frosts in winter, but I do not know if it would survive months of solid freeze. It is a fantastic pasture species, especially on deep soils with hot weather, and good nutrition (especially nitrogen and sulphur).

Aim High, Achieve More

One final comment on pastures. The aim is *not* to avoid spending any money on the pastures. The aim is profit. It is unsustainable to have pastures without adding fertiliser to replace what is taken away (as beef, milk, etc.). You would be locking yourself into a low-cost but low-return form of livestock production.

If you have to use licks (supplements) for your livestock, that is a clear warning sign that the nutrition for your pasture plants is inadequate and you should be adding the necessary nutrients to the pastures instead. I.e., if licks are needed, it means the pasture plants are deficient in those nutrients, and so if added to the pasture instead, *these would increase the pasture production as well as provide the necessary nutrition to the livestock*.

If you have to use licks (supplements) for your livestock, that is a clear warning sign that the nutrition for your pasture plants is inadequate.

Don't stock for the worst year. You will miss out on big profits on all the other years, and as you get your pastures performing as good as they possibly can (without going overboard on inputs and management), you will be amazed at how stress-tolerant and productive your pastures become.

Be curious. Keep checking to see if what anyone else is doing in the world is better than what you are doing. We used to think 1,000 lbs of beef/acre/year *production* was impossible. In 25-inch rainfall areas, that is quite easily achieved now by the best cattlemen (99% still produce far less than that). (*Editors: This isn't a misprint—Wayne does indeed mean one-thousand pounds of beef weight gain per acre per year*.) The potential is therefore higher than that because it is no longer a potential if even just one person achieves it.

So don't just say "yeah, but" that is impossible on your land because of . . . . Someone is probably already doing it in conditions *worse* than yours. Be curious. Find out how they do it. Happy farming!

Rangeland Health & Planned Grazing Field Guide

by Nathan Sayre & Kirk Gadzia

TECHNIQUE

Gadzia is a grazing consultant; Sayre is a geography professor at UC-Berkeley.

The following is excerpted from the original guide, a joint publication of Earth Works Institute, The Quivira Coalition, Nathan Sayre, and Kirk Gadzia, 2003, available at www.quiviracoalition.org. While the subject is a slight departure from Leading Edge*'s 'standard' content, the concepts are of critical importance, not widely understood or implemented, and more relevant to grain cropping than we realize.*

Introduction to Grazing

This field guide is an introduction to grazing management designed to help landowners, stock handlers, and agency personnel make better decisions involving rangeland. Improved management decisions will increase vegetative cover, control erosion, protect water quality, and improve animal production.

Arid and semiarid rangelands (receiving less than 10 or 20 inches of rain per year, on average, respectively) defy some of the central assumptions of conventional range management. They are highly variable over time and space, making fixed measurements of carrying capacity or "the right" stocking rate questionable. Which plants grow, and how much they grow, depends not only on how much rain falls, but when and how quickly it falls, and on the weather that follows it.

Plants must be able to withstand drought and take advantage of rain when it finally arrives. Different plants will grow depending on whether the rain arrives in summer or winter, in large quantities or small. Over thousands of years of evolution, the vegetation of these areas has adapted to reflect these circumstances. In recent decades, scientists have begun to develop models to explain and explore these complex dynamics. This field guide presents some updated tools and concepts of range management that reflect the improved scientific understanding of range dynamics.

Photo by Courtney White.

Fenceline contrast on the Ogilvie Ranch. In years prior to the photo, grazing intensity was actually about 4 times higher on the pasture on the left, but it had a growing season to recover while the pasture on the right did not. Sufficient recovery time is essential to the robustness of desirable perennial plants.

Central to an understanding of range dynamics is the concept of 'disturbance.' Droughts and wildfires are natural disturbances in arid and semiarid rangeland ecosystems. Grazing is also a type of natural disturbance to which many range plants are adapted. The effects of grazing depend—like those of other disturbances—on *timing* (when they happen), *intensity* (how severe they are), and *frequency* (how often they recur), and grazing can be managed in these terms. Vegetation is highly sensitive to variations in available water and nutrients, both of which cycle through the ecosystem in ways that can be indirectly influenced by management. Management tailored to these processes, and attuned to variability, can conserve rangeland resources and help restore areas that have been degraded in the past—while simultaneously producing greater returns for the ranch.

Grazing is a type of natural disturbance to which many range plants are adapted.

Ranching as Sustainable Agriculture

To be sustainable, ranching must convert natural forage into livestock in such a way that the perennial forage plants retain vitality year after year. This is possible because grasses (and many other rangeland plants) are resilient to grazing—they can recover from it, provided that the disturbance is not too great. However, grazing is not limited to the plants that are eaten. There are other factors to consider: water, soils, nutrients, other plants, wildlife, and a host of organisms that interrelate with all of them. Livestock are only one piece of a much larger puzzle that must fit together if ranching is to be sustainable.

At its simplest, 'biodiversity' is the richness or number of species (kinds of organisms) in a community. When the community is rich, the ecosystem is more resilient to disturbance. Therefore, it is necessary to maintain resources other than just grass, soil, and cattle. As one rancher put it: "My goal is to manage for diversity and complexity of life on the ranch: biodiversity. Each plant species has different growing seasons, different root zones, and different leaf capacity. Each provides a different pathway for conversion of solar energy to life. By maximizing the pathways of solar energy conversion, I maximize production. I have learned that biodiversity extends beyond a mixture of grass. Each animal, fish, and insect species expresses something . . ." about the health of the land.

Grazing as a Natural Process

Grazing is a natural process which has been occurring for millions of years. From the fossil record it has been determined that grasses and grazers evolved together some 45 million years ago. Having co-evolved, grazers and grasses are adapted to each other.

Imagine a perennial plant over the course of a year. Many plants go dormant during the part of the year when water is insufficient or temperatures not suitable for that species. Grazing during the dormant season is unlikely to cause damage, because the leaves are not active or living tissue at this time (i.e., they are not photosynthesizing and not exchanging materials with the plant's

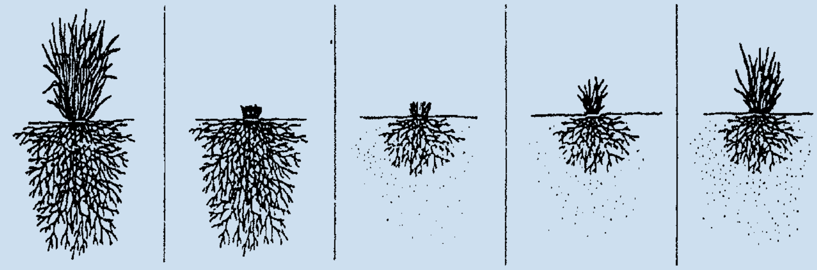


Figure 1. Effects of grazing on the growth cycle of a perennial grass.

roots). When moisture and temperature conditions reach certain levels, the plant enters a period of growth. Belowground, the plant's roots begin to grow, drawing water and nutrients from the soil. Aboveground, the leaves begin to 'green up,' beginning at the base of the plant. New leaves form and some portion of the old leaves may regenerate, turning from brown to green.

To be sustainable, ranching must convert forage into livestock in such a way that the perennial forage plants retain vitality year after year.

Throughout the growing season, the plant responds to changing conditions of moisture and sunlight. If conditions permit, the plant continues photosynthesis through the growing season until temperatures become unfavorable again. It produces enough food to support growth in the roots and the leaves, as well as to develop tillers, vegetative branches, and/or seed stalks. It stores up energy for the upcoming dormant season. It flowers and sets seed. Eventually the plant returns to dormancy, its leaves again turning brown. The health or vigor of the plant depends on its ability to produce enough food during the growing season to survive through the dormant season and resume growth when conditions are again favorable.

In commencing to grow after dormancy, the plant utilizes stored energy to produce new aboveground growth. It thus takes a risk, so to speak, that the new leaves will be able to produce enough additional energy to replenish its supplies. At this early stage of growth, then, the plant is more vulnerable to leaf loss than it is later in the growing season.

Grazing disturbs the plant by removing leaf tissue. This can be good, bad, or indifferent for the plant as a whole. If very little leaf is removed, the effects of grazing may be negligible. A more severe, single grazing may slow growth in the roots (Table 1, see next page), and/or accelerate the growth of leaves, but recovery is likely if grazing does not recur for one to two growing seasons. Repeated defoliations in the same growing season, however, can set the plant back for many years to come (see Figure 1).

Grasses have several traits that enable them to tolerate grazing, and in many circumstances to benefit from it. Most importantly, they produce more leaf area than is necessary for optimal photosynthesis, meaning that some leaf area can be removed without damage. Younger leaves photosynthesize more efficiently than older ones, and defoliation of older leaves can expose younger leaves to greater sunlight. *Overgrazing* occurs when a plant bitten severely in the growing season gets bitten severely again while using energy it has taken from its crown, stem bases, or roots to re-establish the leaf area—something perennial grasses routinely do. Overgrazing can happen:

- when the plant is exposed to the animals for too many days and they are around to re-graze it as it tries to regrow;
- when animals move away but return too soon; or
- when grazing is allowed too soon after dormancy when the plant is growing new leaf from stored energy.

Overgrazing occurs when a plant bitten severely in the growing season gets bitten severely again while using energy it has taken from its crown, stem bases, or roots to re-establish the leaf area.

How Grazing Affects Root Growth

Percent Leaf Volume Removed	Percent Root Growth Stoppage
10%	0%
20%	0%
30%	0%
40%	0%
50%	2-4%
60%	50%
70%	78%
80%	100%
90%	100%

Table 1.

Water & Nutrient Distribution

How plants respond to grazing also depends on larger conditions in the area: the other plants present, topography and soils, and whether it's a dry year or a wet one. Two ecological processes strongly determine the vigor and composition of vegetation, especially in arid and semiarid rangelands: the flow or cycling of water, and of nutrients. Put simply, the plants on a range—what they are and how well they are growing—are a reflection of these underlying ecological processes. The goal is to develop means of managing grazing for improved water and nutrient availability.

Plants require water and nutrients for growth. These are not static quantities: they increase and decrease, sometimes rapidly, and they move around. The issue is not simply how much moisture or nutrients there are, but whether they are available to plants when they need them. In arid and semiarid regions, small changes in the availability of water and nutrients can have dramatic effects on vegetation. Therefore, we have to manage rangelands in a way that effectively uses available water and diligently recycles the nutrients in the soil and plant matter.

Effective Use of Water. Moisture is scarce in arid and semiarid areas, and precipitation is highly variable. The key issue is how much of the total precipitation is retained in the system and for how long, because this determines how effectively the plants use the moisture. A second, related issue is erosion: where erosion is high, water retention tends to be low.

Vegetation strongly affects the distribution of water in space and time. In the absence of vegetation, raindrops hit the ground surface at a high rate of speed. The impact dislodges fine soil particles, which then clog the pores of the soil. This greatly reduces infiltration and accelerates erosion, where soil particles are transported downhill in runoff. This reduces the quality of the soil that remains. In extreme cases, a thin crusty surface ('capping') develops which encourages runoff and prevents plant establishment, resulting in more bare ground.

If a raindrop hits plants or litter (mulch), on the other hand, the impact on the soil is greatly diminished. Even a thin cover of litter will protect soil from capping and reduce erosion. (*Editors: See the water infiltration article by Rolf Derpsch in the Dec. '03 issue.*) Established plants intercept water both from the sky and running off from higher ground. By slowing its progress, the plants diminish the water's erosive power. Studies indicate that small increases in the basal cover of plants (i.e., the number of stems per square foot) can

During early regrowth, the plant utilizes stored energy to produce new leaves. It thus takes a risk that the new leaves will be able to produce enough additional energy to replenish its supplies.

dramatically increase the infiltration of water into the soil. The leaves of grass plants catch water and deliver it to the base of the plant, where it is unlikely to disrupt the soil upon impact. Roots open pores in the ground and support communities of insects, fungi, and bacteria that create and maintain cavities and tunnels for water to pass through. The difference is especially pronounced when rainfall is torrential, as in Southwestern U.S. summer monsoons.

The more water that is retained in the soil, the more resilient the system will be to extremes of rainfall. The goal can be expressed simply: capture as much of the rain that falls as possible, and retain that water in the soil so that it can be safely released to plants and downstream areas over time. Given that drought is almost 'normal' in the Southwest, this is an important goal.

Cycling Nutrients. The nutrient cycle consists of the movement of nitrogen, phosphorus, and other minerals from the soil, through plants, and eventually back into the soil. The more effectively the nutrient cycle functions, the more nutrients are available to support plant growth.

Decomposers—especially insects—are a key link in both the water and nutrient cycles. Termites can dramatically increase water infiltration rates by opening pores in the soil. Without plants to feed on, termites disappear and the soil becomes more compact and impermeable. Termites actually consume the majority of aboveground dead plant matter in Southwestern deserts. Without their activity, many of the nutrients in dead plants would remain trapped in standing matter, unavailable to other plants.

Disturbances like grazing and fire also play a role in the nutrient cycle by reducing the standing crop of old plant material and bringing it into contact with the ground, either as manure, ash, or by trampling. (*Editors: Lest this be misinterpreted, fire was relatively infrequent in the native ecosystems of the North American prairies and the desert Southwest. Gadzia urges great caution when using fire as a management tool in 'brittle' environments.*)

The nutrient cycle is strongly affected by the water cycle, for better and for worse. Plants cause the two cycles to reinforce each other. An area with good plant cover will retain more water and cycle more nutrients, allowing the plants to survive droughts better and to produce still more vegetation in good years. If the soil is hard and bare, on the other hand, less moisture penetrates into the ground, which dries out more quickly and makes plant growth more difficult, which in turn diminishes the amount of nutrients being cycled in the area. Plants and litter also have a strong effect on ground surface temperatures and evaporation rates. Bare ground is hotter, drier, more subject to temperature extremes, and less likely to permit germination of new plants. It is also poor habitat for microorganisms and insects that enhance nutrient cycling.

Studies indicate that small increases in the basal cover of plants (i.e., the number of stems per square foot) can dramatically increase the infiltration of water into the soil.

The processes that determine water and nutrient availability come together at the surface of the ground. If the soil is well-covered with plants and stable under the surface because of roots and biological activity, the ecosystem is functioning properly and the potential for long-term sustainable production of forage is good. The range will be able to recover from disturbances like drought and grazing. However, if there is poor vegetation cover, limited root mass, and minimal biological activity in the soil, and if the watershed drains precipitation too quickly via rills and gullies, then soil loss by wind and water will be higher and will weaken the resilience of the system, making it more vulnerable to disturbances. Productivity will gradually diminish, usually for a long time.

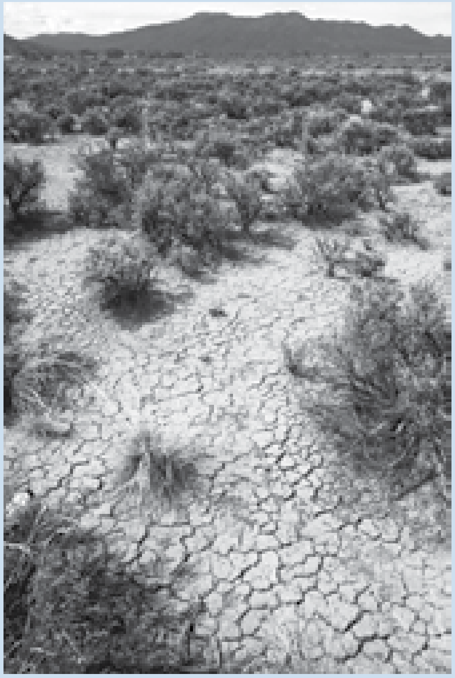


Photo by Courtney White.

Soil capping, a result of raindrop impact where soil lacks cover by plant matter. The capping reduces infiltration into the soil.

Monitoring

The water and nutrient cycles, and their effects on plants, are difficult to observe or measure directly. Most of a perennial grass plant is below the ground, in the root system. Nutrients like nitrogen and phosphorus are invisible to the eye. *Monitoring* is a way of measuring ecological processes indirectly. The processes themselves cannot

Photo by Duke Phillips.

Regardless of how it's accomplished, the essentials for prosperous range are to keep the stock in a herd and prevent them from regrazing an area until it's fully recovered.

be observed, but indicators of the processes can be observed and measured. Litter cover, for example, is an indicator of the cycling of nutrients, because litter is organic material (with captured nutrients) that remains on the soil for decomposition (release of nutrients).

Monitoring must be: 1) consistent; 2) practicable—that is, not too time-consuming or difficult; and 3) related to management goals and activities. The point of monitoring is simple: it provides feedback that is timely and objective. Monitoring data can reveal the effects of management decisions well before they are apparent to casual observation, greatly increasing one's ability to avoid lasting damage and to encourage range improvement. Every manager learns from experience, but good monitoring allows that learning to happen more quickly and systematically. Lessons learned from monitoring also help range managers to adapt and update their management plans.

Managing Livestock Grazing

Two primary tools for the management of grazing are available: disturbance and rest. Some disturbances can be manipulated, like grazing and (to some degree) fire. Others, like drought and flood, are largely beyond the manager's control. The central principle of improved grazing management is to use the tools skillfully and to plan for the disturbances that cannot be controlled.

For purposes of brevity, this field guide will only discuss the skillful use of the tools of grazing and rest. The main tool, controlled grazing (or planned grazing), is a disturbance that can be managed through three different parameters: *intensity, timing*, and *density.*

Intensity. Intensity refers to how much biomass is removed from a plant by livestock. It measures the percentage of net primary production that is channeled into herbivores rather than consumed by fire, (slow) oxidation, or decomposers. Intensity is a function of three variables: the number of animal units in a pasture, the length of time they are there, and the size of the pasture. To manage intensity, therefore, requires a tool with three components: one for animals, one for time, and one for area.

A plant that is grazed again before recovering will store less energy in its tissues and will weaken over time. The challenge is to control the impact of grazing in such a way that the grasses have time to recover.

Animal-days per acre, or ADAs, contains all three components necessary to measure and manage intensity. Adjustment must be made for the class of livestock being grazed (cattle, sheep, goats, llamas, etc.). Once this adjustment is made, animal-days per acre is exactly what it says: animal units, multiplied by days in the pasture, divided by the size of the pasture in acres. (*Editors: See the original publication for more on ADAs, and for specific rangeland health indicators*.)

Timing. During the growing season, the challenge is to control the impact of grazing in such a way that the grasses have time to recover. It's impossible to know when it will rain, how much, or how long the growing season will last. So there's no telling exactly how long it will take for grasses to recover from grazing. But the principles of growing-season grazing management are fairly simple: 1) the more leaf area that's grazed off, the longer recovery will take, and 2) a plant that is grazed again before recovering will store less energy in its tissues and will weaken over time. Finally, grazing should not happen at the same time of year, every year, in any given pasture. If it does, the palatable species that are young and green at that time will bear a disproportionate share of the impact and will eventually decline relative to other species.

Grazing should not happen at the same time of year, every year, in any given pasture.

Control over grazing boils down to control over the distribution of livestock across the range and over time. The most common way to do this is with fencing, but there are other ways to control the distribution of livestock as well. Mineral blocks have been used this way for decades. Where water can be turned on and off, it can also be used to control the location of grazing pressure. Herding is an ancient technique that is currently being reborn in a few areas. Riders and dogs move and control the herd. (*Editors: Technological methods are becoming a reality, also, such as mobile fencing controlled remotely, etc.*)

Density. Perhaps the most controversial issue in livestock distribution concerns density. Should livestock graze together in a herd, or should they be spread out across the range? For decades, ranchers and range conservationists have worked to spread cattle out in order to utilize forage more evenly across large pastures. Improved understanding of forage growth habits has prompted some ranchers to amalgamate their herds and work them as a single unit or, in certain circumstances, as two herds. The benefits they attribute to this are several. A single herd is more easily monitored. This decreases labor and other costs associated with routine care. Cattle in a herd are also better able to fend off predators than if they were spread out, just as wild ungulates are. Further, the herd will trample undesirable (unpalatable) species and restrain their growth or prevent their establishment and survival.

Planned Grazing Example: Will I Overgraze?

# Land divisions	Avg. Graze Period (GP)	Recovery Period Given (RP)	Plant Growth Rates			
			Slow Growth		Fast Growth	
			GP Too Long	RP Too Short	GP Too Long	RP Too Short
8	4	30	No	**Yes (1)**	No	No
	13	90	No	No	**Yes (2)**	No
31	1	30	No	**Yes! (3)**	No	No
	3	90	No	No	No	No

GP = Grazing Period (days)
RP = Recovery Period (days)

This is an example only. This simplified example assumes:
A) **Slow growth** requires **90** days of recovery; **fast growth** requires **30** days.
B) Pastures are equal in size and quality of forage (seldom true in the real world).
Note the 'Yeses' in the diagram. They indicate overgrazing:
•Yes #1. During **slow growth**, the recovery period is too short. A 90-day recovery period is needed, but only 30 days are given.
•Yes #2. During **fast growth**, the grazing period is too long. Animals stay in the pasture too long and re-graze plants that have already been bitten and have regrown from energy derived from the roots.
•YES! #3. During **slow growth**, the recovery period is too short. A 90-day recovery period is needed, but only 30 days are given. **This is the worse scenario: Animals will overgraze a higher percentage of plants because 31 land divisions would have a smaller pasture size than with 8 land divisions.**

With low pasture numbers, the only way to avoid overgrazing when vegetation growth rate is fast is to move the animals quickly. The only way to avoid overgrazing when vegetation growth rate is slow is to move the animals slowly. With high pasture numbers (>30), the animals can be moved slowly, without overgrazing, but there can be negative effects on animal nutrition.

Developing a Grazing Plan

Planning is critical to sustainable grazing and to avoid overgrazing. Not only does good planning improve management, it also provides a greater sense of control over one's livelihood, which can be an important boost to morale in a business characterized by uncertainty and risk. Grazing plans should be adaptable to annually changing circumstances and always be ready for the worst.

The central task of planning is to allocate grazing pressure and rest. This includes when the grazing will occur, at what intensity, and for how long. But planning is not complete until provision is made to monitor the effects of management actions and thereby learn from them. Without monitoring, mistakes may go unnoticed until it is too late to minimize the consequences, while successes may be misinterpreted. The grazing plan will need to take into account the ecology of each area and be flexible enough to cope with weather variability and respond to monitored indicators.

For more information, refer to Harland E. Dietz, 1989, Grass: The Stockman's Crop—How to Harvest More of It, *Sunshine Unlimited, Inc. (P.O. Box 471, Lindsborg, KS); or Allan Savory with Jody Butterfield, 1999,* Holistic Management: A New Framework for Decision Making, *2d ed., Island Press. See also Kirk Gadzia & Todd Graham, 2006,* Bullseye! Targeting Your Rangeland Health Objectives, *V. 1.0, pdf download at www.quiviracoalition.org. For Gadzia's consultancy, see www.resourcemanagementservices.com.*

Photo by Kirk Gadzia.

Cattle shifted to a new paddock on Maui—285 heifers moved in less than 5 minutes by opening a gate and blowing a whistle. Photo was taken just 5 minutes later.

Planned Grazing Benefits

by Greg Judy

TECHNIQUE

Greg Judy manages a grazing operation near Clark, Missouri.

'Management Intensive Grazing' in concert with 'Planned Grazing' are the only tools we use to build our grass-to-beef operation, which consists of 10 leased farms and 3 owned farms. We use no purchased fertilizer, no seed, no herbicides, no grain, no tractor, and no hay is baled off the farms—the cattle do everything for us. For improving your pasture forages, there is no better equipment made than a cow. Our stocking density ranges from 150,000 to 450,000 lbs per acre (150 – 400 cows per acre). To achieve this kind of stocking density you must move the cattle daily to a fresh strip of fully rested, fully regrown forage.

For years, we ran a stock density of 16 to 20 head per acre with a two-day graze period. We never could control our weeds and always had rank uneaten grass when we moved them. We were on a 4 – 5 week rest cycle before that pasture was grazed again. As the grazing season progressed, the cattle would always leave the rank grass and weeds.

With our present heavy stocking density, everything is eaten or tromped flat on the ground. Our present rest period is 60 – 90 days; everything is new green growth and the cattle love it. We have deeper grass roots than before, we catch nearly every drop of rain, manure distribution is much better, the soil stays cooler, and droughts are no longer a problem, along with many more benefits.

In addition, our stocking rate *for the season* has increased dramatically. It used to take 5 acres to run an animal unit for the season. Now we can run an animal unit on 1.5 acres. Our neighbors utilizing conventional management have stocking rates of 5 – 6 acres to support an animal unit, and their land continues to deteriorate.

The new system most definitely produces more forage. We are grazing more cattle on all farms and yet we have more grass than previously under the lighter stocked rotation. The diversity of grasses has increased along with a huge decrease in weeds. One of the many problems with light stocking rates is that it benefits weed encroachment. Cattle refuse to eat them, so weeds encroached more each year. With heavy stocking rates, all species are eaten or trampled equally. We are building soil now, before we were not. The grass is more robust; it grows back with very little moisture due to the long-rested, fully regrown roots.

Planned grazing is more profitable. We have more calves to sell off of the same acres of grass, or in the custom-grazing scenario we can graze more cattle which equates to more cash coming in from monthly invoices on the same amount of ground. I don't know how far we can push the numbers, since this is our first year with the heavy stocking rates. In terms of labor, we are moving more cattle with one move—rather than having them spread over 3 farms, they are stocked heavily on one farm (fewer moves, less gas, less time). It costs much less to produce a pound of beef under the intensive system.

The land is coming alive in the terms of more earthworms, more microbial activity, more dung beetles recycling the manure, much better animal impact on the land, more diversity of grasses, fewer weedy species, and cows that are much more docile due to daily moves. We have the ability to weather droughts much better (longer rest periods), eliminating the need for destocking.

While the initial change to rotational grazing began improving our pastures immediately, the latest change to heavier stocking rates appears to be producing even more dramatic benefits. This is the first year we have taken stockers in for custom grazing in July and August (our hottest months), while our neighbors were feeding hay. We had plenty of grass even in a severe drought. We have so much more control of our production system now: We are in the driver's seat! I am loving it—I have never had more fun grazing than this summer, even with the drought. This system has taught me to think about everything that I do and observe more closely what nature is telling me about my management decisions.

The truly neat thing about this whole process is that it's sustainable, and the cattle do all the hard work. All you need to invest in is some 3:1-geared poly-wire reels and white tread-in posts. There is not a more powerful tool on the face of the earth than a mob of cows moved daily across your farm. You show me another tool that fertilizes, mows, stimulates forage growth, and reproduces, and I will buy it! We would be out of the grazing business today if we had not changed our old grazing methods and mindset. Cattle can heal the soil, we just have to learn to graze correctly.

Greg Judy is the author of the book No Risk Ranching, *2002, Green Park Press.*

Photo by Greg Judy.

Greg Judy's cattle at his heavy stocking rate.

No-Till for Profitability, Part 2

by Matt Hagny

In this, our 5th Anniversary issue, we begin a new series to revisit some Feature Farmers of past issues. Kent Stones was the cover story of our inaugural publication in December 2001, and so we recap the progress and new problems to arise during the last 5 years. The original story is available at www.notill.org/leading_edge.htm.

Kent Stones, farming in north-central Kansas with his wife, Cindy, has experience with nature's vagaries: "In the past five years, the largest obstacle we've faced has been to remain profitable in years of below-average rainfall. The contrast was so radical with the previous four years—'96 through '99—which were very favorable for all crops we grew, and quite lucrative. However, 2000 through 2004 were very marginal. One thing notable about no-till is that cash expenses are somewhat higher and relatively constant on a yearly basis. These expenses had to be settled out annually."

Kent's reaction was to make adjustments. "We went to less-intensive rotations," meaning that he dropped corn in favor of more milo, he gave up on stacked (two consecutive years of) feed grains, and he eliminated sunflowers. "Sunflowers were just too efficient at extracting water, which prevented me from following them with another viable crop." He has arrived at a 4-year rotation of wheat >>wheat >>milo >>soybeans, and admits that during the drought, "Sometimes we can't make the first wheat [after soybeans] work," meaning that it doesn't break-even.

Deleting corn and sunflowers from his crop line-up allowed Kent to parse his machinery list, and by 2003 he had eliminated a 12-row planter and associated row-crop heads for the combine. This furthered his goal of getting lean with his machinery costs, which he now calculates (at the behest of Moe Russell Consulting) as 25% of owned machine FMV, plus repairs, plus labor, plus any custom hire, minus any receipts from doing custom jobs for others. The result should be near (or under) $60/a for a competitive grain farm, according to Stones and Russell (Stones' operation comes in at $48/a). Kent also eliminated a full-time employee for the cropping enterprise, and dropped some peripheral activities such as trucking. Kent & Cindy now get by with only seasonal part-time help, and by hiring some custom harvesting.

Tough years of drought and low prices: "It made us more efficient in the long run."

While Kent was busy chopping overhead, pulling him in the other direction was the expansion of their acres by more than 25%, as well as "the advancing of my personal calendar—in other words, my age." Some of that burden was handled by updating their air drill from a 30-ft model to a 42-ft Deere 1890 with a high-capacity cart. Also, Kent went from a 60-ft sprayer with a 300-gallon tank to a 90-foot with an 800-gallon tank, "And I wouldn't even consider [farming this many acres] without auto-steer on the tractor, sprayer, and combine." By relying more on outside expertise—financial, marketing, and agronomic—the Stoneses have had a little more time to devote to cropping tasks.

While the challenges were piled high in the early 2000s, Kent regards it as a useful vetting of 'fat' that had crept into his management. "We really addressed expenses. It made us more efficient in the long run." Careful maneuvering paid off—"We've had exceptional profitability the last two years," a combination of a return to more favorable weather (i.e., some rain) and higher market prices. Kent describes current farmer psychology as "euphoric," and expects some good times in the near future. Farther out, he views as inevitable a down-cycle and "extinctions" of farm operations from the relaxing of budgets and the tendency to become over-extended.

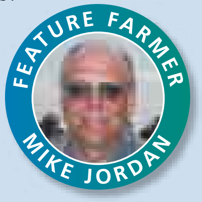
During the worst years of the drought, some fledgling no-tillers caved in to their tillage predilections. While Kent empathizes with their plight, he states, "For me, a return to tillage was never a consideration."

Always mindful of the bigger picture, Kent notices the response of his soils to continuous no-till during his tenure: "The productivity differences are shocking—really shocking. As an example, this year we took possession of a new farm where the milo made 74 bu/a—the remainder of my operation averaged 123 bu/a. For soybeans, that new land made 35 bu/a, while the balance of my farm went 49.9 bu/a." —Progress, indeed.

By the Numbers

by Roger Long

Any good farm manager knows his numbers: COGS, break-evens, expense ratios, etc., but few have as good a command of their numbers—and are so willing to share—as Mike Jordan. The north-central Kansas grower spews out production statistics like a proud mother rattling off her children's birthdates. Milo cost of production in '06 was $1.94/bu, first-year wheat was $2.42/bu, second-year wheat $2.40/bu, average fuel consumption is 2 gal/a with 1 gal/a for harvest and 1 gallon for planting and spraying. Jordan, a self-proclaimed numbers-lover, says, "I like doing records," and is as comfortable with a computer and an Excel spreadsheet as most growers are with a pair of pliers and baling wire. What numbers he can't recall are retrieved—literally within seconds—on the business computer. Few growers slice, dice, and scrutinize their operation from so many different angles.



Every detail of every operation—from tractor hours per field to the number of tender truck trips per operation—is credited to a field in Mike's FarmWorks software. Such detail may appear tedious and unnecessary on the surface, but his refined records later steer decisions toward greater profitability. Every farm expense finds its way to an individual field, which makes his low cost-of-production numbers all the more impressive. Mike's overall average wheat yield in '06 was 49 bu/a, and when divided into expenses gave him an average cost per bushel of $2.41 (which included cash rent, and a land charge to himself for owned land, but didn't include his or his wife's labor). Considering most of his wheat was following sunflowers in '06 and that he is seeing an average 5-bushel bump for second-year wheat (+17 bu/a in '06), his cost may even be less in 2007 due to increased use of second-year wheat. His '06 second-year wheat averaged 63 bu/a, with the only costs being pre-plant stubble spraying, planting, fertilizer, seed, a little in-crop herbicide, and harvest.

Photo by Roger Long.

Jordan's second-year wheat, fall of '06.

Mike is quick to point out that gross revenue per acre of wheat was actually a bit higher when he was tilling and fallowing, but his net profit is much, much higher with no-till: "Cost of production of wheat was $60 to $90/a higher in tillage than in no-till." Keep in mind that he is comparing no-till to minimum-pass mulch-tillage, not the more costly multiple disking and field-cultivating of full-bore, clean tillage! How ugly would that be? Mike is now growing a crop on every acre every year, as opposed to just 2 crops in 3 years under his old tillage system, which certainly keeps costs down.

While Jordan's gift for analysis keeps him on his no-till track, the impetus for his no-till start is quite likely inherent: "My dad disliked tillage. He parked the plows in about 1960 or '61 and went mulch-tillage. He was also one of the first to try atrazine in a chemical-fallow program." Since Mike's father was his largest landlord, Mike's move to no-till was helped along: "[Dad] just didn't like the waste that went along with tillage—the bare soil, the loss of water, and then the erosion and gullies it created—it just didn't make any sense." Once begun, Mike's transition to no-till went rather quickly: "In 1995, I quit tilling one field as an experiment, then another and another. Yields got better and I never found any reason to till any of them again. After a 4-year transition, I was done with tillage."

"Cost of production of wheat was $60 to $90 per acre higher in tillage than in no-till."

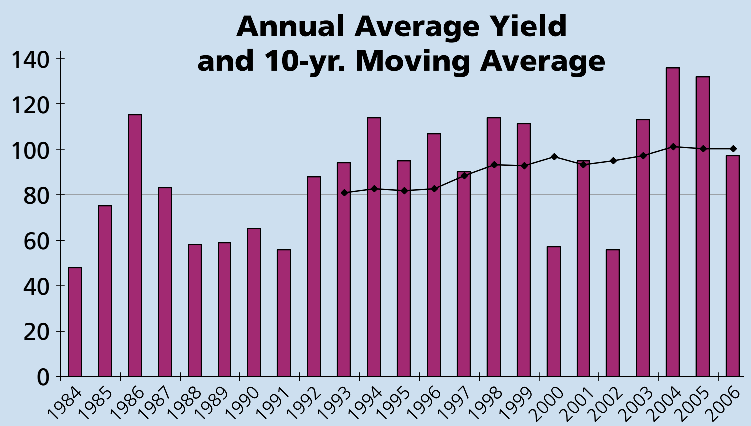
Mike's close relationship with his dad, until his passing a few years ago, certainly smoothed the conversion to no-till, especially since his dad had such a big influence on Mike's farming career. "He always liked trying new things. When I first talked to him about trying sunflowers, he said, 'I've been trying to kill them off ever since I've been farming, but if you can find a way to make money off of 'em, I'm all for it!' " And Mike recalls back to his youth, to the very first crop that was *his*—another idea nurtured by his father: "My first crop was 6 acres of continuous wheat that I had as a 4H project back in '68. It yielded 30 bu/a . . . . Dad was real proud!"

Agronomy & Analysis

Mike's rotation has been wheat >>milo >>sunflowers with an occasional corn substitute for milo, or with soybeans for sunflowers. "My corn yields are typically 40 bushels behind my milo, so I don't plant very much. I use it to clean up some weed problems from time to time. I always hear about how well others do with their corn and it seems like it should work, so I've been planting just enough to keep my toes wet." He also admits to his struggles with soybeans: "I have hit-and-miss success with sunflowers, but soybeans have been *consistently* bad. . . . Where I'm in and out of growing them, it seems like I usually pick the lousy years to plant them." He uses soybeans occasionally to clean up weed problems but can't quite stomach the 15 bushels per acre he often hauls in for yield. (*Editors' Note: Other producers in Mike's area have long histories of profitable soybean production, on average*.)

Jordan currently farms around 2,500 acres, which has generally been divided almost evenly among the three crops. However, Mike is currently in the process of stretching his rotation to include back-to-back wheat crops, which will put wheat on about half of his acres. That's quite a change from when he was doing tillage and had gone to a heavy reliance upon row crops. "When I was tilling, wheat—and especially summerfallow wheat—had a very high cost of production. I've found that the cost of production on no-till wheat is significantly lower. Wheat is [now] one of my most profitable crops."

Few evaluate yield from so many angles. Of course Mike uses yield mapping, but Mike's analysis goes far beyond looking at multi-colored printouts. There is the typical check with neighboring farmers to see how his no-till yields stack up against their tilled fields, which Mike either wins or ties, but then Mike proceeds to compete against himself. Refer to the graph, where Mike has plotted whole-farm average milo yields from '84 to '06. While the single-year yields may suggest no real trend, when those numbers are put into 10-yr moving averages, the increase is readily apparent. The moving average continues to rise as the 'down' years aren't as bleak as they once were, but Mike worries about the tops not breaking through to higher levels. Without a doubt, Mike is searching for the next breakthrough. Fertility rates and timing, seed, planting dates and population—everything is carefully scrutinized to find the next step up in productivity. And don't think for a minute that weather variations from one year to the next aren't taken into consideration. Mike keeps an hourly weather log on his computer that is generated from his own weather station. For that matter, anyone can check his weather info since his station serves as the data-collection point for the www.wunderground.com Beloit, KS site.



Jordan's whole-farm milo yields continue to trend upward in no-till.

> **"Every time I put a field into no-till, yields start improving—I can't find any reason to till."**

Jordan's gift is with numbers, but he has a great appreciation for the agronomy that creates those numbers, and his attention to detail isn't limited to the office. He constantly evaluates each production step to improve yield. As he looks at this year's wheat following sunflowers, he questions if he has enough population and enough tillers. He thinks back to when he first started no-tilling wheat and the changes he put in place at that time: "I was told that when you first start no-tilling, you need to up your nitrogen a little, but after a few years you can back it off to normal levels." With wheat being such an integral crop of Jordan's operation, he gives particular care to its well-being. He has increased his seeding population to around 1.8 bu/a and puts on 20 lbs of N and 20 of P_2O_5 (liquid) in the seed furrow at planting. Depending upon the condition of the crop at top-dress, it will get an additional 80 to 100 units of N in streams with Mike's sprayer during late winter. (Most of the N for his milo and sunflowers also gets streamed on the surface during winter.)

As we look at more of his wheat, Mike wonders aloud why so much of it has burnt, yellow leaf tips, and he's already thinking of whom to consult first. He utilizes Brad Johnson of Farmway Co-op for scouting, agronomy services, and new ideas, and an informal cast of experts from various disciplines to provide information for the next crop plan. He references advice from Phil Needham's seminars, conversations with Ray Ward, and discussions with K-State Extension specialists from assorted meetings he attends.

The Business of Growing

Ever the hawk on expenses, Mike's tractors and seeding equipment still look like they are owned by someone doing tillage, largely due to the fact that they're all paid for! Rest assured, there's no tillage on any acre Jordan manages: "We haven't tilled anything since '99." Other than selling off—or in some cases simply parking—the tillage equipment, there weren't any changes in machinery as Mike made the transition to no-till. Although he does admit that a new no-till drill is first on his wish list, he has been "getting by" with his 40-ft Sunflower drill—"It's a little light for no-till, and sometimes doesn't handle all the residue that I have, but I've been able to make it work." His 80-ft Flexi-coil sprayer is pulled by a CIH 9330 4WD that also serves as a drill and planter tractor. He still has a holdover CIH 9370 (360 hp) that is overkill on the grain cart, but Mike has in the back of his mind that it would be useful in the future should he decide to upgrade to a bigger, heavier, no-till drill. Along with the fact that a smaller-hp tractor could end up costing money to trade for, Mike can afford to overkill by a few ponies. Jordan is extremely self-sufficient in that he and the hired man do all of the planting and harvesting, and most spraying, except an occasional late-season row-crop application.

No-tillers as a group have eliminated tillage for a plethora of reasons—soil and nutrient conservation, reduced labor, wildlife habitat, etc. While Jordan may appreciate these aspects as well, it is readily apparent this businessman has instituted no-till for one simple reason: No-till allows greater efficiencies that afford higher profits. Even though Jordan has been no-tilling much of his land for over 10 years now, each year the numbers seem to show him a new facet of the story—for instance, field efficiency. Without the need for farming on the contour, and with the ability to drive through grass waterways, Jordan is able to farm more fields in square or rectangular blocks, as opposed to the irregular small fields created by terraces and waterways. "With the exception of one field, I have all my fields planted to one crop and have eliminated a tremendous amount of turning." He admits to having very good landlords who have welcomed no-till based upon their complete trust of Mike's decisions—as with any salesman, when they truly believe in their product, they are extremely effective. Undoubtedly, Mike's experiences and knowledge of no-till make him a powerful proponent of the practice: "Every time I put a field into no-till, yields start improving—I can't find any reason to till."

Photo by Emily Jordan.

Mike with '04 sunflowers.

Mike and his wife have a son, Gregory, majoring in computer science at Kansas State University, and as we pass by another field of milo stalks, Mike comments, "I turned [that field] over to my son this past year. He's not sure, but he's thinking about coming back and farming. He saw the profit that he made on just those 80 acres—it got him to thinking about what could be done on a much bigger scale." Mike isn't one to push his kids into something: "I want him to do what he will enjoy doing." But like Mike, and Mike's father, there seems to be that great appreciation for the land, and for the chance to work with your dad doing what you love. And so, quite likely, the legacy will live on in another great numbers guy—someone who loves the business of doing business, who can't escape the lure of farming and the 'hidden' opportunities for profit tucked away in so many corners.

No·till On The Plains

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