

LAND & LIVESTOCK



A Holistic, Soil-Healthy System— Gabe Brown's Regenerative Farming Practices

by ANN ADAMS

Many people these days are excited about how to improve soil health while creating a profitable agricultural business. While the answers are tried and true in grass-fed production (albeit with much variability), large acreage crop systems are still a new frontier for those seeking to create regenerative farming models. In my mind, Gabe Brown of Bismarck, North Dakota is on the front edge of that exploration. I've heard him speak at numerous events and always come away inspired and filled with new ideas of how these new agricultural systems could work.

One of the more recent times I heard Gabe speak was at the Quivira Coalition Conference in November 2012 in Albuquerque, New Mexico. He began his talk on how to build soil health by saying that in North Dakota they can get snow 9 months out of year. But, he always hears the excuse "Sure this stuff works in North Dakota, but it won't work on my place." But as he noted, it's really a matter of "If it can work in North Dakota, it can work anywhere." The point is, if you have soil, even really poor soil, you can improve the health and profitability of it by pushing yourself to think outside the box and experiment.



Because of high organic matter, Gabe's fields were able to handle much of the 13 inches of rain that fell in a 22 hour period. In fact, the land captured 8 inches of that rain before the water began moving off. Moreover, when Gabe dug up soil, he found a soil that was friable and not water logged.



Results of Managing Holistically	
<ul style="list-style-type: none"> • Yields 30% higher than county average • More of saleable product • More nutrient-dense product • Improved Quality of Life • Increase carbon storage • Increased Profits • Regenerating the resource for future generations 	<ul style="list-style-type: none"> • No Chemical Fertilizers • No Pesticides • No Fungicides • Reduced Herbicides • Reduced Fossil Fuel • Reduced Labor



Gabe has found that by managing holistically, he's improved the triple bottom line of the farm—increasing land health has led to better profit and improved quality of life.

Starting from Scratch

Gabe and Shelly Brown bought the Brown Ranch from Shelly's family in 1991. The farm had been farmed conventionally as long as the family had owned it since 1956. The land was not in great shape and most of the fields had organic matter ranging from 1.7-1.9%. There was very little plant diversity and infiltration rates were ½ inch per hour. The 5,400-acre ranch gets 16 inches of precipitation a year but only approximately 9 of those come in the form of rain.

As Gabe looked at his options he came to accept that they were dealing with a degraded resource, and he needed to think about more than just sustaining it—he needed to regenerate it. "When people talk to me about sustainability, I have a hard time with that," says Gabe. "Why sustain a degraded resource. We need to focus on reversing that degradation and regenerate the resource." For that reason, he has spent his energy on actually increasing the fertility of the landscape he manages by looking at how a healthy landscape functions. In his mind, the model to follow is in how healthy native rangelands and pastures function—with lots of biodiversity.

"We practice Holistic Management Grazing," says Gabe. "My son teaches at the local college so he had his students come out and count how many species we had in one of our native pastures. They counted over 140 different species." One of the reasons that biodiversity is so important is that all those different roots produce root exudates which feed soil life. With healthier soil comes more glomalin so the Browns' soil has the pore spaces which increases water infiltration that helps them in both droughts and floods.

Floods & Droughts

The soil was put to the test in June 15, 2009 when 13.6 inches of rain fell in 22 hours. The Browns experienced no erosion and the first 8 inches infiltrated before the rest moved off. This was in contrast to his neighbor who had water sitting on his land for 3 months. "That's why you need to

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work with nature,” says Gabe. “You can’t impose your will, because nature wins every time.” It was the Browns’ focus on soil health that allowed them to reap the benefit of a soil that could infiltrate that amount of water and store it in the soil profile.

That focus really began in 1993 when the Browns went 100% no till on their 2,000 acres of cropland. “We learned we had to keep the armor on the soil surface,” says Gabe. They learned how to transition from a small grain operation to a diversified system. That transition meant not just no-till, but also planting a variety of species. Gabe plants warm and cool season broadleaves and grasses, which means diversity in the cropping system. For Gabe a cool-season grass could be oats, a warm-season grass could be corn, a warm-season broadleaf could be sunflowers, and a cool-season broadleaf could be flax or brassica. “We feed soil life,” says Gabe. “It needs a diverse diet so you need to seed a lot of different plants. You have to look at what the soil needs to determine what to plant. We may plant a cool-season cover crop primer or we may have a cover crop primer for the whole year, it all depends on what the resource needs.

Cover Crops 2012	
Cool Season Grasses <ul style="list-style-type: none"> • Annual Ryegrass • Oats • Barley • Winter Triticale • Rye • Spring Wheat 	Cool Season Broadleaves <ul style="list-style-type: none"> • Canola • Radish • Turnip • Lentil • Sweet Clover, Berseem Clover, Crimson Clover, Persian Clover, Hairy Vetch, Sub Clover • Phacelia • Buckwheat • Kale • Flax • Winterpea
Warm Season Grasses <ul style="list-style-type: none"> • Hybrid Pearl Millet • Sorghum/Sudangrass • German Millet • Corn 	Warm Season Broadleaves <ul style="list-style-type: none"> • Sunflower • Cowpea • Safflower • Favabean • Soybean • Sunn Hemp • Ethiopian Cabbage • Alfalfa

“But just growing diverse crops in rotation is not enough. Gabe believes that you need to speed up biological time by growing cover crops with a great deal of biodiversity. He is constantly experimenting with different combinations to improve soil health. The Burleigh County Soil and Water Conservation District (SWCD) has been doing some research on this very thing.

In 2006, the Burleigh County producers were faced with an extremely dry year. It had been a winter with very little snowfall, so the SWCD seeded a polyculture cover crop (also known as cocktail seeding). They seeded into dry soil and had only one inch of rain from seeding until late July when the data was collected. One plot was seeded with a monoculture of turnips, and in another only oilseed radish. Each of these test plots were only 1/10th of an acre. The results were astounding. If you look at the production outcome, the cover crop had triple the production of the monoculture plantings. There isn’t a clearer picture of how production management can make a huge difference in outcomes, particularly in challenging times like a drought. The SWCD’s explanation of why the ½ rate cover crop slightly out yielded the full rate is simply because the full rate was too many plants per square foot in that drought.



2006 Production on District Plot	
Crop	Production #/acre
Cocktail Mix (1/2 rate)	4785
Cocktail Mix (Full rate)	4350
Pasja Turnip	2070
Cowpea	1914
Purple Top Turnip	1513
Soybean	1496
Oilseed Radish	1260
Lupine	1232

Multi-Species Grazing

Soil health also means that growing season lengthens as you have a diversity of species growing throughout different times of the year. So as Gabe looked once again at rangelands he realized he had only one grazer in his operation—cattle. “Look at what healthy native rangeland has,” says Gabe. “It had very diverse species mix with bison, elk, rabbits, predators, insects. Producers don’t pay enough attention to the benefits of a diverse and healthy insect population.

“We are also looking at the importance of predator insects. There was a recent study by Dr. Jonathan Lundgren of the Agriculture Research Service (ARS) in Brookings, South Dakota. The study was performed on Dr. Duane Beck’s Dakota Lakes Research Farm near Pierre, South Dakota. This farm had a field of 23 years of corn-on-corn production with non-GMO corn. Dr. Lundgren hand placed 1,000 corn rootworm larvae per foot in that field and watched to see what would happen. You’d expect total decimation of the crop because Dr. Beck uses no insecticide, but



These pictures clearly show the difference of how a mono-culture of turnips performed the year when there was only 1 inch of rain by July. In contrast, a diverse polyculture cover crop of over 16 seeds performed remarkably better under the same conditions and soil types. Both were subject to drought conditions, but the biodiversity of the polyculture allowed it to make more effective use of the water that did come.

there was only a 1% loss of the corn roots. Why? They set their traps, and after doing some extrapolation, Dr. Lundgren estimated that there was a billion predator insects per acre to address the corn rootworm.

"Dr. Beck had created a healthy soil with his cover crops so he created an environment where the predator insects could thrive and keep the pests in balance. We've done the same thing on our place. That's why we don't use any insecticide or fungicide. We want to have the predator insects, and we need some pests to feed the predators. It's all about a balance and about looking at the whole. All species have a purpose, and we want our management to reflect nature. That understanding made us look at multi-species grazing and we brought in other livestock to create more diversity.

"When my son Paul came back to the farm, I had one request—he had to think outside the box and push my thinking. Well he did that. He said, 'We've got diversity in crops, so we need to diversify the livestock.' So Paul has added pastured poultry, ducks, chickens, and turkeys to try to imitate nature. We also brought on sheep to increase diversity even more.

"Livestock are simply a tool to convert sunlight into dollars. We make our cattle earn their keep. Cattle have legs so we make them use them. We combine them with the crops we grow to improve soil health even more. We may start with a cool season primer such as fall seeded biennials and then graze this at high stock density for only a matter of hours, moving the livestock 5-6 times a day (either with our 350 cow/calf pairs or our 400 yearlings)." Despite many people's concern about the labor it takes to set up fences for that many daily moves, Gabe says it takes only an hour each day to set up fences for those moves. When they leave, they've covered the ground with litter. That's the armor to protect the soil while feeding macro organisms. Right now the Browns soil is so full of life that they need to get more carbon into the soil to feed that life. It takes only 2 months for the soil life to consume all that litter so they are challenged to keep the ground covered. After the animals graze, the Browns seed another soil primer with a drill. Gabe found that results from broadcasting were variable in his environment so he prefers to drill the seed. He grass finishes the cattle so he figures out how to fit his cover crops into the holes in the native forage cycle so there is always feed for the cattle and always a living root to feed the soil organisms.

Diversity = Profit

So how does all this management focus equate to profit? Besides the resilience to flood and drought and increased production during those times, Gabe has consistently been able to have a 200% higher gross

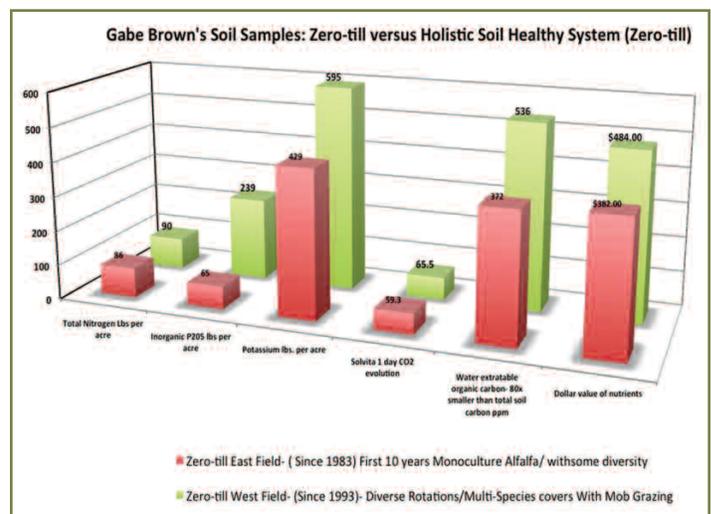


Cool season grasses (oats) are planted in combination with other broadleaf plants to maximize diversity.

profit per acre and a 20% increase in bushel production than the county average. The main reason again is a healthy, functioning soil.

"Measuring for NPK with a conventional soil test is a waste of time," says Gabe. "My conventional soil tests have shown that I only have 10 units of nitrogen. But with a functioning soil I'm producing more than the county average. The soil life allows good growth without inputs. That's why we don't need any synthetic fertilizer. If you want to take care of the energy crisis, get rid of synthetic inputs and focus on soil health. I'm getting 130 bushels to the acre. The county average is 100 bushels per acre. Instead of focusing on the plant, we're focusing on the soil. That is why one needs to use a soil test that takes soil biology into account. I prefer to use the test that was developed by Dr. Rick Haney."

Dr. Rick Haney's research (ARS) of Gabe's farm also shows the difference between his no-till fields versus no-till and livestock. That's the real combination to take soil health to the next level. If you look at the nitrogen levels, they are about the same. But, the inorganic phosphorus and potassium is much higher where livestock has grazed because of the root exudates and soil biology that happen through both diversity of plant and the grazing/pruning of those plants by animals.



In this chart created by Dr. Rick Haney of the Agricultural Research Service (ARS), he compares the soil health of no-till soil versus Gabe Brown's soil which has the added benefit of livestock integrated into the system. As can be seen in this chart, the organic carbon in the Brown Ranch soil is almost 50% more with the value of the nutrients being almost 30% more as well.

"People say to me, 'Gabe your system is going to crash.' But, that's not going to happen if I keep feeding the soil with diversity of crops, cover crops and livestock," says Gabe. "If you take care of the soil, it will provide the nutrients you need. If you focus on the soil, that means more money in the producer's pocket. If you look at our expenses per acre for corn, you see it cost me \$1.10/bushel. The U.S. average cost of production for corn is \$4.40/bushel (without land costs). If I add my land costs in it goes to \$1.20 /bushel. The U.S. average with land costs is \$5.50/bushel." So what's the cost of not cover cropping and using livestock to improve soil health? What's the profit loss to farmers? An 80% decrease in profitability if you are the average American corn farmer. That should be a powerful motivator to change farming practices towards healthier soil and less reliance on inputs which will in all likelihood continue to go up.

New Frontiers

When Gabe isn't busy working on improving soil health and profit, he's exploring how to use the same farming techniques to grow vegetables as well as grain. In a low-rainfall year, he decided to try no-till potatoes and onions by laying down the potatoes and onion sets then covering them with hay. "I'm lazy, so I used the garden vegetable species as a primer," says Gabe. "I seeded a 20-acre garden with over 70 species. In 90 days we had more vegetables than we could eat. We didn't use any irrigation to grow these plants. The extra produce we donated to a food pantry. Paul was trying to inventory what we grew, and we counted 20 thousand pounds of zucchini and squash alone. It was a fun project to do, and we'll continue to do it. So much time we spend worrying about what species we should or shouldn't plant next to another. It doesn't matter so much with healthy soil. After we harvest, we bring in cattle and ducks and poultry so the garden gets the same livestock fertility treatment."

Gross Profit	
Income/Acre	
Yield 159 bushels/acre @ \$6.48/bushel	
\$1030.32/acre	
Expenses/Acre	
Seed \$64.05	
Herbicide \$12.50	
Crop Insurance \$17.94	
Planting \$18.00	
Combining \$22.00	
Trucking \$24.40	
Storage \$15.90	
Total Expense \$174.79	
Gross Profit \$855.53/acre	
(does not include income from direct payments, CSP, and winter grazing)	
Cost per bushel of corn = \$1.10 (excluding land cost)	
Gross Profit \$5.38/bushel	



In an experiment to see if this type of no-till cropping could work in a garden situation, Gabe polyseeded 20 acres of farm land as a vegetable garden. Despite a very dry year they were able to harvest 20,000 pounds of zucchini and squash alone by using this method. To plant potatoes and onions no-till he simply placed the sets on top of the soil and covered them with hay.

water, cleaner air, healthy land, and healthy people; they are all intertwined," says Gabe.

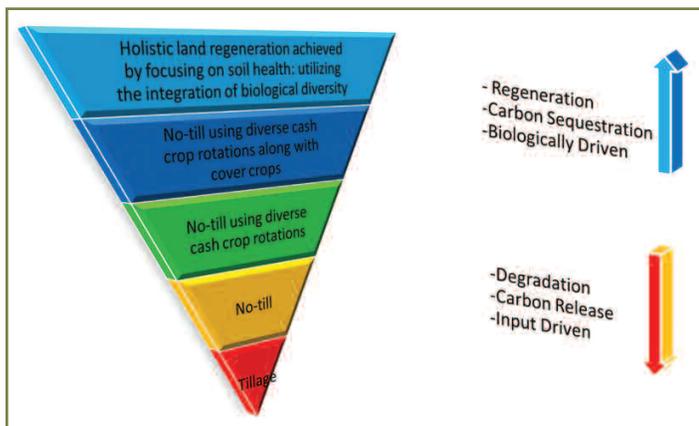
Gabe readily admits he's not organic. He still uses one herbicide pass every 3 years. "I want to get to organic," says Gabe. "Some organic folks are doing one tillage pass every 3 years. We're going to meet in the middle and learn from each other. For the most part, with the amount of residue we have, weeds aren't an issue. If weeds are germinating, something is out of sync."

Gabe is excited about the concept of pasture cropping as the ideal of keeping the land covered while growing a cash crop. The problem is that you need to seed a cool-season cash crop into a warm-season perennial stand or a warm-season cash crop into a cool-season perennial stand and in North Dakota the difference between cool season and warm season is about a week, he jokes.

When asked if his neighbors think he is crazy, Gabe replies, "Yes, because I am. When I first started, I only had to go back to Thomas Jefferson's journal. He was doing the same thing. I'm just coming full circle. I tell people I'm just 200 years too slow. When I bought into no-till, a mentor told me to sell all my tillage equipment so I could commit to learning how to no-till and not go back to the status quo. You learn, and I learned the hard way."

Gabe continues to explore different combinations that help improve soil health but are also good forage for the livestock. He likes triticale and hairy vetch because he can either hay it or graze it or combine it for seed. He has found that the triticale is more palatable to livestock than rye and has more protein. He is beginning to experiment with compost as he continues to look for ways to get his organic matter up to 6-7%, like the rangelands he works to mimic. His stock density is currently 685,000 #/acre, and he's only grazing any given paddock once/year. He doesn't use fly control because it would be detrimental to dung beetles and other predatory insects. He's also using cover crops (biological primers) to extend the grazing season which reduces hay usage and, therefore, costs.

His focus on these additional soil fertility practices are a result of the Holistic Management training and mentoring from HMI Certified Educators Don Campbell (as far back as 1997), Wayne Berry, Terry Gompert and Joshua Dukart. "When I started down this road of resource



Gabe sees the management options available to agricultural producers on a spectrum of how they improve land health. The ultimate healthy soil building practices is a combination of holistic land regeneration techniques that he continues to experiment.

Gabe sees these different land management techniques as a spectrum toward improved soil health. The first step is to eliminate tillage because it destroys the soil. So that means going to no-till with the next step being to diversify your crop types. Follow that with the addition of cover crops. Then you integrate livestock and move to multi-species grazing. That's when you get to regeneration. The results? "Cleaner

regeneration, I did so not knowing about Holistic Management at the time," says Gabe. "I will never forget when I first heard Don Campbell. I had just had my third year of crop failure due to hail and drought and I asked Don how financially do I cope with that?" His answer was sympathetic, but honest, "Replan!" It took me a while to realize what he meant, but I will never forget those words as I went home and replanned!

"That was my first exposure to Holistic Management, so I had a lot to learn but it got me thinking. It was not like I grasped Holistic Management right away, so my thought process changed slowly over time. Over time I realized that I needed to take my profit first. This has made a real difference in how we manage our operation. Early on it "forced" us to cut expenses. Now we realize that those expenses are not needed.

"Making a profit in agriculture today is very easy if you use Holistic Management. As far as production planning goes we now use the Holistic Management decision testing in every situation we encounter on our operation. We ask ourselves, will this have a positive impact on our resources? Will this decision help us meet our vision statement? On our operation we realize that we need to put the resource ahead of short-term profitability as it is the resource that will sustain this operation for future generations."



In situations where the resource needs more carbon, Gabe allows the biennials to reach a more mature state and then lets the livestock consume only 1/3 of the above ground biomass.



This is the amount of litter that Gabe aims for when working to feed the "livestock" (micro-organisms) below the ground.

Getting the next generation involved in production agriculture is very important to the Browns. "The next generation is going to have to live with the ramifications of the current production model, which is degrading our resources. It is imperative that they have the holistic training to rectify this situation," says Gabe.

Gabe and Shelly are busy turning the ranch over to their son, Paul, through a well thought out succession plan. "We knew Paul wanted to come back and ranch," says Gabe. "We sat down with him and his sister. We told them that Paul gets to work into operation and we made different outcomes for his sister. When Paul came back from school, we wrote up a 20-year plan so that 5% of the ranch is turned over each year to him. I had seen way too many instances where parents wait until they are ready for retirement before making transition plans. That is not good for the parents and certainly not for the children, especially any children involved in the operation. Shelly and I were 50 years old and Paul was 24 when we developed this plan so we all knew what the plan for transition was up front. We formed a Family Limited Liability Limited Partnership. Shelly and I are the principle partners and we can transfer portions of this to Paul over time. This insures a smooth transition without estate tax

ramifications should unforeseen circumstances develop."

"There is no better feeling than working with one of your children. We look upon it as blessing and do what we can to make it work. We also told him that any new enterprises he wanted to start up, he'd get 100% of the income from them. By doing this he learns financial planning and decision making. Paul took Holistic Management training so he is well versed in these processes. We are challenging him to push himself and think outside the box," says Gabe.

"If you are starting to farm, the number one thing to realize is that the biggest roadblock is the human mind. You have to look at things differently. Don Campbell from Canada says, 'If you want to make large changes, change the way you see things.' You have to have the ability to see differently. We try to fail at something every year. We want to see and know how a little different approach or different species of livestock will affect things. How do we know if we don't try it? Experiment. If you don't fail, you're not trying hard enough. Just fail small. I don't tell people about my failures because I'm afraid they won't try it on their place. Just because it is failure at Gabe Brown's doesn't mean that it will fail somewhere else." 🙌

To learn more about the Brown ranch visit their website at: www.brownsranch.us



As part of the effort to increase above ground biodiversity, Gabe's son, Paul, has developed a pasture poultry operation for the farm.