

About Soil Biology

Dear Friends, Neighbors and Customers

This article will be of keen interest to some of you.

Others may just hit delete.

I wrote it because some of you have asked, and because this is an important topic.

Soil is not just important to farmers. Soil health is important to anyone who eats. Whether omnivore or vegetarian.

Good farmers have known for centuries, actually millennia, that livestock combined with crop rotation can maintain soil health and productivity indefinitely.

Fifty years ago, virtually all Midwest farmers raised livestock and practiced crop rotation. From a soil health standpoint, that was good.

Now, very few do.

The classic rotation is;

Year one. Oats with alfalfa interplanted. The oats is harvested in late summer. The alfalfa is not harvested in the seeding year.

Year two and three. Alfalfa harvested for hay.

Year four. Corn.

Year five. Corn or soybeans.

Year six. Corn or soybeans.

Repeat.

The alfalfa and most of the grains were fed to animals on the farm. The typical farm sold animals for meat or milk. Some of the grains were also sold.

This rotation and its many regional variations maintained a healthy soil and a healthy soil biology.

It also broke weed and insect cycles.

I have pasted an article below that someone sent to me in 2012. It contains a good explanation of crop rotation combined with animal agriculture.

Old Ways Help Iowa Farmer Beat Drought



Iowa farmer Dick Thompson uses diversity to survive droughts and other natural disasters. (VOA/S. Baragona)

- **Steve Baragona**

August 29, 2012

BOONE, Iowa — Unlike most of his Iowa neighbors, farmer Dick Thompson is not expecting the US government to help him survive the drought.

While others depend upon federally subsidized crop insurance, Thompson relies on old-fashioned farming methods to see him through.

As drought scorches U.S. corn and soybean harvests, most American farmers protect themselves from major financial losses with federally subsidized crop insurance.

This year's insurance payouts are expected to top last year's \$10.8 billion in damage from droughts and floods.

The federally backed program is the backbone of the farmer safety net Congress is considering as it debates the Farm Bill, an enormous five-year package of legislation encompassing agriculture and nutrition policy.

Thompson, 80, says he will see none of it.

"I have never bought crop insurance since we started to farm," he says.

On his own

Thompson also foregoes many of the tools of modern agriculture. He uses few chemical fertilizers and weed killers. He doesn't grow genetically modified crops.

"I'm old-fashioned and I'm proud of it," he says.

And yet, Thompson says his farm is more profitable than his modern-farming neighbors.

That success has inspired researchers like Matt Liebman at Iowa State University to study how farmers can succeed with such a contrarian approach.

"The reason we're doing this is because of what he's doing," Liebman says. His research fields at Iowa State University mimic much of what you find on Thompson's farm.

Diversity

One explanation is crop diversity, something lacking on many Iowa farms today.

Corn and soybeans carpet the Iowa landscape. Many farmers grow nothing else. And when those crops do poorly, as they will in this year's drought, payments from crop insurance keep farmers in business.

Instead of crop insurance, Thompson protects himself the old-fashioned way.

While he grows corn and soybeans, he also raises hay and oats, along with cattle and hogs.

His oat crop was harvested before the drought hit. His third crop of hay sits scattered in round, shoulder-high bales on what will be next year's corn field.

"I think it's common sense," Thompson says. "You've got diversity and you've got some protection there. If one crop doesn't do well, maybe the other one will make up for the difference."

Losing ground

What Thompson calls common sense used to be common practice on Iowa farms.

But the amount of land used to grow hay is half what it was two decades ago. Oats have fallen by nearly 95 percent.

Livestock disappeared, too. The number of farms with cows decreased by half between 1982 and 2007. The number with hogs fell by more than 80 percent.

Thompson says that is a mistake. "If I'd sell the cows, I would be like everybody else around me, corn and [soy] beans," he says.

The livestock difference

Thompson will not sell off his herds because his cows and hogs are good for more than income. They also provide the manure to fertilize the soil, eliminating the need for chemical fertilizers.



keys to his success. (VOA/S. Baragona)

Unlike many farmers, Thompson still raises livestock and says that is one of the



And the manure helps the soil hold water, another form of insurance in a drought, according to Iowa State University researcher Rick Cruse.

"It really adds to the condition of that soil that does favor crop growth, particularly under stress conditions," Cruse says. "And that's the kind of conditions we're experiencing this year."

And they are conditions farmers everywhere are more likely to face in the future with climate change.

Triple win

Matt Liebman says his research shows that Thompson has lessons for everyone.

"Looking toward diversity, crop-livestock integration, the careful stewardship of the soil, making the best use of every drop of rain that falls, those are lessons that we should know here. And they're even more important elsewhere," he says.

Thompson says it takes more work to farm this way than with chemicals and crop insurance, but he thinks it's worth it.

"I think it's a better way of taking care of the land and the environment and the pocketbook," he says. "You can have all three."

Thompson says the old-fashioned ways might still be the best.

End of VOA Article

Continuous corn and soybeans requires more fertilizer, more herbicides and more insecticides each year as it kills the soil.

In the past, we were taught to think of the soil as a mixture of chemicals. I believe most farmers and fertilizer dealers still think of soil that way.

We believed that organic material mattered but mostly for soil tilth and moisture holding.

The biological life of the soil, meaning bacteria, fungi, nematodes and worms was not really a consideration.

In the early 1970s, Earl Butz was Nixon's Secretary of Agriculture. Earl told us that there would never again be a grain surplus. He said that we should plow up the fence rows and plant all the acres we could. He left office in 1976. A few years later grain prices and the farm economy in general collapsed into a 20 year slump.

I listened to Earl. I plowed all the Sherburne County sand I could buy or rent.

In the 1970s, I got 200 bushel corn yields. It required irrigation and lots of fertilizer. The new weed killers, Atrazine and Roundup were of great help too.

We understood soil as containing so many pounds of nitrogen, phosphorus, potassium etc per acre.

If a crop farmer hoped to harvest a grain crop that needed "X" pounds of nitrogen, he added what the soil lacked. Plus a bunch more to account for natural losses.

I farmed that way.

I knifed in anhydrous ammonia. At first, I was delighted that the ammonia killed the pocket gophers.

Later I realized that it was killing everything that lived in the soil. Not just gophers, but bull snakes and mice too. The ammonia killed everything. Earthworms, bacteria, good bugs, bad bugs, all gone.

After the third year, the sand became so coarse and loose it would blow in any wind.

To remedy that, I pioneered no-till planting in this county. That stopped the sand from blowing.

Somehow, the organic content of the soil kept falling anyway.

I was not worried. I told people that all I needed the sand to do was hold the plants upright.

After about five years, yields starting falling off. The plants were running short on trace elements.

I added magnesium and a few other elements to my fertilizer. It became a treadmill. Every year something else turned up missing.

After almost 20 years of chemical farming my soil was not just dead, it was coarse and sterile. The soil PH was in the low 5s. It was hard to grow sandburs.

This farm is in the Anoka Sand Plain. In fact our sand is some of the coarsest sand in that Plain. This part of the Sand Plain should never have been plowed in the first place.

There are farms in this Plain that have a less fragile sand. If farmed carefully and irrigated, those sands are quite productive for raising potatoes and other high value food crops.

The great prairie loam soils of southwestern Minnesota, Iowa and the eastern Dakotas are much different from my sand.

Those soils are better able to endure tillage and continuous cropping.

Nevertheless, history, not just our history but world history tells us that no soil can be abused indefinitely.

That is the bad news.

It takes centuries to build topsoil. But building topsoil is not exactly the same as restoring soil vitality and natural fertility.

The good news, and the point of this article is that great farmers in a number of locations are proving that soils can be revitalized in only a few years.

The secret is not a secret at all. It is the old recipe of crop rotation and organic material buildup combined with the clear realization that plant biology is crucial.

There are billions of microbes in a cubic foot of healthy soil. Those microbes (microorganisms) are bacteria, fungi, protozoa, microscopic creatures both plants and animals.

Those creatures are essential for making absorbable nutrients available to plants.

They work, as any symbiotic biosystem works, to keep things in balance. The natural habitat for these microbes is organic material. Organic material that is primarily last year's roots.

It is in the microbes' interest to produce nutrients that plants need. Healthy plants mean more roots.

More old roots mean more microbe habitat.

It turns out that the old, actually ancient system, of animals and crop rotation had it right.

The mental breakthrough for me is to understand soil as a biological rather than a chemical system. With that perspective and some new information, the process and the pieces all fit together. I have been working for over 20 years to restore my land to pasture. Carefully grazed pasture is the best way to manage this fragile soil. Most of it is doing well. I have nice restored native prairie pastures, good legume mix pastures and blended pastures. Even so, there are trouble spots. There are areas that could be much better. I think this new perspective will help me to improve all my soil. I wish I had learned what I am now learning 20 years ago. The restoration process might have gone much quicker and much smoother. If you are interested, there are plenty of opportunities to learn more. This information has gone mainstream. The USDA (US Department of Agriculture) website has lots of information. The most recent issue of the Minnesota Volunteer from the DNR has a good overview article. You can locate that article with a simple internet search in a few clicks. This stuff is good news. It is exciting. It makes sense. It works. Best regards.
Tom Barthel

Link to our Facebook page.

[Snake River Farm Minnesota on Facebook](#)

Sarah's Blog for all recipes, customer letters etc.

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