FARM REPORT

FROM THE PRESIDENT'S DESK: HIGHER GRAIN PRICES AND LOWER STARCH DIETS

Corn prices have steadily increased since last fall and ag economists are warning about skyrocketing feed prices as we head toward spring (Feedstuffs, Jan. 26, 2021). Some are predicting corn at $5 to $6/bushel, and so farmers who have not pre-purchased corn and soybean meal may struggle with high feed prices.

Some feeding approaches are worth remembering anytime, but especially when feed prices are high. Lower starch diets – either from feeding more forage or making strategic use of non-forage fiber sources (i.e., fibrous byproducts) – deserve a second look when corn prices are high.

We've known for a long while that the rumen microbes don't require starch per se, but just a steady supply of fermentable carbohydrates including starch, sugars, soluble fiber, and digestible NDF. It's true that rumen starch fermentation yields the most microbial protein, but sugars such as sucrose, and soluble fiber such as pectin, supply about 88% as much. With NDF, the focus is squarely on forage quality because the greater the NDF digestibility, the more microbial protein is produced.

When grain prices spiked a decade ago we evaluated how a higher forage diet compared with a typical diet of 50% forage and a diet containing byproduct fiber in place of corn. The high forage and the byproduct fiber diets both contained similar, and lower, starch content than the standard diet. The standard diet contained 20% conventional corn silage, 20% brown midrib (BMR) corn silage, and 10% haycrop for a total of 50% forage. In contrast, the higher corn silage diet contained about 53% BMR corn silage and 10% haycrop silage for a total of 63% forage in the ration DM. We used BMR corn silage as the main forage to enhance the digestibility of NDF. The diet based on non-forage sources of fiber contained the same forage sources and amounts as the standard diet (50% total forage), but corn meal was reduced to only 3.8% of ration DM and replaced with fibrous byproducts such as beet pulp and wheat midds.

All three diets contained similar crude protein (16.5%) and protein fractions, fat (3.9%), and sugar (6.8%). Ration NDF was lower for the standard diet (34.7%) than either the higher corn silage or non-forage fiber diets which were both similar (38.1%). Starch content was greatest for the standard diet (26.0%) and lower for the higher forage diet (21.4%) and non-forage fiber diet (21.3%).

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ORANGE YOU GLAD?

If you've been able to gather anything from my previous Farm Report articles it should be that I really like to eat and enjoy new flavor experiences. Winter citrus season is upon us, and now is the perfect time of year for grapefruit, Meyer lemons and navel, blood, and Cara Cara oranges. If you've never had a Meyer lemon, I highly recommend giving one a try; however, their season is often shorter than the New York Jets', and sometimes harder to find than their Super Bowl rings. (I eagerly await the pitchforks and torches on this one.)

Perhaps cows would enjoy a taste of winter citrus as well, with the added benefits of increased milk components. A Brazilian study recently published in the Journal of Dairy Research found that orange juice industry by-product silage increased milk fat and protein in multiparous Holstein cows in peak lactation. The high soluble carbohydrate and pectin content of orange peel makes it a desirable silage product; in addition to being highly digestible and nutritious, it also does not further acidify the rumen environment. Citrus pulp is not an uncommon additive in dairy diets, as it can be a lower-cost supplement and doesn't have large impacts on intake or lactation performance. The end product of orange peel degradation is acetic acid, a volatile fatty acid (VFA) important for milk production. This study hypothesized that replacing whole plant corn silage with orange peel silage would improve the rumen environment and increase nutrient intake and milk yield without compromising milk composition.

Eight ruminally cannulated cows 110 ± 22 days in milk received four TMR diets in which whole plant corn silage was replaced by orange peel silage at rates of 0 (control), 25, 50, and 75% of forage DM. The forage-to-concentrate ratio of the diets was 75:25, with corn silage and orange peel as the only forage sources. The results showed that substituting orange peel for corn silage had a significant effect; cows' dry matter (DM), energy, and neutral detergent fiber (NDF) intakes all decreased with each increasing substitution level of orange peel for corn silage. Cows had the lowest DM intake and milk yield when fed the diet with 75% orange peel replacement, due to decreased rumen fill. However, this diet also resulted in the highest percentage of milk fat and protein (4.1% and 3.7%, respectively). Milk fat in the diets with the highest replacement level of orange peel showed a 20.6% increase compared to the control diet. Rumen pH was lower in the diets with replacement rates of 0, 25, and 50% of forage DM of orange peel than the diet with 75% of forage DM replacement 7 hours post-feeding, which demonstrated that the higher inclusion rates of orange peel stabilized the rumen pH despite the robust fermentation that occurred. The orange peel also may have improved the utilization of other dietary NDF through the stabilization of the rumen pH and positive effects on the microflora. Those diets with 25 and 50% of forage DM orange peel replacement exhibited similar milk yield and milk protein to the control diet containing only corn silage.

This work supports exploration of other alternative forage sources to corn silage. While corn silage is a primary forage source, there are many parts of the world where other equally nutritious and sustainable alternatives could be used when corn is not readily available. Brazil's orange juice industry produces a considerable amount of orange peel by-product, which could be a cost-effective and efficient forage replacement for corn silage if it doesn't compromise nutrition or milk production. Just as distiller's grains can be used as a concentrate without further processing, U.S. farms near orange growers or orange juice production facilities may be able to incorporate orange peel by-product into diets without the need to further process them into citrus pulp pellets. Orange you glad there's options?

— Cari Reynolds
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NOBODY ASKED MY OPINION, BUT…

…had I known in February 2020 that I wouldn't be eating in a restaurant again for at least a year, I'd have ordered dessert.

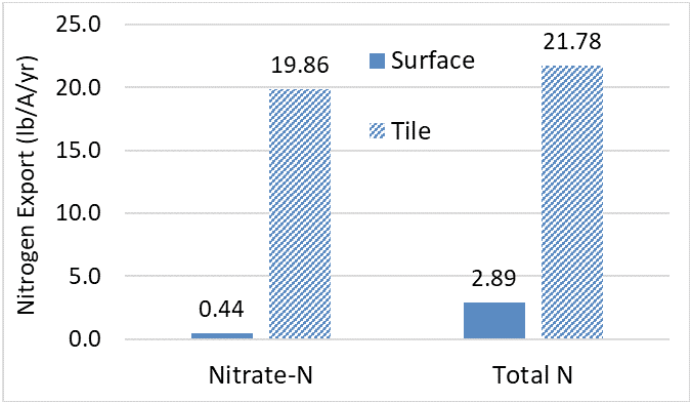
…how can a food that tastes good have no calories? According to the nutritional label, a Vlasic kosher dill pickle spear has zero calories. Aren't calories what makes food taste good?

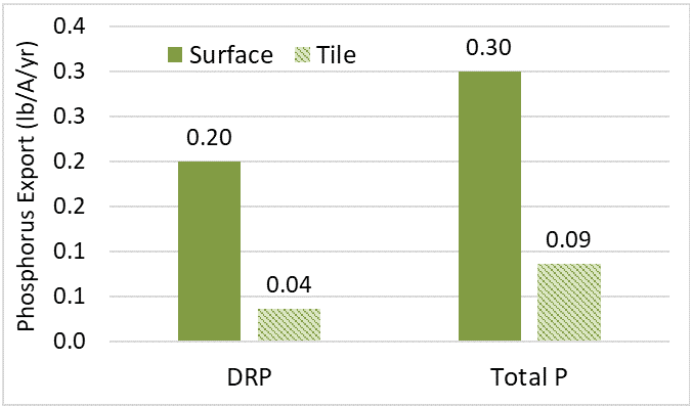
…I wonder what happened to Preparations A through G?

— E.T.

DRAINAGE WATER QUALITY FROM ALFALFA-GRASS PLOTS, YEAR 3

From January 1, 2018 through December 31, 2020, tile drainage flows and surface runoff were monitored from four, 0.25-acre plots at Miner Institute with funding from the Northern New York Agricultural Development Program. Following corn harvest in 2017, the plots received a broadcast manure application (8,000 gal/A) that was incorporated with a disk harrow. The following spring, a 60/40 mixture of alfalfa and cool season grasses were planted. In each of the three years, the field was harvested twice for hay crop silage, with broadcast manure applications (4,500 gal/A) following the harvests in 2019 and 2020.





Annual precipitation has ranged from 24.8 inches to 37.0 inches and average total runoff (surface + tile) has ranged from 5.6 inches to 11.2 inches. Tile flow has accounted for between 53% and 91% of the total runoff from the plots. Throughout the study, the vast majority of surface runoff has occurred during snowmelt events.

The two graphs show the average annual phosphorus (P) and nitrogen (N) losses and illustrate the contrasting stories of their movement. Despite accounting for just 28% of the runoff during the three-year study, 78% of the total P exports were produced by surface runoff. Similarly for dissolved reactive P (DRP), the bioavailable form of P that comprised 61% of total P, surface runoff accounted for 85% of losses.

The 2019 monitoring year was the only year in which P exports from the tiles (0.16 lb/A) exceeded those from surface runoff (0.04 lb/A). The runoff patterns in 2019 were markedly different, with only 1.0 inch of surface runoff, compared to 2.3 inches in 2018 and 3.4 inches in 2019. Tile flows were also substantially greater, with 10.2 inches of tile flow compared to 3.3 (2018) and 3.8 inches (2020). Despite this substantial increase in total runoff, total P losses in 2019 (0.20 lb/A) were 62% and 56% less than in 2018 (0.52 lb/A) and 2020 (0.45 lb/A), respectively. Although we cannot definitively state that the reduction in surface runoff and increase in tile drainage caused the drop in total P losses, the average concentrations of P in tile flows have been consistently lower than in surface runoff. Increasing the subsurface drainage capacity of the plots reduced the risk of surface runoff, and despite the high rate of tile flow, P concentrations were low enough to result in the lowest rate of P loss throughout the study.

Unlike P losses, the majority of N losses occur through the tiles, with an average of 2.9 lb/A/yr of total N lost in surface runoff compared to 21.8 lb/A/yr from the tiles. The dominant form of N differed between the two runoff pathways, with nitrate comprising 91% of total N losses in tile flows and a combination of ammonium and organic N accounting for the majority of N lost in surface runoff.

This contrast in nutrient loss dynamics demonstrates the challenge with developing and utilizing best management practices (BMPs) that simultaneously address P and N losses. As we see with the case of improved subsurface drainage potentially reducing P losses, this same practice increases the risk of N loss. This highlights the need for multiple approaches in order to properly address water quality issues. For this site, in addition to current BMPs including in-season manure applications to replace crop nutrient removal, subsurface injection of manure could address surface runoff P losses and drainage water management could reduce the risk of N loss during the nongrowing season.

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DE-WORMING YOUR CROPS

We often think of parasitic worms as a livestock problem, but very similar wriggling creatures have been known to stir up trouble in plants as well. They all belong to the phylum Nematoda (nematodes) and only about a third of the species are vertebrate parasites. While some of these worms are being praised (and even raised) for their ability to control insect pests (entomopathogenic nematodes), plant pathogens like soybean cyst nematode (SCN) are known for more malicious reasons.

This peculiar nematode species was first found in the U.S. in a North Carolina field in 1954. Since then, the affected area has been spreading gradually and now covers much of the East Coast, the Midwest, and several south central states. SCN was first confirmed to be in New York in 2016 and recent sampling efforts have confirmed the presence of the nematode in 30 of the 42 counties that were sampled in 2020. If SCN isn't feeding on your soybeans already, it probably will be soon.

Soybean acreage in NY was up considerably in 2020 as compared to 2019, and promising commodity price outlooks for 2021 may rally additional soybean cash crop plantings throughout the state. Beans can be a very lucrative crop in New York, with state yields typically averaging close to the national average. Soybeans have a high rotational value in corn-based agroecosystems and have a flexible planting window in the spring. Furthermore, soy is one of the most forgiving crops when it comes to no-till planting. But how concerned should we be about the infamous cyst nematode?

SCN attacks the roots of host plants by burrowing in and extracting the energy and nutrients that support root growth. This puts a metabolic strain on the plant which results in reduced yields that are proportional to the population of nematodes in the soil. Fortunately, SCN populations in most NY fields still appear to be quite low. You should still be concerned about SCN, however, since the nematode populations are probably growing exponentially if you haven't been managing them. One hurdle is that viable eggs and juveniles can remain dormant in the soil for over a decade, making it extremely difficult (if not impossible) to completely eradicate SCN from infested fields. That being said, one of the most effective tools that we have for managing SCN is crop rotation with non-host species such as corn, perennial forages, or small grains. As the name implies, soybeans are the victim crop of greatest significance, but it's important to consider that other legume crops such as edible beans may be hosts as well. Even perennial forage crops such as alsike clover and birdsfoot trefoil are known to be host species along with several different weeds.

One of the scariest things about SCN is that it can cause significant yield losses without any visible above-ground symptoms. This means that your crop revenue can be headed south without you even knowing it even if you regularly walk your fields. That is why one of the primary SCN experts in NY, Jamie Cummings (formerly with NYSIPM), recommends that periodically testing your soil is a worthwhile investment if you regularly grow soybeans in certain fields. Testing typically should run about $25/sample and will provide the information you need to make informed decisions about managing SCN.

There are some chemical seed treatments available that have some activity on SCN, but these can be costly and may only provide partial protection. Resistant soybean varieties are also an option, but these should be chosen with care as many of the resistant cultivars share the same SCN resistance traits and examples of resistance breakdown have been reported in recent years. While breeders continue to search for additional sources of resistance, it's unlikely that there will be a one-size-fits-all solution to SCN. Just like other pests and diseases, an integrated approach that combines cultural, chemical, and biological control measures will get the job done.

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Dry matter intake was greatest for cows fed the standard diet, intermediate for the byproduct diet, and lowest for the higher forage diet. The lower intake for the higher forage diet likely reflected its higher forage NDF content. Although milk yield was reduced for cows fed the higher forage diet, milk fat percentage was elevated, and so solids-corrected milk yield was similar for all diets as was efficiency of solids-corrected milk production. Microbial protein production was similar for all three diets.

This study showed us that we can feed higher forage diets when the forage contains highly digestible NDF. As we enter a period of higher grain and feed prices, we need to re-focus on the fact that cows can do very well on higher forage diets if the forage quality is high. And if fibrous byproducts happen to be priced competitively, we should be prepared to take advantage of their high fiber degradability.

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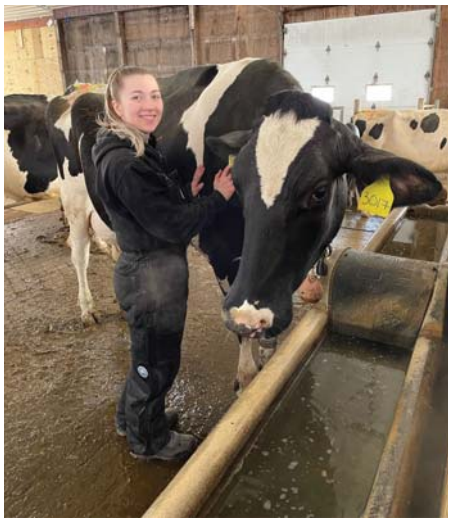
MINER INSTITUTE WELCOMES NEW RESEARCH INTERN

My name is Emily Youngmark and I'm a new research intern at Miner Institute! I'm incredibly excited to be a part of such an influential institution. I grew up in Dixon, Illinois, a relatively small town on the northwest side of the state. Being a small town in the middle of nowhere, there isn't much around besides farmland, rivers, a few state parks, and a beautiful prairie reserve. I spent a great deal of my childhood exploring these areas and going fishing with my dad. I believe growing up the way I did helped me develop a deep respect for the environment.

Unlike many of the students and interns at Miner Institute, I didn't grow up on a dairy farm. In fact, I had no interest in farming of any kind. Instead, I grew up in a small residential area several miles away from the nearest farm. Even so, I still found myself drawn to farm animals. As a kid I was always convinced that I was going to become a large animal veterinarian. Truth be told, I thought the only two jobs I could have where I would be around animals were veterinarian or farmer. This thought remained planted in my head until I transferred to the University of Missouri in 2018.



I graduated from the University of Missouri this past December with a B.S. in Animal Sciences. During my time at Mizzou I would discover two very important things about myself: I no longer wanted to be a vet and I absolutely loved research. These revelations would come about within my first semester after I signed up to be a volunteer calf manager at Foremost Dairy and was accepted as an undergraduate research assistant in a reproduction lab in Mizzou's Animal Science Research Center.

At Foremost I spent the majority of my time caring for heifer calves from birth to weaning, though I would also aide the milking staff or the vet from time to time. As a research assistant, I took part in projects targeting the origin of certain uterine cancers and determining the role of the immune system in uterine repair. These two jobs helped mold my love for the dairy industry as well as encouraged me to pursue a future in research. I'm extremely grateful for my time at Mizzou.

Even though I have a background in reproduction, I have always been fascinated by nutrition. There is no doubt that nutrition is the root of every successful farm. Without proper nutritional strategies, animals would not be able to produce and farmers would not make a profit. After completing my internship I hope to attend graduate school and continue studying nutrition. I want to continue my studies researching management strategies to reduce greenhouse gas production. With concern for the environment growing every day, it is likely that agricultural practices will change drastically. Sustainable farming has become something to strive towards. I believe the key to sustainable animal agriculture is through nutrition.

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SOUTHERN EXPOSURE

The Bride and I will soon be heading north for the season, bidding Virginia a more-or-less fond goodbye. The "more or less" is because while we love our home on the shore of the St. Lawrence River, in Virginia March is a spring month, with spring bulbs, flowering trees and magnolias in full bloom. Meanwhile, up in the North Country it's, uh, not spring. Maybe it's true that "it ain't the heat, it's the humidity", but up north it isn't the cold but the wind that often accompanies it. And no place in the North Country is it worse than West Hill in Ellenburg Center, where farmers there rate wind speed via the "West Hill Wind Gauge". This consists of a 3-foot length of logging chain attached to a fence post. The chain is always moving since the wind never stops blowing on West Hill. During a "light" wind the logging chain swings at a 180-degree arc, during a "moderate" wind the chain is parallel to the ground, while during a "strong" wind the end links snap off and blow away.

— E.T.

INCLUSION OF ALFALFA HAY IN CORN SILAGE-BASED DAIRY DIETS

Corn Silage and Alfalfa Hay Are Complementary Forages

Corn silage has become the predominant forage source in the U.S. and typically contains 6-8% crude protein, 28-40% starch, 36-46% neutral detergent fiber, and 3-8% ash (dry matter basis). Alfalfa hay, on average, has 22% crude protein, 1% starch, 2-3% crude fat, 38% neutral detergent fiber, and 11% ash (dry matter basis). The consumption of alfalfa hay has been declining, mainly due to high prices and competition from other alternative feeds such as almond hulls. Nevertheless, corn silage and alfalfa hay are complementary forages, and it's beneficial to include both forages in dairy diets compared with either one alone. There are several reasons: First, the majority of crude protein in alfalfa hay is rumen degradable protein, which can be utilized by ruminal microorganisms to produce microbial protein. The synthesis of microbial protein in the rumen requires energy that can be provided by the high amount of starch in corn silage. Second, the recommended content of crude protein is 16-17% for high-producing dairy cows, and the inclusion of alfalfa hay in corn silage-based diets can help to meet the requirement of crude protein. Third, the requirement of lysine is calculated as 6.6% of the metabolizable protein requirement of lactating dairy cows. Lysine represents 2.5 and 4.4% of the metabolizable protein in corn silage and alfalfa hay, respectively, and thus this lysine deficiency can be partly reduced by including alfalfa hay in corn silage-based diets. Fourth, alfalfa hay contains high levels of sodium and potassium and thus has greater dietary cation-anion difference and feed buffering capacity, which in turn can stabilize ruminal pH in dairy cows fed corn silage-based diets.

Corn silage in Bunk 21 at Miner Institute

Studies Investigated Varying Ratios of Corn Silage to Alfalfa Hay:

There have been several dairy studies evaluating the effects of different ratios of corn silage to alfalfa hay. One study was done in 2007 by Dr. David Schingoethe's lab at the South Dakota State University. In their study, cows were fed 3 diets containing corn silage, 50% corn silage and 50% alfalfa hay, or alfalfa hay as the forage source. Dry matter intake was higher for the combination of corn silage and alfalfa hay (55 lbs/d) compared with corn silage (48 lbs/d) and alfalfa hay (46 lbs/d). Milk yield increased linearly as the proportion of alfalfa hay increased (58, 63, and 64 lbs/d for corn silage, corn silage + alfalfa hay, and alfalfa hay, respectively). However, yields of 4% fat-corrected milk and energy-corrected milk averaged 58 and 64 lbs/d, respectively and were not changed by dietary treatments. Yields and concentrations of milk components (i.e., fat, protein, and lactose) were not influenced by treatments, with the exception that milk fat content decreased linearly to increasing amounts of alfalfa hay. Another study was completed in 2009 by Dr. Barry Bradford's lab at Kansas State University. They formulated 4 diets by replacing corn silage with incremental amounts of alfalfa hay (0, 7, 14, and 21% of ration dry matter) and observed that both dry matter intake and milk yield showed linear increases to increasing dietary levels of alfalfa hay. Dry matter intake increased from 59 to 61 lbs/d, and milk yield increased from 68 to 69 lbs/d. In contrast, solid-corrected milk (mean = 67 lbs/d) and energy-corrected milk (mean = 74 lbs/d) did not differ across dietary treatments. Increasing amounts of alfalfa hay did not change yields and concentrations of fat and protein. The third study was from Dr. Richard Erdman's lab at the University of Maryland, and his lab compared a diet with corn silage as the sole forage and a diet with 50% corn silage and 50% alfalfa hay as the forage source. They reported that dry matter intake, milk yield, and 3.5% fat-corrected milk averaged 49, 78, and 86 lbs/d, respectively and were similar between these two diets. Milk fat content was higher for the corn silage diet (3.91%) compared with the 50% corn silage and 50% alfalfa hay diet (4.32%). However, yields of milk fat and protein and milk protein concentration were not different between these two diets. Taken together, the inclusion of alfalfa hay in corn silage-based diets can probably improve feed intake and milk yield in dairy cows and have limited effect on modifying milk component yields.

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CHANGING CROP RECOMMENDATIONS

Continual advances in agricultural technology ensures job security for those of us advising farmers, but another way we do so is by occasionally changing our crop recommendations. An example: For years we told farmers that they didn't need to apply sulfur for most field and forage crops since there was more than enough in precipitation — remember "acid rain"? Then EPA instituted highly effective regulations restricting the sulfur content in industrial emissions and diesel fuel, and banned high-sulfur coal. Sulfate depositions plummeted, and eventually we began recommending sulfur-containing fertilizers. But this was based on crop response data, not a change in philosophy.

A more recent change is the amount of grass seed recommended in alfalfa-grass mixtures. Much of the data supporting the new recommendation is via Jerry Cherney at Cornell University, which is logical since New York has more alfalfa seeded with a forage grass than any other state. But as with sulfur, this is based on replicated research. I followed two years of this work in the Cornell University plots at Miner Institute, walking the plots where Jerry had seeded several rates of tall fescue with a constant rate of alfalfa. I remember him saying what a piddling small amount of tall fescue the ½ pound rate represented, especially when working with small plots.

Unless there's a (research-based) reason to change a crop recommendation it tends to remain the same. Cornell University's grass seed recommendations changed little for half a century, between 1965 and 2015. When seeded with alfalfa, Cornell's recommended rate of timothy or orchardgrass per acre was 4-6 lbs. in 1965, and 4 lbs. in 2015. Why almost no change — was it a case of "If it ain't broke, don't fix it."? No, it was because there wasn't any new research data so nobody knew if the rate needed "fixing"! Much has changed in alfalfa-grass seeding recommendations in recent years, both grass species and seeding rates, and the result is that dairy farmers in the Northeast are harvesting higher-quality forages.

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YOU DON'T OWN IT IF YOU DON'T KNOW WHERE IT IS (*Editorial comment*)

"A place for everything, and everything in its place." People tend to fall on one side or the other of the neatness scale. Two former presidents of Miner Institute represented the extremes of this scale. Harry Randy always started and ended his workday with nothing on his desk except a telephone, his name plate and a desk pad. Charlie Sniffen, who was president following Harry's untimely passing, had his desk against a wall so that his ever-growing pile of correspondence and assorted other papers would have something to lean against. This characteristic extended to his computer, which crashed one day because Charlie never deleted his email. (Actually, in this case I think his poor computer didn't crash; it simply choked to death.) But as Charlie would probably say: If a cluttered desk is the sign of a cluttered mind, what does an empty desk signify?

I'm generally on the neat side of the scale, though on request The Bride will gladly delineate my list of other faults. The wall of our Oak Point workshop has shelves with over 100 red plastic containers that once held Folger's coffee. These represent literally thousands of morning cups of coffee but are also my attempt at "a place for everything". Each container is labeled, so if I need some 6d galvanized finishing nails, for instance, I can find them in a matter of seconds. The top of the workbench itself — that's another issue.

It makes little difference whether I can find those finishing nails quickly, but what they own and where it's located is much more important for farmers needing that certain repair part or maintenance item in the middle of planting season. And I've noticed that the better farmers usually have more organized repair shops. I don't think it's a coincidence that how farmers organize the "pieces and parts" in their shops is consistent with how they manage the rest of their farm business.

— *Ev Thomas*

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Closing Comment

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