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South Central NY Dairy and Field Crops Program
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DAIRY & FIELD CROPS DIGEST
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How to Talk about COVID-19 Vaccination with your Employees

By Mary Kate MacKenzie, Farm Business Management Specialist; Richard Stup, Agricultural Workforce Specialist; and Mary Jo Dudley, Director of the Cornell Farmworker Program https://blogs.cornell.edu/scnydairyandfieldcrops/

The decision to receive the COVID-19 vaccine is a highly personal one, yet each individual's decision has profound implications for public health. At the farm level, that makes farmer and farm worker vaccination an important risk management issue. The more people on your farm who are fully vaccinated against COVID-19, the lower your risk of experiencing a COVID outbreak with consequences for employee health and farm operations. As a manager, your words and actions have potential to influence employee attitudes about the vaccine. How can you communicate effectively about COVID-19 vaccination with your family members and employees? Here is a list of Do's and Don'ts to help you have productive conversations that lead to more vaccinations.

DO

1. Be the first person on your farm to get the COVID-19 vaccine.

Actions speak louder than words. Leading by example is an easy way to demonstrate that you take the threat of COVID seriously and you view the vaccine as an important tool to reduce COVID risk. It also gives you the ability to speak from your own experience about the process of getting vaccinated and any side effects that you experienced. If one person on the farm gets vaccinated, that may make others less hesitant about receiving the vaccine. According to a survey conducted by the Kaiser Family Foundation's COVID-19 Vaccine Monitor, individuals who were eager to get the vaccine were 79% more likely to know someone who was already vaccinated compared to individuals who said they would get the vaccine "only if required".

2. Discuss COVID-19 vaccination early and often with your employees.

Encourage employees to get the COVID-19 vaccine and discuss how vaccination is good for the farm. Share your reasons for getting vaccinated and describe your experience with the vaccination process. Provide information about COVID-19 risks and the benefits of vaccination from trusted sources, including the CDC, the Cornell Farmworker Program, and the Institute for Food Safety at Cornell. Be sure to provide information in your employees' native language. Share the English and Spanish recordings of a recent webinar featuring medical providers discussing "COVID-19 vaccines for farmworkers: Should I get it and what are the side effects?"

3. Share the fact that vaccines have a long and effective history of controlling and eradicating diseases in both humans and animals.

Measles, mumps, diptheria, whooping cough, and polio are just a few of the devastating human diseases that we control routinely with vaccines. Smallpox, an historic scourge of humanity that killed 3 in 10 of its victims and left others scarred and blinded, was eradicated worldwide by vaccines.

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Similarly, animal agriculture industries have long used vaccines to prevent disease in livestock. Farmers and farm employees should be very familiar with vaccines and understand the import role they play in controlling disease and promoting health.

4. Help employees navigate the logistics of getting vaccinated.

Make sure your workers know that, in New York State, vaccination is free and available to anyone age 16 and up who lives or works in the state. Share information with your employees about clinic locations, dates and times, and how to register. Make sure employees know they are eligible for up to four hours of paid leave to get a COVID-19 vaccination. Discuss transportation options and whether the farm is able to transport employees to a vaccination site.
Once your employees have registered for the vaccine, make sure they have all necessary documentation ready for their appointment, including photo identification. This can include documents from another country, such as passports, voter registration cards and consular IDs, or photo identification from another state. Everyone should bring proof that they live or work in New York State. Those that do not have a New York State ID can bring a paystub showing the farm address. Health insurance is not required for vaccination. However, people who have health insurance should bring their insurance policy information to their appointment.

5. Listen to employee concerns and consider whether you can do anything to alleviate them.

Listening without judgement to employee questions and concerns is one of the best ways to build confidence in the COVID-19 vaccine. Some employees may voice concerns stemming from a lack of information or misinformation about the vaccine. Others may worry about missing work after getting the vaccine due to potential side effects. In response, be prepared to share your own reasons for getting vaccinated, provide information about vaccine safety from reliable sources, and communicate your farm's sick leave policy. Discuss staggering vaccination dates for workers to avoid the possibility of everyone experiencing side effects at the same time.

6. Continue sharing information about new opportunities to get vaccinated.

Farmworker vaccination efforts across New York State are gaining momentum. Now that eligibility is based on age, farmers and farm workers may access the vaccine through multiple channels, including sites run by New York State, county health departments, and pharmacies. According to the Governor's April 13 announcement, the state is devoting additional resources to increase vaccine delivery to farmers and farm workers through convenient pop-up vaccination sites. As you learn about new vaccination opportunities, be sure to share them with your employees. If you have workers who are not ready to get vaccinated now, they may be interested in a few weeks or months.

DON'T

1. Repeat doubts about the safety of COVID-19 vaccinations from unreliable sources.

The scientific community is strongly in support of the vaccines that are approved for use in the U.S. because they are safe and effective. This was demonstrated both through large scale trials while the vaccines were being developed and now by the hundreds of millions of people who have safely received them. Rumors and doubts expressed by leaders can make employees afraid of the vaccine. There are actual risks from vaccines, such as rare allergic reactions, but these risks are far outweighed by the risk of not getting vaccinated and the danger that unvaccinated individuals present to themselves and to everyone with whom they come into contact.

2. Disregard or judge employees when they ask questions or share their concerns.

These are truly uncertain times and the pandemic has provoked historic levels of fear in our society. Stress and anxiety can hinder good decision-making and leave people vulnerable to unfounded rumors and misinformation. Do not dismiss employees' concerns with a quick judgement. Instead, listen and ask questions. A listening ear can help people unpack their concerns and hold them up for examination against the facts. You might then have an opportunity to follow up with reliable information from trusted resources after listening.

3. Fail to encourage your employees to get vaccinated.

It is not enough to rely on public messages to encourage your employees to get vaccinated. As a business manager, you are a trusted source of information and guidance. Your silence about COVID-19 vaccination might be read by employees as indifference or, worse, hostility toward vaccination. The

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safety of your employees and their families, the future of your business, and the health of our communities depends in part on your positive communications about vaccination.

Conclusion

Leadership matters. Your efforts to encourage vaccination for your employees and their families could have far-reaching effects in protecting health and life. Please do your part to encourage the people you lead to get the vaccine, get protected, and help snuff out COVID-19.

Resources

Here are the full web addresses for the two webinar recordings referenced above, hosted by the Cornell Farmworker Program and Finger Lakes Community Health:

COVID-19 vaccines for farmworkers: Should I get it and what are the side effects? (English): https://cals.cornell.edu/covid-19-vaccines-farmworkers-should-i-get-it-and-what-are-side-effects

Las vacunas para el COVID-19: ¿Debería obtenerla y cuáles son sus efectos? (Español): https://cals.cornell.edu/las-vacunas-para-el-covid-19-deberia-obtenerla-y-cuales-son-sus-efectos

A set of FAQs, based on farmworker questions during the webinars, is available through the Cornell Farmworker Program (farmworkers@cornell.edu).

The Cornell Farmworker Program also has emergency resources available to assist farm workers whose families have been affected by COVID-19. Information about the farmworker emergency relief fund in both Spanish and English can be found at: http://www.trabajadores.cornell.edu/

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Disease Prevention to Reduce Antibiotic Usage: On-Farm Perspectives from CNY Dairy Producers

By Betsy Hicks & Christine Georgakakos

Disease Prevention


Photo by: Betsy Hicks

Many dairy farmers know the truth in the saying, "an ounce of prevention is worth a pound of cure", and manage their herds in such a way as to keep their cows healthy rather than having to treat sick cows. Not only does disease prevention keep herds healthy, it also minimizes antibiotic usage. Farmers we interviewed discussed three main ways of keeping their herds healthy as related to reduction in antibiotic usage: vaccination & immunity, cow comfort & facility conditions, and attention to nutrition at every stage of life. Our interviews with dairy producers highlighted similarities in terms of disease prevention, no matter farm size or management system.

Vaccinations & Immunity

Farmers in every management system we interviewed discussed vaccination as a powerful tool for disease prevention. One organic producer stated, *"we try to find, do everything possibly under the sun, to prevent … that's the key, how to prevent all these issues".* Similarly, a large conventional farmer noted that intensive, farm-specific vaccination protocols were key to using less antibiotics, stating, *"When we were 100 cow farm, we would probably treat more cows with [antibiotics] than we ever do now. It was, in years past, it was a more reactive thing. Cows are sick, now the bigger your farm gets, you tend to be more … proactive … so you tend to worry about your vaccines, and making sure they're all in line".*

Newborn calf immunity was also seen as a major avenue to prevent disease & minimize antibiotic usage. Colostrum feeding to newborns was discussed among all farm categories. One conventional farmer explained: *"A baby is going to get her first couple months of immunity from that colostrum. If you collect it right and you give it to them in a timely fashion, and you give them enough … they're going to get their immunities from there because you can't really vaccinate a calf and have their immune system ready to respond to that vaccine until three/four months of age."*

Cow Comfort & Facility Conditions

Another unifying theme we found among farmers was the belief and practice of using cow comfort to maintain good animal health – whether it be through barn design, flooring material, or minimizing stress. One farmer in our study said*: "Give them the best you can give them to eat and keep them comfortable with good air"*. Baby Boomers especially commented on minimizing stress as an important factor, and one farmer commented that, "*you know, it's kind of like people. You hear about people getting sick and their doctor says, 'You need to quit your job. There's too much stress.' And then they just start feeling better. Well I think it's the same with cows. When you're not pushing them for production".* One Gen X farmer talked about minimizing stress: "*we just like them to be cows. I hate doing anything to them that I don't have to do".* Analyzing and improving facility conditions in terms of cow comfort was mentioned among all categories of farmers. Some farmers stated, *"if we have a lot of mastitis issues … is everything clean? Is there an issue in the equipment? And then in the barn where the cows lay in the stalls, liming the stalls, keeping everything nice and clean and dry".* Ventilation and keeping the cows' environment clean were a main focus for many of our conversations around disease prevention.

Nutrition

Fresh cow nutrition and care was frequently referenced by farmers to help prevent disease on their dairies. Across categories, farmer noted that this stage required more attention, with an increased need for treatments (both antibiotic and non-antibiotic) as compared to the rest of lactation. Treatments referenced across management scales included calcium bolus, drenching and giving vitamin supplementation. Conventional farmers were more likely to mention these practices as an alternative to antibiotics than organic farmers. Probiotics were also widely references as being a supplement for fresh cows across management.

Calf care also appeared to be a top priority for farmers across all farm categories. *"The calf stuff has been a really big deal in terms of preventative stuff, and in terms of treatment"* was a common perception we heard. Improving calf immunity through colostrum, vaccination and probiotics was often discussed. One farmer stated, *"Every calf gets colostrum. If it's born at 11 o'clock at night, I stay up with that damn calf, and it gets colostrum,"* highlighting the importance farmers put on making sure calves get the care they need.

The Dairy Industry Unified

Ways to achieve herd health may differ among farms, but there are many common themes across the industry on how farmers view disease prevention. Noting these commonalities is a way to share to the public that the industry is working towards healthier herds and less antibiotic usage every day. These disease prevention actions and others ultimately lead to reduced antibiotic usage on farms and reduced risk of antibiotic residues and resistant bacteria in the environment.

This article is part of a series, written from a peer-reviewed article entitled "*Farmer perceptions of dairy farm antibiotic use and transport pathways as determinants of contaminant loads to the environment" published in the Journal of Environmental Management (*https://doi.org/10.1016/j.jenvman.2020.111880*). The work focused on twenty-seven interviews of dairy farmers in Central NY March through October of 2019, completed and summarized by the authors. Eight of the farms included managed their farms according to USDA Certified Organic standards, and the remaining nineteen farms managed their farms conventionally. Farm size ranged from under 50 mature cows to over 1000 mature cows. This series talks about the nuances between farm size and management, specific to findings interesting to the dairy farmer. This article highlights farmer perspectives of antibiotic usage on-farm as well methods farmers use as a means for disease prevention.*

Evaluation of Residual Herbicides for the control of Marestail and Common Lambsquarters in Soybean

By Mike Hunter, Regional Field Crops Specialist, CCE Northern NY Regional Ag Team

Glyphosate resistant (GR) soybeans made postemergence weed control relatively easy with a single application. The use of postemergence (POST) glyphosate in GR soybeans has been the primary weed control program used by many NNY soybean growers. While this system seemed to simplify weed management, relying on total postemergence programs can be difficult to manage if not properly implemented.

The benefits of early season weed control to protect the crop yield can be lost if the single POST application of glyphosate is delayed. A single POST glyphosate application also puts considerable selection pressure in weed populations increasing the spread of resistant weed populations in NNY. In recent years, multiple resistant horseweed (a.k.a marestail) has been found in New York State and has quickly become a troublesome weeds for many growers, including those in NNY.

The spread of multiple resistant marestail moving across the state, including Northern New York, is forcing many growers to change their current herbicide programs. This has led to a renewed interest and need to use soil residual herbicides for improved soybean weed control.

In 2020, a replicated soybean herbicide trial was conducted on a farm near Watertown, New York, in Jefferson County. This trial included 13 different herbicide programs consisting of preemergence (PRE) herbicide . The soybeans were planted May 21, 2020, These PRE treatments were applied on May 22, 2020 and visual weed control ratings were done 35 days after application (DAA). Marestail and common lambsquarters were the dominant weeds along with some yellow foxtail. The marestail at this site was suspected to be resistant to both Group 9 (i.e. glyphosate, Roundup) and Group 2 (i.e. Classic, FirstRate) herbicides.

The treatments included an untreated check, Classic (chlorimuron, Group 2), Sharpen (saflufenacil, Group 14), Tricor DF (metribuzin, Group 5), Trivence WDG (chlorimuron, flumioxazin, metribuzin, Groups 2, 5, 14), FirstRate (cloransulam, Group 2), Boundary 7.8 EC (metribuzin, S-metolachlor, Groups 5, 15), Valor SX (flumioxazin, Group 14) and Spartan Charge (sulfentrazone, carfentrazone Group 14, 14). Spartan Charge is not registered for use in New York State. This location received .87" precipitation total in the 10 days after PRE treatments were applied. This provided sufficient rainfall to activate the soil applied preemergence herbicides in the trial.

Weed control ratings taken 35 days after application of the PRE treatments applied May 22 showed good to excellent control of common lambsquarters for all treatments, with the exception of Tricor DF (metribuzin) at 5 oz/A (66.75% control) shown in Table 1. Tricor DF, a Group 5 herbicide, will not provide control of triazine resistant common lambsquarters. At this location, Tricor DF at 10.6 oz/A provided greater than 93% control of the common lambsquarters indicating a non triazine resistant population.

Marestail control ratings taken 35 days after application of the PRE treatments applied May 22 showed Sharpen (Group 14) at 1 oz/A provided excellent control (99.75%) and all of the treatments that included metribuzin (Group 5) showed excellent control (97.5% or greater) see Photo 1. The other Group 14 herbicides, Valor SX and Spartan Charge, applied alone only provided 21.25% and 25% control respectively. *Please note that Spartan Charge is not labeled for the control of marestail but was included in the trial for evaluation.* Both Group 2 herbicides, Classic at 1 oz/A and FirtRate at .75 oz/A only provided 28.75% and 32.5% control of the marestail. This was not surprising, considering the fact that this site had a suspected population of Group 2 resistant marestail. These results are shown in Table 1.

Trivence WDG at 6 oz/A, Boundary 7.8 EC at 2.1 pt/A, Tricor DF at 10.6 oz/A and Valor SX at 2 oz/A tank mixed with Tricor DF at 5 oz/A all provided excellent control of both common lambsquarters and marestail.

A single postemergence application of glyphosate or a tank mix with a Group 2, ALS, herbicide will no longer control multiple resistant marestail; therefore, growers must use an effective soil residual herbicide with the preplant burndown program or apply separately just prior to planting. There are no effective postemergence herbicides to control multiple resistant marestail in glyphosate tolerant (Roundup Ready) or conventional soybeans. If multiple resistant marestail is present or suspected, growers must consider planting Xtend, XtendFlex, Enlist or Liberty Link soybean varieties to allow for effective postemergence control options if necessary.

Table 1.	Rate	% Control[1] 35 DAA[2]	% Control[1] 35 DAA[2]
Herbicides	Amt/A	Common Lambsquarters	Marestail
Classic	1 oz	100a	28.75b
Sharpen	1 oz	82.5ab	99.75a
Sharpen Tricor DF	1 oz 6 oz	88.0ab	98.75a
Trivence WDG	6 oz	99.5a	97.5a
FirstRate	.75 oz	98.0a	32.5b
Boundary 7.8 EC	2.1 pt	94.0ab	100a
Valor SX	2 oz	94.5a	21.25b
Valor SX Tricor DF	2 oz 5 oz	93.25ab	100a
Spartan Charge	8.5 oz	90.0ab	25.0b
Spartan Charge Tricor DF	8.5 oz 5 oz	100a	98.75a
Tricor DF	5 oz	66.75b	100a
Tricor DF	10.6 oz	93.5ab	100a

[1]Visual control rating, means followed by the same letter are not significantly different (p=0.05 Tukey's HSD)
[2]Days After Application treatment evaluation

For More Information:

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Photo 1.

Resistant Marestail Soybean Herbicide Trial in NNY flumioxazin alone applied PRE May 22, 2020

Resistant Marestail Soybean Herbicide Trial in NNY flumioxazin + metribuzin applied PRE May 22, 2020

Understanding the role of carbon in agriculture – Part 1

By Kurt Thelen, Michigan State University, Department of Plant, Soil and Microbial Sciences

Old McDonald had some…carbon?

Wheat straw biomass on the landscape. Photo by Kurt Thelen, MSU.

Just about everyone is familiar with the Old McDonald nursery rhyme. History tells us that the lyrics derive from an old folk song prevalent in the British Isles and North America hundreds of years ago. Flash forward to 2021 and carbon capture and storage is now being touted as a potential new role for old McDonald's farm.

For some time now, the popular press has covered the ongoing debate about climate change. Some articles point to agricultural as a primary contributor to the problem. Currently, the U.S. Environmental Protection Agency (EPA) estimates agriculture and forestry together account for 10.5% of U.S. greenhouse gas emissions (0.7 million metric tons). Transportation and industry are estimated to account for about 60% of emissions (4.0 million metric tons). However, what really sets agriculture apart is its potential to remove carbon dioxide (CO_2) from the atmosphere and sequester it in soil.

Science is now demonstrating that agriculture can be a primary solution to the problem of greenhouse gas emissions and climate change. As a result, farmers are now hearing terms like carbon credits, carbon financing and carbon payments. Why all the buzz now about farms being considered part of the solution to climate change? Conceptually it is quite simple—once you understand the basics of how carbon is cycled in the environment.

The issue of climate change revolves primarily around the main atmospheric form of carbon, CO_2. In fact, CO_2 is the metric, or currency in which changes in atmospheric radiative forcing (i.e., global warming) are measured. What does all this have to do with farming? As it turns out, the most effective way to reduce atmospheric CO_2 levels is through Mother Nature's own process of photosynthesis. A few simple, back of the envelope calculations demonstrate agriculture's ability to assimilate CO_2, which can potentially lead to carbon capture and storage. Let's use corn, the nation's top crop, as an example.

Corn will contain, on a whole plant basis, approximately 43% carbon (C) by weight. Additionally, the amount of C deposited by roots will be approximately 29% of the shoot biomass carbon. Using the above ballpark figures and assuming a typical mid-Michigan corn grain yield of 180 bushels per acre, we can calculate the amount of atmospheric CO_2 corn will potentially assimilate during the growing season to be a whopping 34,679 pounds per acre!

The 2020 national corn growing champion 476-bushel yield, which happened to be grown in Michigan by Don Stall of Charlotte, Michigan, would have assimilated 91,707 pounds per acre CO_2! Of course, this figure represents the total amount of C assimilated in the corn crop, not the amount of C "sequestered" in the soil. Much of the assimilated C is naturally recycled back to the atmosphere when an animal respires CO_2 while metabolizing corn grain in its feed or soil microbes metabolize stover remaining in the field. The key to "sequestering" or successfully capturing and storing some of the assimilated carbon into the soil depends upon the farmer's use of C-smart best management practices including minimal or no-till systems and the use of cover crops.

Carbon dynamics in the soil are complex, but these best management practices help to move and maintain soil C into a more stable form in the soil. Soil C exists primarily in organic form as soil organic matter, which is comprised of forms that decompose at different rates, the most stable of which can persist for thousands of years. With proper management, over time the C level of the soil can be raised to a new equilibrium level.

In Part 2 of this series, we will discuss the challenges of capturing and storing C in agricultural soils, which unfortunately can be a long-term process that under poor management can be easily reversed.

Hopefully you now understand that there's really nothing new about farming's potential to help protect the environment by capturing and storing C in the soil with the adoption of best management practices. The potential has been there since the very first farming took place. And, although they will probably not be adding "carbon" to Old McDonald's lyrics, C sequestration will likely be of value to farms of the future in terms of emerging policy involving C credits, C financing and C payments. E-I-E-I-O.

*This article was published by **Michigan State University Extension**.*
https://www.canr.msu.edu/news/understanding-the-role-of-carbon-in-agriculture-part-1

Podcast from CCE Dairy Educators & PRO-DAIRY, "Troubleshooting Herd Health Issues on Your Dairy"

This podcast is a series about troubleshooting herd health issues on dairy farms. It features PRO-DAIRY and CCE Dairy Specialists who over the course of fourteen episodes will discuss specific areas to look at when experiencing issues in different life stages of the dairy cow. Episodes focus on preweaned calves, transition through weaning, heifer phase, calving pen issues, metabolic disorders of the transition cow, specific fresh cow issues, lactating cow issues from mastitis, issues with reproduction, production, feeding behavior and facilities, hoof health and lameness, and problems during the dry period. Some episodes feature guest speakers and case studies, and was released on November 30th. Look for a new episode each week on the PRO-DAIRY website (https://prodairy.cals.cornell.edu/events/podcasts/) where you can find each episode along with additional resources and speaker contact information. You can also listen via SoundCloud on the CCE Dairy Educators channel, and check back for future podcast series. For more information, contact PRO-DAIRY's Kathy Barrett (kfb3@cornell.edu) or your CCE Regional Dairy Specialist, Betsy Hicks (bjh246@cornell.edu).

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Controlling Summer Annual Grasses in Forages

By Ben Beckman - Extension Educator & Nevin Lawrence - Integrated Weed Management Specialist https://cropwatch.unl.edu/2021/controlling-summer-annual-grasses-forages

The use of trade names or products does not indicate the promotion of products, these are strictly used for educational purposes. Information has been adapted from the 2021 Guide for Weed, Disease, and Insect Management in Nebraska.

Summer annual grasses are tough weeds to deal with, especially in perennial systems like pasture or hay fields. They can take advantage of the smallest opportunity to invade and, once established, are hard to control. Summer annual grasses also have a larger impact at reducing hay quality compared to broadleaf weeds. Proper management requires the right timing and patience.

Species like foxtail, sandbur and crabgrass are annuals that often emerge after perennials, grow fast and quickly set seed. This life cycle can make control difficult. In many circumstances, cultural practices like timing of hay harvest or grazing management may offer the most cost, and control, effective option. If herbicide control is decided upon, there are a few options to choose from.

Alfalfa Only

In Roundup Ready® alfalfa stands, treatment is pretty straight forward, by using an alfalfa approved glyphosate product. Label guidelines do recommend treating before weeds exceed 6" in height. It is important to make applications before the alfalfa canopy begins interfering with spray coverage.

Straight alfalfa stands may use grass selective products like Select® or Poast®. Recommended weed height will vary depending on product, target and rate, so be sure to follow the label recommendations.

Pursuit® and Warrant® may be an option to consider for added broadleaf control. Warrant® is labeled as a pre-emergent option only and will have limited impact on established grasses, while Pursuit® is labeled for both pre- and post-emergent applications. The Pursuit® label does not list sandbur as a controlled species in alfalfa. As with Roundup®, canopy cover can interfere with spray distribution, so applications following harvest are recommended.

Another option may be Gramoxone®. Paraquat herbicides like Gramoxone® are non-selective, burn down products, so any green plant material will be damaged. However, if used immediately following harvest when alfalfa regrowth is limited, you may get control of annual species with a minimal yield reduction.

Alfalfa/Grass Mixes

Prowl H_20® is labeled for alfalfa and both perennial cool and warm-season grass hay. Therefore, Prowl H_20® can be used in mixed, alfalfa/grass hay fields. Prowl H_20® should be applied similar to Warrant®, pre-weed-emergence in established hay fields. Pursuit® can also be used in mixed alfalfa/grass hay fields, but the label warns that significant stunting to the perennial grass can occur. Potentially, stunting of the perennial grass may serve as a further opportunity for weed encroachment or reduce hay tonnage. The use of Pursuit® should be carefully considered in the mixed hay fields.

Timing herbicide applications in alfalfa can be tricky. No product will provide season-long weed control, so it is important to consider the timing of weed germination and haying restrictions before making an herbicide application. All alfalfa herbicides will provide better weed control if applied when both the hay crop and weeds are small. Generally, the best time to apply is after hay harvest, as soon as bales are removed and before significant hay regrowth occurs. Applying herbicides immediately after hay removal also will help meet haying restrictions (Table 1).

Table 1: Alfalfa post application harvest restriction (days) for several herbicide options.

	Alfalfa Herbicides					
	Glyphosate	Prowl H20®	Poast®	Select®	Warrant®	Pursuit®
Harvest Restrictions (days)	5	14	14	15	20	30

If you plan to make an application following alfalfa, cutting, make sure the target weeds are at the appropriate soil temperature. Just like our seeded crops, annual grass weeds need certain sustained soil temperatures to begin germination (Table 2). You can monitor soil temperatures through CropWatch, or by placing a thermometer in your own field.

As with any pre-emergent herbicide, yearlong control may require more than one application. However, a second application may come into conflict with maximum annual application amounts, so be sure to check with the pesticide label before reapplying.

Summer annual grasses in forage crops are not the easiest weed to deal with, but with the right product, a bit of patience and proper timing, it doesn't have to be a problem we can't control.

Table 2: Sustained soil temperatures for summer annual grass germination.

	Species		
	Crabgrass	Foxtail	Sandbur
Soil Temperature (°F)	55°F	60°F	65°F

First Cutting Updates – Coming to a Field Near You!

The SCNY team is planning to monitor alfalfa heights again this spring to help predict quality and %NDF if there are no restrictions for COVID 19 containment. Alfalfa height has been proven to be a reliable indicator of NDF values in the field for alfalfa, alfalfa/grass mixed and all grass stands. The team wants to identify fields that can be measured on a weekly basis. If you have fields that we can come out and measure, please let or Betsy know! Results will be compiled on a weekly basis – to receive weekly email/text updates, please contact us at 607.391.2673/bjh246@cornell.edu with your email address/cell phone number.

The numbers that are indicators for using alfalfa heights for NDF content are as follows:

⇒ 100% grass stands should be cut when nearby alfalfa is 14 inches tall, to achieve 50% NDF

⇒ Begin cutting 50/50 mixed alfalfa/grass stands when nearby alfalfa is 22 inches tall, to achieve 44% NDF

⇒ Begin cutting 100% alfalfa stands when alfalfa is 28 inches tall, to achieve 40% NDF

Predicted days to cut are based on daily NDF increases for grasses of 1.0% point, 50/50 mixed alfalfa/grass stands of 0.8% points, and alfalfa of 0.5% points. Predictions are adjusted for the coming week's weather.

Typically NDF increases about 0.8 to 1.2 per day for grasses, with cooler weather being the lower end of the range and warmer weather being the higher end. For alfalfa, NDF increases about 0.4 to 0.7 per day, also dependent upon warm/cool weather.

The weekly email features a table of the locations in the region where alfalfa heights are measured, including elevation, and target date for harvest. Even if your fields aren't measured, you can use the location and elevation as a guide to conditions that may be similar to your own.

Recruiting Farms for Dairy Farm Business Summary Program

Have you ever thought it would be helpful to have a clearer picture of your business performance? Would you like to compare your dairy business to others in the industry? Do you have decent financial records?

If you said "Yes!" to any of these questions, the Dairy Farm Business Summary could be a great fit for you and your farm. By participating, you will work with a CCE farm business management educator to complete a detailed financial analysis of your farm using 2020 data.

The DFBS is designed to enable producers to:

⇒ analyze their financial situation

⇒ set future goals

⇒ make sound financial decisions

Dairy Farm Business Summary and Analysis (DFBS)*

The DFBS also allows producers to compare their business to an average of other producers.

"The DFBS has enabled our farm to make solid business decisions on expansions and monitoring income and expenses comparing ourselves to other farms in our area, state and country. Without the DFBS, we believe we will lose critical information that keeps us competitive and eventually lead to an unstable food supply in our region and statewide."

-- Operator of 360-cow dairy farm in Albany County, DFBS participant for 20 years.

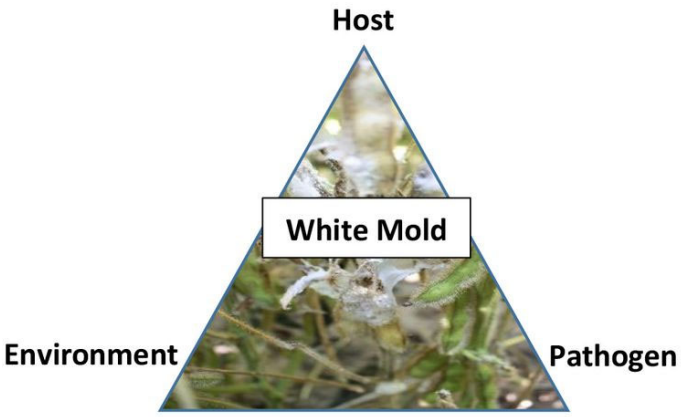
Records submitted by dairy farmers provide the basis for extension education programs for farmers, applied research studies and classroom teaching. Individual farm data are kept strictly **confidential**. Participation in the project is **free of charge** for New York farmers.

Contact Mary Kate MacKenzie at mkw87@cornell.edu to learn more or sign up!

Begin Managing White Mold in Soybeans this Spring

By Michael Staton, Michigan State University Extension, and Martin Chilvers, MSU Department of Plant, Soil and Microbial Sciences

March 24, 2021— White mold can be a damaging disease of Michigan soybeans. Consider implementing management practices this spring in fields prone to white mold.



Soybean producers should use an integrated approach to white mold management, and some of the most effective practices are implemented in the spring. This article discusses these practices and offers specific recommendations. An overarching concept to keep in mind when deciding which practices to implement is to select practices that have been proven to reduce white mold when it occurs but will not reduce yields significantly if environmental conditions don't favor white mold.

When managing white mold, it is helpful to understand principles of the disease triangle. White mold disease only occurs when all three factors come together: a susceptible host, presence of the pathogen and favorable weather conditions. By altering components of the triangle, which are discussed below, we can influence disease development including variety selection, affecting canopy microclimate through planting rate and row width, and even managing sclerotia of the pathogen.

Variety selection

Varieties vary significantly in their susceptibility to white mold and planting the most resistant varieties in fields prone to white mold is a key management practice. All seed company catalogs provide relative white mold ratings for the varieties they offer. These ratings provide valuable information when comparing varieties from a given seed company. However, they are less useful for comparing the level of white mold tolerance between varieties from different companies.

Selecting varieties that resist lodging and have a narrower canopy width can also reduce the incidence and severity of white mold. Planting varieties from a range of maturity groups may help some fields avoid severe white mold infestations by staggering the susceptible flowering period. We saw this in 2014 where the early maturing varieties tended to avoid white mold infection and development.

Planting rate

Reducing planting rates can be an effective tactic for reducing white mold. We saw this in two on-farm planting rate trials conducted in Michigan (Table 1). Reduced planting rates will decrease the potential for lodging and plant-to-plant spread of the disease. Consider reducing planting rates to end up with a harvest stand of 80,000 to 100,000 plants per acre in 30-inch rows when planting into fields having a high potential to develop white mold. There are many factors that determine final plant stands such as soybean germination and emergence that producers need to account for when reducing planting rates.

Table 1. Soybean planting rate effects on yield and income at the two locations infested with white mold.

	Yield (bushels per acre)		Income ($ per acre)	
Planting rate	2015 Sanilac	2018 Saginaw	2015 Sanilac	*2018 Saginaw
80,000	63.2 a	66.2 a	$622	$653
100,000	61.1 b	66.5 a	$591	$648
130,000	61.5 b	64.3 a	$582	$612
160,000	57.9 c	61.2 b	$531	$565
$LSD_{0.10}$	1.7	2.4		

*Using 2020 figures for seed cost ($62/140,000 seed unit) and market price ($10.40 per bushel).

(Begin Managing White Mold — Continued from page 10)

Emerson Nafziger and Dennis Bowman at the University of Illinois developed an excellent soybean planting rate calculator. The calculator allows users to fine-tune planting rates by entering the final stand they want to achieve and adjusting germination and emergence percentages for seed quality and planting conditions.

Row spacing

Wide rows greater than 20 inches can decrease white mold but may not always lead to a yield increase. On-farm trials conducted in Michigan have shown that 30-inch rows reduce soybean yields by approximately 2 bushels per acre when compared to 15-inch rows.

Nutrient management

Applications of nitrogen fertilizers or manure have been shown to increase early plant growth and canopy closure, creating favorable conditions for the development of white mold. Therefore, nitrogen fertilizer and manure applications should be avoided in fields having a history of white mold. Nitrogen fertilizer applications to soybeans are rarely profitable, making this the easiest practice to implement.

Cover crops

Using small grain cover crops like oat, wheat or cereal rye grown with soybean can stimulate sclerotia germination, apothecia emergence and spore release before soybean blossoms appear. This can potentially lower white mold incidence and protect yield. Crimping and rolling a cereal rye cover crop has also been shown to reduce white mold incidence. Cover crops will alter the environment, so manage them carefully.

Biological control

Producers may also consider applying a biological control product such as Contans to fields having a history of severe white mold. This product contains *Coniothyrium minitans*, a naturally occurring fungus that attacks and degrades sclerotia in the soil. The product should be incorporated into the soil as uniformly as possible to a depth of 2 inches at least three months prior to initial soybean bloom.

It is important to note that Contans will attack and degrade the sclerotia only when in contact with white mold sclerotia. Tillage operations deeper than 2 inches deep should be avoided following an application of Contans to prevent redistributing viable sclerotia into the top 2 inches where they can germinate and infect your soybean crop.

Remember, the most effective white mold strategies incorporate a variety of tactics and many of the most effective tactics are implemented prior to or at planting.

White mold sclerotia (left) and white mold apothecia (right). Photos by Mike Staton, MSU Extension.

This article was produced by Michigan State University Extension and the Michigan Soybean Committee. It was originally published in the Spring 2021 issue of the Michigan Soybean News.

This article was published by Michigan State University Extension. For more information, visit https://extension.msu.edu. , or call (888-678-3464).

Automation and Robotics in Production Agriculture

By Michael Langemeier & Michael Boehlje; Center for Commercial Agriculture, Purdue University *Reprinted from: https://farmdocdaily.illinois.edu/2021/04/automation-and-robotics-in-production-agriculture.html*

April 9, 2021— **Trends in Automation and Robotics**

Before discussing the expected adoption of automation and robotics in production agriculture, we will discuss trends in automation technologies that are important to most, if not all, industries. Willcocks (2020) discusses the importance of three primary automation technology types: physical robots, robotic process automation, and cognitive automation. Physical robots will perform industrial tasks that were previously more labor intensive. Robotic process automation uses software to automate tasks that were previously performed by humans. Cognitive automation uses sophisticated software to automate tasks or improve task precision. Machine learning, visual processing of data, and the use of large data sets to improve decisions are components of cognitive automation.

Turning to the adoption of these technologies, Chui et al. (2016) note that automation will not necessarily eliminate entire occupations. However, automation is likely to affect portions of almost all jobs. The authors identify three groups of occupational activities: 1) those that are highly susceptible to automation, 2) less susceptible to automation, and 3) least susceptible to automation. Least susceptible tasks include personnel management and decision-making, planning, and creative tasks. Less susceptible tasks include stakeholder interactions and unpredictable physical work. Examples of unpredictable physical work provided by the authors included construction, forestry, and raising animals. Highly susceptible tasks include data processing and predictable physical work. Examples of predictable physical work provided by the authors included welding and soldering on an assembly line, food preparation, and packaging.

It is important to note that a portion of most industries have data processing and predictable physical work activities that are susceptible to automation. Chui et al. (2016) estimated that approximately 20 percent of the time spent in U.S. workplaces involved performing physical activities or operating machinery in a predictable environment. The authors listed the service sector, manufacturing, and the retail sector as the most susceptible to automation. Activities and sectors classified in the middle range for automation included financial services and insurance, construction, and agriculture. As the authors noted, unpredictable physical work conducted in unpredictable environments, which is prevalent in agriculture and construction, make it more challenging, but not impossible, to automate tasks.

The most difficult activities to automate are those that involve managing and supervising people, and activities that apply expertise to decision-making, planning, and creative work. Computers do a good job with well-defined tasks. However, as noted by both Chui et al. (2016) and Willcocks (2020), it is difficult to codify and improve machine learning techniques to mimic human skills and capabilities such as leadership, creativity, intuition, judgement, tacit knowing, social interaction, peer judgement, motivation, and many other tasks. In particular, tacit knowing or the fact that humans know more than they can describe is problematic to automation (Polanyi, 2009). Obviously, tacit knowledge makes it difficult to write code for machine learning.

Examples from Production Agriculture

Rather than provide a comprehensive list of automation technologies that are either being developed or that are already being used, we will briefly describe some noteworthy examples. Autonomous grain carts and tractors have garnered considerable press. Autonomous grain carts enable an individual in the combine to locate the cart, tell the cart to follow and match the speed of the combine, and unload on the go. Autonomous tractors use GPS and other wireless technologies to farm land without requiring a driver. These tractors are programmed to observe their position, determine speed, and avoid obstacles.

Another technology with a lot of promise in production agriculture, particularly for sensing and monitoring, is drones. Erickson and Lowenberg-DeBoer (2020) indicate that the adoption rate by retailers of drones reached 42% in 2020. Moreover, 46% of the retailers indicated that they currently offer drone imagery. This percentage is expected to increase 19% in the next three years. Drones are used for crop or livestock monitoring; to plan and make land improvements; to make seed, fertilizer, and pesticide prescriptions; to help with replanting decisions; and to make grazing decisions. As technology continues to improve, farms will able to use drones to enhance crop and animal health, and to enhance the ability to assess the impact of seed, fertilizer, and pesticide applications. Also, drones will enhance a farm's ability to assess the impact of adopting specific practices such as reduced tillage, the use of cover crops, or rotational grazing.

The *Hands Free Hectare* project associated with Harper Adams University in the UK uses automated machines to grow crops remotely without drivers or agronomists in the field. The project utilizes autonomous navigation systems to plant, grow, and harvest an annual cereal crop. Individuals are not allowed to step on the field so drones are used to take soil and crop samples, and to monitor the growing crop. Cost analysis on robotics by Lowenberg-DeBoer et al. (2019) based on data from this project suggests that automation has the potential of reducing the costs for smaller acreage farms more than larger acreage farms, thus reducing, but not entirely eliminating, economies of size in crop farming.

3-D printing could also contribute significantly to production agriculture. 3-D printers will allow machinery dealers and producers to manufacture spare parts on-site. This technology will likely change how we think about manufacturing batch size and inventories, and will allow parts to be produced on site and just-in-time, which could substantially reduce machine downtime. During peak work-loads (e.g., planting and harvesting seasons), this reduction in downtime would be extremely valuable.

(Continued on page 15)

Still Taking Surveys of Dairy x Beef Use on Dairies in New York

Are you a dairy producer in New York State? The usage of beef on dairy genetics has steadily grown over the last few years, and we are working towards understanding the trends and markets of this strategy. Has your farm used beef sires as a part of your breeding strategy?

Even if you have not used beef sires in your dairy herd, you are encouraged to take the following survey to fully quantify the usage of beef sires. If you have not used beef sires, the survey should only take a minute to complete. We ask you to take this survey, put together by CCE Regional Dairy Specialists. This survey can be accessed using the QR code below, or at the following link: https://cornell.ca1.qualtrics.com/jfe/form/SV_4HHU14xa0XN4xg1

The survey should take approximately 15 minutes to complete. You can start it now and access it again later for completion, if needed. Your participation in this survey will help CCE to compile data on usage of beef sires on dairy farms in New York State Assemble common practices & gather financial parameters for marketing dairy x beef calves in New York State and provide information on the current dairy x beef market.

The survey will be open for several months, starting mid-October. For questions, please contact Betsy Hicks (bjh246@cornell.edu), Regional Dairy Specialists with Cornell Cooperative Extension.

We sincerely appreciate your participation and we look forward to sharing our results with the dairy industry!

Just in case you missed it, check out our recordings on…

Critical Calf Care

YouTube Playlist & Box Files:

https://www.youtube.com/playlist?list=PLPeiM7kIdN2oLNe_4VcIxZrB_ZJZOrxTC

https://cornell.app.box.com/v/criticalcalfcare

Not to worry, we have you covered! All of the sessions have been recorded and resources are available for you to download. Topics covered included recognizing and diagnosing disease, dystocia and difficult calvings, record keeping and the economics of disease, hydration and electrolytes, scours and nutrition, emergency situations, and an expert panel. Focusing on calf care and these areas will promote the success of your herd. For more information on calf care or the series, reach out to Betsy Hicks, Dairy Management Specialist at bjh246@cornell.edu.

Avoiding Injury from Seed Corn Maggot

By Robert Wright - Extension Entomologist, Thomas Hunt - Extension Entomologist, Justin McMechan - Crop Protection and Cropping Systems Specialist

In the past few years, we have received several reports of injury from seed corn maggot that has reduced stands of Nebraska soybeans. The greatest risk for seed corn maggot injury is when a green manure or animal manure is incorporated just before planting. The female flies are attracted to lay eggs on sites with decaying organic matter. The seed corn maggot will also feed on germinating crop seeds and can reduce seedling vigor and, if abundant enough, reduce plant stands. In many cases this year, recently killed cover crops may have attracted seed corn maggot to lay eggs in the affected fields.

The following University of Minnesota recommendations can help minimize injury from seed corn maggots.

Cultural Control

- Delay planting until soil temperatures promote rapid seed germination.
- Avoid planting for at least two weeks after fresh organic materials have been incorporated into soil.
- Degree-day models can guide decisions about adjusting planting date to avoid periods with high larval abundance. Seed corn maggot development is estimated using a base temperature of 39°F (3.9°C) for the degree-day calculation.
- Avoid planting during peak fly emergence. For the first three generations this occurs when 354, 1,080 and 1,800-degree days have accumulated, respectively since Jan. 1.
- Use of a labeled insecticidal seed treatment on corn or soybeans should provide adequate protection against seed corn maggot, **except when there are high densities of these insects**. Growers not using insecticidal seed treatments can modify their planting dates to minimize injury from these insects by monitoring growing degree days.

Source: https://cropwatch.unl.edu/2021/avoiding-injury-seed-corn-maggot

Pasture Soil Compaction: A Slow but Stealthy Thief of Pasture Productivity *By A. Fay Benson – Cornell Cooperative Ext. - SCNY Dairy Team*

I had a pasture soil compaction epiphany while working in a St. Lawrence County pasture on a NE SARE supported project. The project was to plant radishes and other brassicas into established pasture swards. The goal was to try methods of establishment of late season forages which would increase the palatability and nutrient density of fall pastures. The project had only minimal success because even though I burned back the pasture sward with acetic acid, it eventually grew back and smothered the young brassicas. While standing in the pasture, I looked under the fence line (see photo 1) and could see the soil under the fence was a good six inches higher than the pasture soil. Under closer inspection, the plants under the fence were a healthier mix of cool season grasses, while out in the pasture there were clumps of sedge grasses, which is an indication of low oxygen in the soil due to compaction. The other interesting piece of information was that I was in the pasture with the farmer who had managed it for the past 15 years and he had not noticed the difference in soil heights. I believe that this was because compaction happens very slowly over the years and goes unnoticed. Once I became aware of this phenomenon, I began to see it in more and more pastures that I visited. But how big of a problem was it?

Photo 1

It made sense to me that pastures would have some compaction, after all, animals that graze these pastures are out every day in the grazing season, even in times of heavy rainfall which is when soil is most prone to hoof compaction. When putting together a proposal to NE SARE to investigate pasture compaction, I found studies that showed a medium-sized cow could have more compaction per square inch than a medium sized tractor. To get an idea of what happens to soil when compacted, see diagram 1 showing the pie charts comparing compacted soil vs uncompacted soil. In the uncompacted soil, the area in a defined volume of soil is evenly divided between pore space, and the minerals that make up the soil. In a compacted soil, the pore space is reduced by about half so that there is a higher percentage of minerals in the same space. This loss of pore space has far reaching effects on the soil to be productive.

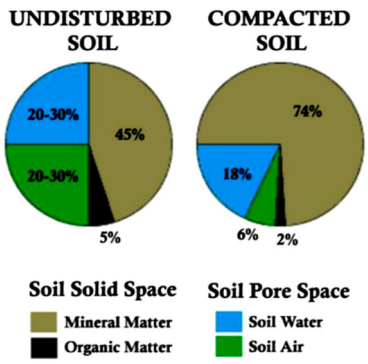


Diagram #1
Soil Pore Space Affect Soil Biology's Ability to be Productive.

Loss of Pore Space Reduces Pasture Productivity

Air space is the most effected by compaction. Its loss affects three components of productivity:

1. The beneficial biology in soil is aerobic, therefore it needs oxygen to breath, as well as space to exhale carbon dioxide. The biology is responsible for breaking down organic matter and converting it to microbial metabolites which enter roots to feed pasture plants.
2. Lack of air space in soil limits deep-rooted pasture plants and encourages plants, such as sedge grasses, which survive in soil with low levels of oxygen by using an air tube. This is part of its anatomy that brings air from above ground to its roots below ground. I saw this firsthand at the pasture in St. Lawrence County, as well as others.
3. Limiting the environment for biology to do its work, reduces the strength of soil aggregates, which speeds up compaction.

The reduction of pore space for water in the soil also has negative impacts on productivity:

1. Reduction of the water holding capacity of the soil will decrease sward growth in times of drought.
2. If there is less water in soil aggregates in the spring, the compaction relieving action of "frost heaving" will be reduced since there is less ice to expand in the aggregates.
3. Water infiltration will be reduced to lower portions of the soil since pathways will be impeded to handle rainfall. This, in turn, causes ponding on the surface which only exacerbates the issue of compaction. If the pasture is located on a hillside, the ponding turns into the runoff of nutrients.
4. Pathways for water infiltration is also impacted by "Platy" structures forming in the upper layers of soil. (see photo 2) The plates are formed by hoof compaction in upper levels of the soil. The plates can be seen by digging a shallow test pit and looking for horizontal lines in the soil which can be separated easily by a knife or by hand. In severely impacted soil, roots can be seen growing horizontally, rather than vertically, along the plates. The forming of plates in pasture soil impacts roots to lower levels as well as water infiltration.

Photo 2

Other outcomes of the NE SARE study of pasture soil compaction

A fact sheet prepared by myself, along with Nancy Glazier and Abbie Teeter was accepted by NE SARE to help farmers not only identify, but remediate pasture soil compaction. It can be found at: https://cdn.sare.org/wp-content/uploads/20210126132426/Compaction-Fact-Sheet-Final-1.pdf

In our work, we are researching a method for comparing penetrometer readings from one year to the next. This would allow

(Continued on page 15)

(Pasture Soil Compaction: Continued from page 14)

a farmer or researcher to measure any changes in pasture soil compaction due to changes in management from one year to the next. A single reading of soil resistance with a penetrometer will vary from one day to the next due to soil moisture changes. Our hypothesis is that by taking two readings in the pasture, one from the optimum compaction area under the fence line and one from an impacted area in the pasture, the ratio of the two will remain constant since whatever variable impacts one area will have the same impact on the other area. We are calling the comparison of these two sites the Pasture Compaction Ratio (PCR). The ratio of the two areas will hopefully capture any changes in the pasture compaction since the fence line reading will always be optimum the only changes will be due to changes in the pasture soil resistance. More information about the PCR can be found here: https://projects.sare.org/sare_project/lne19-372/. Our work will continue into 2021, when we will have three years of data collected on the PCR.

Compaction in pastures is difficult to avoid because of the need to have animals on them in all types of weather. Basic management tools to reduce and prevent compaction are:

1. Keep your soil organic matter high because it is related to aggregate strength which allows a soil to be much more resilient when it comes to compaction. This can be done by grazing more mature grasses and following the "graze half and leave half" rule. This puts the carbon back into the soil.

2. In times of heavy rain try to stay off pasture soil that is prone to compaction, such as silty soils or fields prone to flooding.

3. Switch from grazing to haying on paddocks that allow it. Haying a paddock allows deeper roots to increase the oxygenated zones of your soil.

Watching the health of animals on pasture is enjoyable and easy to do, observing the health of pasture plants or the sward of a pasture requires a closer look and some specific knowledge about plant identification. To observe the health of any soil, including pasture soil, is an evolving field of knowledge. Graziers can add to this knowledge by observing and bringing their observations to extension and research personnel. After all, as Paul Harvey said, "Despite all our accomplishments, we owe our existence to a six-inch layer of topsoil and the fact it rains."

[i] https://onlinelibrary.wiley.com/doi/10.1046/j.1365-040.2003.00846.xb

(Automation and Robotics in Production Agriculture—Continued from page 12)

A good example of the use of automation in the livestock industry is the spread of robotic milkers. This technology has been adopted for a number of reasons including labor cost savings, lack of availability of labor to milk cows, and to improve milk production per cow. Robotic milkers adapt milking frequency to individual cows and by lactation stage. Also, just as precision agriculture adoption for crops results in more timely data collection and improved decision making, a robotic milking system creates a wealth of data that can be used to make decisions (e.g., optimal dairy cow replacement). Use of cameras and heat sensors to monitor movements and temperatures to detect lameness and animal behavior, including feed consumption and waste, and possibly diseases and health issues, are other examples.

Concluding Comments

This article discussed trends in automation and robotics in the general economy, and provided examples of using these technologies in production agriculture. Possible benefits of the adoption of automation and robotics will include reductions in costs, improvements in productivity, increases in the production of value-added products, reduced downtime and improved capacity utilization, and reductions in operating risk. Due to synergies associated with the adoption of multiple technologies, the economic evaluation of automation and robotics will require a whole-farm system approach rather than employing a partial budgeting approach, which just examines the adoption of one specific technology at a time. Many of the technologies that are currently being developed for other industries can or will be readily adopted in production agriculture. As technology continues to develop, robotics and machine learning will at least partially replace physical activities. However, it is important to note that additional expertise and skills will be needed to implement these new technologies. An upcoming article will describe the gap in skills related to the further adoption of automation and robotics, as well as other precision agriculture technologies, in production agriculture.

To view article references, please click this link.
https://farmdocdaily.illinois.edu/2021/04/automation-and-robotics-in-production-agriculture.html

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Upcoming Events

May 1, 2021 **1:30—3 pm**	**Fencing Workshop for Part Time Farmers** Triple 3 Livestock Farm, 955 Parker St. Marathon Register here https://reg.cce.cornell.edu/FencingPastureWalk_211 or 607-391-2664
May 12, 2021 **1—2 pm**	**Managing and Abating Heat Stress on your Dairy in 2021** Understanding recent research on heat stress and what it means for your dairy herd Zoom Registration: www.tinyurl.com/HeatStress21