Agriculture OUTLOOK

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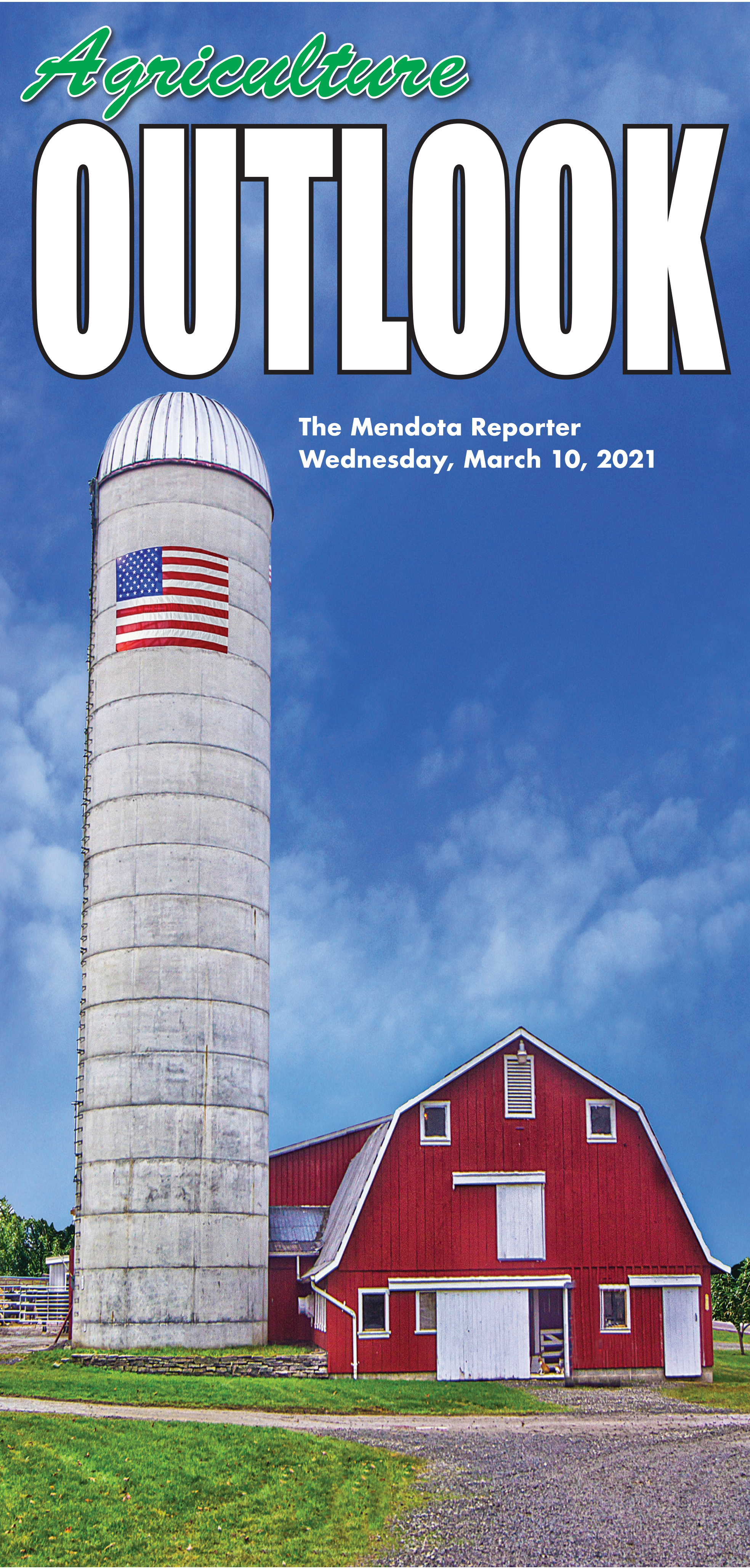

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Variable weather makes weeds harder to whack

By LAUREN QUINN
ACES

Researchers recommend the use of pre-emergence herbicides in combination, and urge farmers to be strategic in timing their application when rain is in the forecast.

URBANA – From flooded spring fields to summer hailstorms and drought, farmers are well aware the weather is changing. It often means spring planting can't happen on time or has to happen twice to make up for catastrophic losses of young seedlings.

According to a joint study between University of Illinois and USDA-ARS, it also means common pre-emergence herbicides are less effective. With less weed control at the beginning of the season, farmers are forced to rely more heavily on post-emergence herbicides or risk yield loss.

"We're having more variable precipitation, including conditions where folks aren't able to plant because fields are too wet. In those cases, pre-emergence herbicide applications are getting pushed back into a period that is consistently drier," says Marty Williams, USDA-ARS ecologist, affiliate professor in the Department of Crop Sciences at Illinois, and corresponding author on the study.

Drier weather may be better for getting equipment onto the field for planting, but it's a problem for pre-emergence herbicides. Using data spanning 25 years and 252 unique weather environments, Williams and his team found most pre-emergence herbicides needed 5 to 15 centimeters of rain within 15 days of application. If that didn't happen, weed control rates plummeted.

"We already knew some rain after application was critical for the herbicide to move into the soil, but we didn't know how much or when," Williams says. "As we look to the future, having more variable rainfall and potentially increasing the frequency of falling below a critical rainfall threshold is problematic."

Christopher Landau, a doctoral candidate on the project, leveraged the university's long-running herbicide evaluation program, for which digital data are available across multiple Illinois locations from 1992 forward. He evaluated the effects of four common pre-emergence herbicides (atrazine, acetochlor, S-metolachlor, and mesotrione) alone and in combination, on three economically important weed species: common lambsquarters, giant foxtail, and waterhemp. He also extracted rainfall and soil temperature data.

The analyses clearly showed the overall need for rain after application, but the pre-emergence herbicides varied in their requirements for rainfall within that 15-day post-application window. For example, S-metolachlor required 10 to 15 centimeters of rainfall to maximize waterhemp control, whereas acetochlor only needed 5 centimeters to control the same weed.

Results also indicated herbicide combinations helped to minimize the amount of rainfall required for successful control. Continuing the example, when atrazine was added to S-metolachlor, the combination needed only 5 centimeters to achieve the same level of control.

"Herbicide combinations often provide additional benefits to weed control programs, including more consistent weed control. The continual evolution of herbicide resistance in species such as waterhemp requires more integrated control measures, and herbicide combinations can be one component of integrated systems designed to minimize weed seed production," says Aaron Hager, study co-author and associate professor and faculty Extension specialist in crop sciences at Illinois.

When the researchers considered the effect of soil temperature alone on herbicide efficacy, they didn't find a consistent pattern. But temperature was clearly important in low-rainfall scenarios.

"When rainfall was 10 centimeters or more within 15 days, the probability of successful weed control with most treatments was maximized under all soil temperatures. However, when rainfall was below 10 centimeters, higher soil temperatures either increased or decreased the probability of successful weed control, depending on the herbicide or herbicide combination. Ultimately, future temperatures in rainfall-limited conditions are likely to exacerbate variability in herbicide efficacy," Williams says.

The researchers note their findings may be especially important in the western Corn Belt, where erratic weather and low rainfall probabilities are even more common than in Illinois. But they still recommend the use of pre-emergence herbicides in combination, and urge farmers to be strategic in timing their application when rain is in the forecast.

"The development and adoption of more integrated weed management strategies that utilize pre-emergence herbicides, in combination with additional cultural, mechanical, biological, and postemergence chemical control options, are needed as U.S. corn production prepares to adapt to a changing climate," Landau says.

The article, "Future efficacy of preemergence herbicides in corn (Zea mays) is threatened by more variable weather," is published in Pest Management Science [DOI: 10.1002/ps.6309]. Authors include Christopher Landau, Aaron Hager, Patrick Tranel, Adam Davis, Nicolas Martin, and Marty Williams. The research was funded by the USDA-Agricultural Research Service.

(The Department of Crop Sciences is in the College of Agricultural, Consumer and Environmental Sciences at the University of Illinois at Urbana-Champaign.)

FFAR grant to research soil health through phosphorus management

WASHINGTON, D.C. – Phosphorus, a nutrient commonly found in manure and commercial fertilizers, is essential to plant growth. Despite phosphorus' importance, there are relatively few studies examining the effect of soil health practices like cover cropping has on phosphorus availability. The Foundation for Food & Agriculture Research (FFAR) awarded Kansas State University a $490,541 Seeding Solutions grant to optimize phosphorus management strategies in cover crop systems, preventing costly overuse of fertilizer. The Kansas Soybean Commission, Kansas Department of Agriculture and Kansas Fertilizer Research Fund are providing $500,000 in matching funds for a $990,541 total investment.

To maximize crop production, farmers monitor the level of phosphorus in the soil to ensure plants are absorbing enough phosphorus. Most farmers use a phosphorus management strategy known as "feed the soil," which involves using more fertilizer at regular intervals to bolster phosphorus levels in the soil. This method maintains high soil fertility to ensure maximum yield but can increase production expenses and pose environmental concerns. If too much phosphorus is applied, rain or irrigation may wash it to nearby water bodies, causing contamination.

> ***"Understanding the impacts of soil health on P availability and cycling is key to identifying the fertilization strategies that will maintain soil productivity and protect water quality."***
> –Nathan Nelson, project director

Overapplication of fertilizer may mask the benefits that healthy soil practices have on phosphorus cycling, the way phosphorus moves through soil and sediment. Phosphorus plays a crucial role in cell development and is a key component of molecules like DNA. When there is insufficient phosphorus in the soil, that can result in a decreased crop yield. However, soil health-promoting practices like using cover crops, non-harvested crops which help preserve the soil, could increase organic soil phosphorus quantities and cycling in soil, eliminating the need for excessive fertilizer application.

Kansas State University researchers are filling research gaps by studying how to cover crops and phosphorous management strategies interact to influence soil health. Over a five-year span, the research team is studying six soil treatments to determine the effect of cover crop planting and optimal timing and placement of fertilizer on soil health and water quality. By identifying mechanisms that affect phosphorus availability and cycling, Kansas State researchers are developing bold management strategies that enhance soil health, reduce environmental impacts and bolster farmer profitability.

"Understanding the impacts of soil health on P availability and cycling is key to identifying the fertilization strategies that will maintain soil productivity and protect water quality," said Nathan Nelson, project director and Professor in the Kansas State University Department of Agronomy. "Our research will investigate the interactions between crop management, soil microbial communities, and phosphorus cycling. Information from our research will help farmers manage phosphorus fertilizer and protect water quality while also building soil health."

This grant is funded through FFAR's Seeding Solutions, a competitive grant program that supports research to solve urgent issues.

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IDOA, State Fire Marshal remind farmers to stay safe while working in grain bins

SPRINGFIELD – The Illinois Department of Agriculture (IDOA), along with the State Fire Marshal want Illinois farmers to set aside time to recognize grain bin safety.

Based on Purdue University's 2019 Summary of U.S. Agricultural Confined Space-Related Injuries and Fatalities report, the U.S. had a five-year average of 58 agricultural confined space related injury and fatality (ACSRIF) cases documented. In 2019, there were 67 (38 of 67 were grain entrapments) U.S. ACSRIF cases documented as opposed to 61 (30 of 61 were grain entrapments) in 2018. Illinois contributed four ACSRIF documented cases in 2019 and five cases in 2018.

"It's easy to become complacent when workers have been in and out of bins for years and never had any problems," said IDOA Acting Director, Jerry Costello II. "People often think they are big enough, strong enough, or fast enough to get out of flowing grain. Unfortunately, problems can snowball quickly. That's why it's important to set aside time to go over safety measures, to prepare farmers for a potential grain bin emergency."

"Fire departments and districts continue to train so that in the event they must respond to a grain emergency they are ready to aid and assist," said State Fire Marshal Matt Perez. "It's important that there are always at least two people working around a grain bin so in case of an emergency a call for assistance can be made quickly. Don't take any unnecessary risks, always think safety first."

Farm workers should attend required safety training as a reminder to utilize the best practices while working in and around grain bins. In addition to required training there are several online training resources available:

• The Grain and Feed Association of Illinois at: www.gfai.org

• The Grain Handling and Safety Council at: www.grainsafety.org

• University of Illinois Extension at: https://web.extension.illinois.edu/agsafety/equipment/grainbinsafety.cfm

Grain Bin Safety Precautions

Whenever possible, don't enter a grain bin. If you must enter the bin, as a farm owner/operator you should:

• Break up crusted grain from the outside of the bin with a long pole. When using a pole, check to see that it doesn't come into contact with electric lines.

• Wear a harness attached to a properly secured rope.

• Stay near the outer wall of the bin and keep walking if the grain should start to flow. Get to the bin ladder or safety rope as quickly as possible.

• Have another person, preferably two people, outside the bin who can help if you become entrapped. These people should be trained in rescue procedures and should know and follow safety procedures for entering the confined space.

• Grain fines and dust may cause difficulty in breathing. Anyone working in a grain bin, especially for the purpose of cleaning the bin, should wear an appropriate dust filter or filter respirator.

• Stay out of grain bins, wagons and grain trucks when unloading equipment is running.

• If it is necessary to enter the bin, remember to shut off the power to augers and fans. It is a good idea to lock out any unloading equipment before you enter a bin to prevent someone from unintentionally starting the equipment while you are in the bin.

• Children should not be allowed to play in or around grain bins, wagons or truck beds.

• Where possible, ladders should be installed inside grain bins for an emergency exit. Ladders are easier to locate inside a dusty bin if there are brightly painted stripes just above or behind the ladder.

• Grain wagons can be a hazard, particularly to youngsters. The grain in a grain wagon acts just like the grain in a bin when moving. It pulls down on whatever might be in the grain and children are not strong enough to pull themselves out of the moving grain.

Ag, trucking industries say Pritzker's proposed tax on biofuel will hurt farmers

(The Center Square) – Some are taking issue with Governor J.B. Pritzker's Fiscal Year 2022 budget proposal, which would bring an end to the sales tax exemption for biodiesel fuel in Illinois.

Pritzker said accelerating the expiration of the sales tax exemption for biodiesel will increase the state general funds revenues by an estimated $107 million dollars.

The Illinois Soybean Growers Association is not happy about it. Chairman Doug Schroeder said Illinois uses 180 million gallons of biodiesel each year, which generates $600 million to Illinois family farms annually.

"To get the tax credit, you have to have 11% bio in the mix or more, and if that tax credit goes away, it will be a little cheaper to run straight diesel, so that is going to be a problem," said Schroeder.

The ISG is also speaking out in support of HB299, a bill introduced in the Illinois legislature in January that aims to create a state renewable fuels standard. The legislation would require a B5 blend from July 1, 2021 through July 1, 2024 when the requirement would increase to B20.

"If we go to B20, it would almost double the current numbers and would be a bigger win for us yet," said Schroeder.

Eliminating the sales tax exemption on biodiesel would add an estimated 20 cents per gallon to the price of diesel fuel. Josh Sharp, CEO of the Illinois Fuel and Retail Association said the state is already at a disadvantage when it comes to prices at the pump.

"Illinois is one of only six states that imposes a sales tax on all motor fuels, so that already makes us very uncompetitive when it comes to the motor fuel market," said Sharp.

Sharp feels ending this incentive would be damaging to the agriculture community in Illinois and hurt small business members at a time when it's so easy for customers to drive across the state to fill up their vehicles.

"It keeps us competitive in price with our surrounding states, but if that goes away, all of a sudden all of that truck traffic that comes through the state is going to be looking at other states to stop and fill up in," said Sharp.

ICGA announces legislative priorities for upcoming year

BLOOMINGTON – Farmers remain optimistic that they will accomplish their top priorities in 2021. They look forward to seeing a new lock and dam start on the Illinois or Mississippi River, a low carbon, high octane fuel standard like the Next Generation Fuels Act approved by Congress, and promoting awareness to our elected officials that conservation practices are being implemented by farmers in Illinois.

All three of these priorities offer significant progress toward addressing climate change.

New Lock and Dam Start on the Illinois or Mississippi River

Barges have the smallest carbon footprint among freight transportation modes. Moving an identical amount of cargo by rail generates 30% more carbon emissions, while trucks generate 1,000% more emissions. Upgrading our locks and dams to allow for even more efficient barge transportation will result in more industries choosing to ship their products by barge and will lessen the greenhouse gases produced.

Transporting goods via our river system is a tremendous advantage that empowers Illinois to export almost half of its corn crop out of the state and compete globally. Improving our lock and dam system will help our entire state's economy benefit even more.

Low Carbon, High Octane Fuel Standard Enacted

Corn farmers have always been invested in helping Americans fill up with a clean burning, earth friendly fuel. Now the opportunity to increase ethanol usage remains even more important. The technology is there to reduce greenhouse gases immediately by using ethanol in vehicles and are hoping to see legislation passed that encourages the transition to even higher blends of fuel. This legislative priority will be realized when the Next Generation Fuels Act or a similar bill is enacted by Congress.

Promoting Awareness to Elected Officials that Farmers are Implementing Conservation on their Farms in Illinois

Finally, farmers know that our fertile soils can store 2-3 times as much carbon as the air in our atmosphere and can sink this carbon for generations to come. Also, NASA data shows that the Midwest's growing crops have more photosynthetic activity than anywhere else on earth.

Being able to store carbon in our soils makes conservation practices like no-till very important. When farmers do not till the earth, they do not release the carbon stored into the soil back into the atmosphere. Coupled with the photosynthetic activity during the growing season, farmers have a unique opportunity to offset carbon increases that other industries do not.

Farmers understand planting cover crops and other conservation practices are a financial investment, which may deter those who want to try them out. A separate Illinois initiative, with key support from the Illinois Corn Growers Association, created a $5 discount on crop insurance for every acre of cover crop planted and saw huge demand well beyond the program's allocated acreage amount.

Between improvements on the lock and dam systems, expanding ethanol usage and demonstrating conservation practices, ICGA and the corn farmers represented are interested in being a part of the climate solution for our country.

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Biodiesel is a direct alternative to petroleum-based diesel and is cleaner burning with up to 80 percent lower carbon emissions per gallon.

Illinois Soybean Growers urges continued commitment to biodiesel & Illinois air quality

BLOOMINGTON – Illinois farmers grow sustainable and high-quality soybeans that provide feed, fuel and food for Illinois and the world. As part of the sustainable cycle of soybean production, a major byproduct is soy-based biodiesel. Biodiesel is a direct alternative to petroleum-based diesel and is cleaner burning with up to 80 percent lower carbon emissions per gallon.

Illinois uses 180 million gallons of biodiesel each year, returning an estimated value of $600 million to Illinois' family farms annually. Since 2003, Illinois has been using B11 and higher biodiesel blends, supported by the exemption of those fuels from state sales tax. This policy for a homegrown Illinois product has made our state a national leader in using cleaner burning fuels and improving air quality.

Recently, Governor Pritzker proposed the elimination of the sales tax exemption that has resulted in enhanced biodiesel utilization and cleaner air. Illinois Soybean Growers (ISG) is committed to clean fuel and supports HB229, which continues Illinois' leadership in reducing dependence on fossil fuels and instituting the statewide use of B20 and higher blends. ISG commits to continued discussion with Governor Pritzker and cleaner fuel advocates to reconcile the proposals in a way that enhances the use of biodiesel in Illinois for improved air quality outcomes.

ISG Chairman, Doug Schroeder, a soybean farmer from Mahomet, released the following statement: "As a farmer who understands that there are markets around the world for my crop, I am always reminded of the value that biodiesel has right here at home. Biodiesel adds value to my farm, my community, and my state. This last year and COVID-19 have put extra attention on air quality for all Illinoisans. Sustaining our use of B11 at a minimum and moving to B20 and higher biodiesel blends helps in promoting an Illinois product, all while reducing our dependence on fossil fuels. I look forward to continuing the conversation, and working with all partners to use more biodiesel to improve our economy and public health."

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Illinois Soybean Growers (ISG) is a membership organization serving more than 43,000 Illinois soybean producers. As part of ISA's mission to uphold the interests of Illinois soybean producers through promotion, advocacy, and education, ISG advances the government relations interests of Illinois soybean farmers at the local, state, and national level. Voice for Soy, the ISG legislative action network, allows producers to easily connect with legislators and regulators to advocate for Illinois agriculture. For more information, visit www.ilsoygrowers.com or www.voiceforsoy.org.

Illinois 4-H staff evaluate the options for summer exhibitions

URBANA – In 2020, more than 400 Illinois 4-H competitive events, exhibitions, and shows went virtual, providing a positive youth development experience while protecting its members, volunteers, and staff. While the 2021 4-H exhibition season will be shaped by the ongoing impact of the coronavirus pandemic, Illinois 4-H is working hard to find solutions that balance the safety of our communities with the benefits our youth gain from participating in face-to-face judging experiences.

For summer 2021, Illinois 4-H is exploring strategies that support a safe return to in-person 4-H exhibitions. As the youth development program of University of Illinois Extension, its events must abide by the guidelines of both campus and the Illinois Department of Public Health. As it evaluates options and applies innovative thinking to its event management processes, it is important to note that Illinois 4-H will continue to follow all relevant public health guidelines.

"We've learned a great deal since the summer of 2020 and we believe there is a path forward that will allow us to step back into in-person exhibitions. Illinois 4-H staff are diligently researching and designing a variety of program formats and structures. Our goal is to provide options so that each county can make their own program decisions based on current local conditions. New safety protocols will play a significant role in our return to in-person programming, so we ask for your help in preparing your family and your community for what that may look like. Specific details will be announced later this spring and will reflect the best practices in place for managing COVID-19.

"By working in partnership with the local public health department and other organizations in our communities, we are hopeful that our youth may be able to participate in one of the hallmark experiences of being a 4-H member – 4-H exhibitions and shows. We remain committed to pacing our decision-making process in coordination with available data and safety protocols, but we are making plans that could allow for a return of in-person judging for 4-H exhibitions in summer 2021."

Farmers can pair up with new ag technology through ISA's AgTechConnect program

BLOOMINGTON – The Illinois Soybean Association is announcing an exciting new program that connects agtech companies with farmers interested in testing the latest on-farm innovations.

Funded by the ISA checkoff program, AgTechConnect matches farmers with agtech companies seeking on-farm testing partners. Agtech companies then work directly with farmers to arrange details for trials and product evaluations.

By offering farmers the opportunity to be the first to try the latest agricultural innovations, providing agtech companies the opportunity to gain valuable farmer input for product development, AgTechConnect is a win-win for both Illinois soybean farmers and agtech companies.

"The AgTechConnect program provides farmers the opportunity to test new innovations on their farm under their management system, encouraging the development of these technologies to help farmers improve their yield, profitability, and sustainability," said Steve Pitstick, ISA Vice Chairman.

If you are a farmer interested in learning about agtech opportunities or an agtech company interested in connecting with Illinois soybean farmers, contact the Illinois Soybean Association at 309-663-7692.

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The Illinois Soybean Association (ISA) checkoff and membership programs represent more than 43,000 soybean farmers in Illinois. The checkoff funds market development and utilization efforts while the membership program supports the government relations interests of Illinois soybean farmers at the local, state, and national level, through the Illinois Soybean Growers (ISG). ISA upholds the interests of Illinois soybean producers through promotion, advocacy, and education with the vision of becoming a market leader in sustainable soybean production and profitability. For more information, visit the website www.ilsoy.org.

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Funding is available for Illinois Conservation Easement program

CHAMPAIGN – NRCS State Conservationist, Ivan Dozier announced funding is now available for the Agricultural Conservation Easement Program – Agricultural Land Easement (ACEP-ALE) program.

Dozier said that the ALE program can help address development and population pressures that pose a threat to Illinois farmland acres currently used for agricultural production. Through conservation easements, NRCS provides financial assistance to eligible partners to assist with the purchase of Agricultural Land Easements (ALE). These easements help farmers/landowners keep working croplands and grasslands in active, profitable agriculture production.

The ALE sign-up is continuous. However, funding cut-offs are established to allow eligible applications to compete for funding. The first FINAL funding cutoff for this fiscal year (FY21) is March 22, 2021. All eligible applications on file with NRCS on March 22, will be considered for funding.

Eligible entities include state and local governments and non-governmental organizations that have farmland or grassland protection programs. Dozier explained, "Agricultural easements can protect the long-term viability of our nation's food supply, which is more important than ever. Easements prevent conversion of productive working lands across Illinois to non-agricultural uses and conserve vital grazing land and pastures," Dozier added.

Agricultural Land Easements can also help keep agriculture lands in the hands of family members, while providing an enhanced opportunity to keep productive land available for secure crop production. Easements can also offer farming opportunities for new farmers to agriculture. To date, producers and partners nationwide have successfully protected more than 1.8 million acres of farmland and grassland through ACEP's predecessor programs – the Farm and Ranch Lands Protection Program and the Grassland Reserve Program.

Interested partners can sign up for ALE at their local NRCS office before the March 22 funding cutoff. Interested landowners need to find a partner who is willing to assist in the purchase of the easement. If you do not know of a partner, contact your local NRCS office to get more information about the type of partner that would hold an Agriculture Land Easement.

Due to the evolving COVID-19 situation, producers may need to set up phone appointments with their local NRCS office. To learn more, visit www.nrcs.usda.gov

ISG program aimed at influencing ag policy, legislation, and advocacy

BLOOMINGTON – Illinois Soybean Growers (ISG) has developed a new program led by influential Illinois farmer-voices to encourage members of the soy community to join the Voice for Soy initiative, to bring awareness to legislative priorities including biodiesel, farm policy and trade, and to champion for the future of the agriculture industry.

The Voice for Soy initiative serves as a platform to help connect Illinois farmers with government officials, and to positively influence important legislation and policies affecting agriculture's ability to operate in a sustainable and profitable way, both now into the far-reaching future.

"Because we are the largest soy-producing state in the country, we have an obligation to use our voices to speak up not only for Illinois soy growers, but for growers across the nation," says Illinois soybean farmer, Stan Born. "There are many things in farming that we can't control, like the weather. But there are things that we can influence, like legislation and regulatory action. So we have to speak up to the representatives in Springfield and Washington D.C. to ensure our priorities are known and our issues are understood."

"Today more than ever, it's easy to be heard," added Born.

Join the Voice for Soy movement today! Text "SOY" to 52886 to receive updates and action alerts, and visit www.ilsoygrowers.com or www.voiceforsoy.org. There is power in numbers.

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Wheat is among the most widely grown cereal crops in the world and the third-largest crop grown in the US by acre.

FFAR grant aimed at helping to develop climate-resilient wheat

WASHINGTON, D.C. – Wheat constitutes 20 percent of all calories and protein consumed, making it a cornerstone of the human diet, according to the United Nations. However, hotter and drier weather, driven by a changing climate, threatens the global wheat supply.

To address this threat, the Foundation for Food & Agriculture Research (FFAR) awarded a $5 million grant to the International Maize and Wheat Improvement Center (CIMMYT) to develop climate-resilient wheat. CIMMYT leads global research programs on maize and wheat, sustainable cropping systems and policies to improve farmers' livelihoods. These activities have driven major gains in wheat variety improvement across the globe for decades; in the US alone, for example, over 50 percent of the wheat acreage is sown with CIMMYT-related varieties.

Wheat is among the most widely grown cereal crops in the world and the third-largest crop grown in the US by acre. Nearly all US wheat crops are improved and supported by public agriculture research. As most wheat in the US is dependent on rainfall and has no access to irrigation, this research is critical for helping the plants – and producers – weather climatic changes including extreme heat and drought. Additionally, the demand for wheat is expected to rise in the coming years – as much as 60 percent by 2050. Without public research, wheat production could decrease by nearly 30 percent over the same period due to extreme climate conditions.

> ***"This project will help bridge a longstanding gap between state-of-the-art technological findings and crop improvement to deliver climate resilient wheat to farmers as quickly as possible."***
> –Dr. Matthew Reynolds, project investigator

Using the FFAR grant, CIMMYT researchers are pioneering wheat breeding technologies to produce heat-tolerant, drought-resistant and climate-resilient wheat.

CIMMYT researchers and collaborators are applying cutting-edge approaches in genomics, remote sensing and big data analysis to develop new breeding technologies. A key intervention will explore the vast and underutilized reserve of wheat genetic resources to fortify the crop against current and future climate-related stresses.

"This project will help bridge a longstanding gap between state-of-the-art technological findings and crop improvement to deliver climate resilient wheat to farmers as quickly as possible," said Dr. Matthew Reynolds, head of Wheat Physiology at CIMMYT and principal investigator of the project.

Breakthroughs from the FFAR funded project will achieve impact for growers via the International Wheat Improvement Network that supplies new wheat lines to public and private breeding programs worldwide, and has boosted productivity and livelihoods for wheat farmers for over half a century, especially in the Global South.

The research and breeding supported by FFAR will be conducted under The Heat and Drought Wheat Improvement Consortium (HeDWIC), a project led by CIMMYT in partnership with experts around the globe, designed to ensure wheat's long-term climate resilience. Under the umbrella of the Wheat Initiative's AHEAD unit, the most relevant advances in academia will be channeled to HeDWIC to help further boost impacts.

"'Heat,' 'drought' and 'wheat' are three of the most important words for billions of people," said CIMMYT Interim Deputy Director for Research Dr. Kevin Pixley. "This partnership between CIMMYT and FFAR will help ensure that the best agricultural science is applied to sustainably raise production of one of the world's most important staple crops, despite unprecedented challenges."

CIMMYT Director General Dr. Martin Kropff said, "This project represents not only a breakthrough to develop wheat for the future, but also an emerging partnership between CIMMYT and FFAR. I look forward to a productive collaboration that will move us all closer to our mission of maize and wheat science for improved livelihoods."

FFAR's investment was matched by a $4.5 million contribution from the CGIAR Research Program on Wheat, as well as a $7.5 million contribution from Accelerating Genetic Gains for Maize and Wheat, which is jointly funded by The Bill & Melinda Gates Foundation and the UK Foreign, Commonwealth, and Development Office (FCDO), for a total $17 million investment to advance wheat breeding research.

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The goal of the USDA grant is to introduce transformative change into how preharvest testing works.

NIFA grant project looks to improve food safety testing for leafy greens

By MARIANNE STEIN
ACES

URBANA – Lettuce is an important food commodity in the U.S., popular for its health and nutrition benefits. But leafy greens can be carriers of foodborne disease, leading to frequent product recalls.

A new University of Illinois study aims to develop better testing methods for produce. Matt Stasiewicz, assistant professor of applied food safety at U of I, received a $348,753 grant from the USDA National Institute of Food and Agriculture (NIFA) for the project.

"Safety testing is important for a ready-to-eat product that isn't cooked before consumption. We want to ensure we find contamination if it occurs so we can remove it from the product stream," Stasiewicz says. "The goal of this USDA grant is to introduce transformative change into how preharvest testing works."

Stasiewicz's project involves swabbing many plants in the field to capture potential pathogens, then passing those aggregate swabs to a single microbiological test.

"The main foodborne pathogen leafy green growers are worried about is toxin-producing E. coli; those have been responsible for outbreaks the last couple of years. We know risk factors are animal intrusion, relatively recent rainfall events, and untreated or otherwise contaminated irrigation water," he explains.

Current preharvest testing involves collecting samples from the field and sending them to a lab for testing. While that may catch major contamination issues, smaller-scale events are often undetected but could still put consumers at risk of illness.

The new method aims to capture much more comprehensive and reliable data. It requires a person to walk through the field with a sterile cloth attached to a stick, swabbing plants by brushing the leaves.

"Rather than physical collection of relatively small samples, we can collect a much larger representation of the entire field," Stasiewicz says.

Meat processors already use sterile sampling swabs for product testing, and those swabs can be adapted to work for produce.

"Food safety issues focused on lettuce are important, and the NIFA grant acknowledges the value of Dr. Stasiewicz's work in this area," says Nicki Engeseth, head of the Department of Food Science and Human Nutrition at U of I. "This research will greatly enhance the lettuce safety testing process, making it more safe, efficient and comprehensive."

The project aligns with Stasiewicz's other research on food safety. He recently received a $220,000 grant from the Center for Produce Safety to study product testing for leafy greens, tomatoes, apples, and other produce. The project uses computer modeling to simulate safety testing throughout the supply chain, including preharvest, at the packer, at the grocer, and at restaurants. The goal is to determine the most appropriate places to apply product testing.

(The Department of Food Science and Human Nutrition is in the College of Agricultural, Consumer and Environmental Sciences, University of Illinois.)

Explaining granges and how they affect rural residents

Local granges serve as a center of rural life in many agricultural communities. People who live outside such communities may be unfamiliar with granges, including what they are.

The most basic definition of a grange is an outlying farm or land with a manor building on the property. When first developed in 12th century Britain, granges were properties that may have been owned by a lord, who chose to live on the property or leased it to others. Other granges were held by the church, mainly by monasteries.

The grange definition and system was modified when the concept was brought to North America. After the Civil War in the United States, Oliver Kelley, the commissioner of the Department of Agriculture, realized while touring the region that poor farmers in the South bore the brunt of the war's devastation. Kelley noted outdated farming practices that were disorganized and largely ineffectual. He considered an organization that could bring farmers together across the country with a spirit of mutual agricultural cooperation.

Out of this idea the National Grange of the Order of Patrons of Husbandry (also called The Grange) was established as a nonprofit organization in 1867. The goal was helping rural American families with a strong emphasis on issues related to agriculture. The first grange (Grange #1) was founded in 1868 in Fredonia, New York. Other granges soon sprung up across the country.

The organization operates on four tiers: community, county or district, state, and national level. It is the oldest American agricultural advocacy group with a national scope. Headquartered in Washington, D.C., it has membership in the hundreds of thousands. According to The Grange, their mission is to "strengthen individuals, families and communities through grassroots action, service, education, advocacy, and agriculture awareness."

In addition to agricultural advocacy, The Grange has been involved with a number of legislative and practical initiatives. For example, it currently is aiming to find ways to reduce the cost of Medicare as well as helping to reform the U.S. Postal Service. It also is advocating for open auctions of spectrum frequencies used for wireless technology to provide greater access to high-speed wireless technology to rural areas. Various Grange halls and centers are located across the country, and these facilities host events and provide gathering spots for families.

Tracing their origins to 12th century Britain, granges remain a central component of agricultural life in the 21st century.

AG OUTLOOK '21

The mechanical process of extrusion, which involves heat, pressure, and steam, leads to gelatinization of starch, which explains the link between starch and energy digestibility.

Extruded grains may be better for pigs

URBANA – Extrusion is the norm in the pet and aqua feed industries, yet it remains unusual for swine feed in the United States. But the technology can improve energy and protein digestibility in pigs, according to research from the University of Illinois.

"We're not doing this much in the U.S., partly because the extrusion equipment typically is not installed in feed mills producing pig feeds. If a feed company decided they wanted to extrude diets or extrude grain by itself, as we did in this case, it would add cost. So the only way it would be economical would be if the pigs performed better with extruded grains," says Hans H. Stein, professor in the Department of Animal Sciences and the Division of Nutritional Sciences at Illinois and co-author on a study in Animal Feed Science and Technology.

Stein and his research team compared pig diets containing either extruded or unprocessed corn, wheat, and sorghum to determine ileal starch and amino acid digestibility, as well as total tract digestibility of energy and fiber. One source of each grain was ground and then divided in two batches, with one batch left as is and the other extruded in a single-screw extruder with an exit temperature of 100 degrees Celsius. Grains were ground and extruded at Kansas State University, but extrusion equipment at the new Feed Technology Center at Illinois will facilitate future research to help meet the growing global demand for animal protein.

"In extruded corn and wheat, we saw a nice improvement in amino acid digestibility. Corn in particular," Stein says. "And we observed increases for energy in extruded corn and sorghum, but not in wheat."

Starch digestibility also increased in extruded grains, compared with unprocessed grains.

"Starch is already well digested by pigs, but by extruding it, we increase its digestibility even more. And we have seen in quite a few other experiments, every time we increase starch digestibility, we increase energy digestibility," Stein says. "There's a very, very close relationship between the two."

The mechanical process of extrusion, which involves heat, pressure, and steam, leads to gelatinization of starch, which explains the link between starch and energy digestibility.

"In the extruded grains, 90% of the starch was gelatinized," Stein says. "Gelatinization opens the starch molecule, making it easier for enzymes to break down every bond within the starch. That leads to greater energy digestibility and absorption."

Fiber digestibility didn't change markedly in extruded grains versus unprocessed grains, but more of the fiber content became soluble with extrusion. "That means some of the insoluble fibers were solubilized. But because fiber digestibility didn't increase overall, that didn't have as much of an impact as we had expected," Stein says.

With pigs extracting more energy and protein from extruded grains, Stein sees a potential economic benefit that could justify the cost of adding extruding equipment to feed mills.

"If feed manufacturers can increase the energy as much as we did in our study, then there certainly is value in extruding grain for pig diets," he says.

The article, "Digestibility of amino acids, fiber, and energy by growing pigs, and concentrations of digestible and metabolizable energy in yellow dent corn, hard red winter wheat, and sorghum may be influenced by extrusion," is published in Animal Feed Science and Technology [DOI: 10.1016/j.anifeedsci.2020.114602]. Authors include Diego A. Rodriguez, Su A. Lee, Cassandra K. Jones, John K. Htoo, and Hans H. Stein. The research was supported by Evonik Nutrition & Care.

(The Department of Animal Sciences, the Division of Nutritional Sciences, and the Feed Technology Center are part of the College of Agricultural, Consumer and Environmental Sciences at the University of Illinois.)

Male weeds may hold key to their own demise

By LAUREN QUINN
ACES

URBANA – Scientists are getting closer to finding the genes for maleness in waterhemp and Palmer amaranth, two of the most troublesome agricultural weeds in the U.S.

Finding the genes could enable new "genetic control" methods for the weeds, which, in many places, no longer respond to herbicides.

"If we knew which genes control maleness and we could make those genes proliferate within the population, every plant in the field would be a male after a few generations, and theoretically, the population would crash," says Pat Tranel, professor and associate head in the Department of Crop Sciences at the University of Illinois and lead author on a study in New Phytologist.

> ***"If we knew which genes control maleness and we could make those genes proliferate within the population, every plant in the field would be a male after a few generations, and theoretically, the population would crash."***
> –Pat Tranel, University of Illinois

Tranel and his colleagues had previously identified molecular markers associated with the male genomic region. After sequencing male genomes for both species, the researchers were able to use those markers to zero in on the male-specific region. Now, they are within 120 to 150 genes of finding their target.

"We're confident most of those 120 or so genes are probably doing nothing. It's just stuff that's accumulated in that region of the genome," Tranel says. "If I had to guess, I'd say maybe 10 of them are actually doing something relevant."

Narrowing down the genes related to gender in these weeds could have practical value for control, but the study also sheds light on the phenomenon of dioecy – male and female sexual organs on separate individuals – more generally. The vast majority of animals are dioecious, but it's rare in plants. More than 90% of flowering plants have both sexual organs on the same individual, and often within the same flower.

Waterhemp and Palmer amaranth, however, are dioecious.

Dioecy means it's impossible for a plant to self-pollinate; instead, female gametes must be fertilized by male pollen from another plant. That's a good thing for ensuring genetic diversity in a population. And it's likely what has made waterhemp and Palmer amaranth so successful at evading the detrimental effects of multiple herbicides.

"To date, waterhemp and Palmer amaranth have evolved resistance to herbicides spanning seven and eight modes of action, respectively. Dioecious reproduction results in all these resistance traits being mixed and matched within individuals. This mixing has allowed populations of both species to combine multiple herbicide resistances, leaving producers with few effective herbicide choices," Tranel says.

Understanding the rare phenomenon of dioecy in plants can help scientists piece together how traits are inherited from each parent, and to understand how the phenomenon evolves.

Unlike in animals, in which dioecy is thought to have evolved just once, scientists believe dioecy in plants has evolved numerous times. And, according to Tranel's study, it appears to have evolved independently in waterhemp and Palmer amaranth, two very closely related species.

"I'm not ready to say we absolutely know they evolved separately, but all the information we found supports that idea. Only two of the 120-150 genes were similar to each other across the two species," Tranel says.

One of those shared genes, Florigen, helps plants respond to day length by initiating flowering. Tranel doesn't know yet whether it determines the gender of flowers, but he's intrigued that it showed up in the male-specific Y region for both species.

"We don't know for sure, but maybe it's involved with males flowering earlier than females. That could be advantageous to males because then they'd be shedding pollen when the first females become receptive. So if, in fact, Palmer and waterhemp really did evolve dioecy separately, but both acquired this Florigen gene for a fitness advantage, that would be a cool example of parallel evolution."

Tranel hopes to narrow down the male-specific Y region in both species even further to isolate the genes that determine maleness. There's no guarantee a genetic control solution will be developed once those genes are identified – Tranel would likely need to attract industry partners for that – but having such a tool is not as far off as it once was.

The article, "Male-specific Y-chromosomal regions in waterhemp (Amaranthus tuberculatus) and Palmer amaranth (Amaranthus palmeri)," is published in New Phytologist [DOI: 10.1111/nph.17108]. Authors include Jacob Montgomery, Darci Giacomini, and Pat Tranel of the University of Illinois, and Detlef Weigel of the Max Planck Institute for Developmental Biology. The project was supported by the USDA National Institute of Food and Agriculture and the Max Planck Society.

(The Department of Crop Sciences is in the College of Agricultural, Consumer and Environmental Sciences at the University of Illinois.)

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