MICHIGAN SUGAR COMPANY / FALL/WINTER 2020 / VOLUME 34 • ISSUE 2

THE NEWSBEET

Think Nutrients

Having a strategy, especially during times of crop stress, can lead to improved sugarbeet yields

MICHIGAN SUGAR COMPANY

ALSO IN THIS ISSUE:

Cooperative Response to Covid-19
RESEARCH: Sugarbeet Crop Defense Against Weeds, Fungus and Parasites
Update on Factory and Facility Capital Improvements

THE NEWSBEET
MICHIGAN SUGAR COMPANY • FALL/WINTER 2020 • VOLUME 34, ISSUE 2

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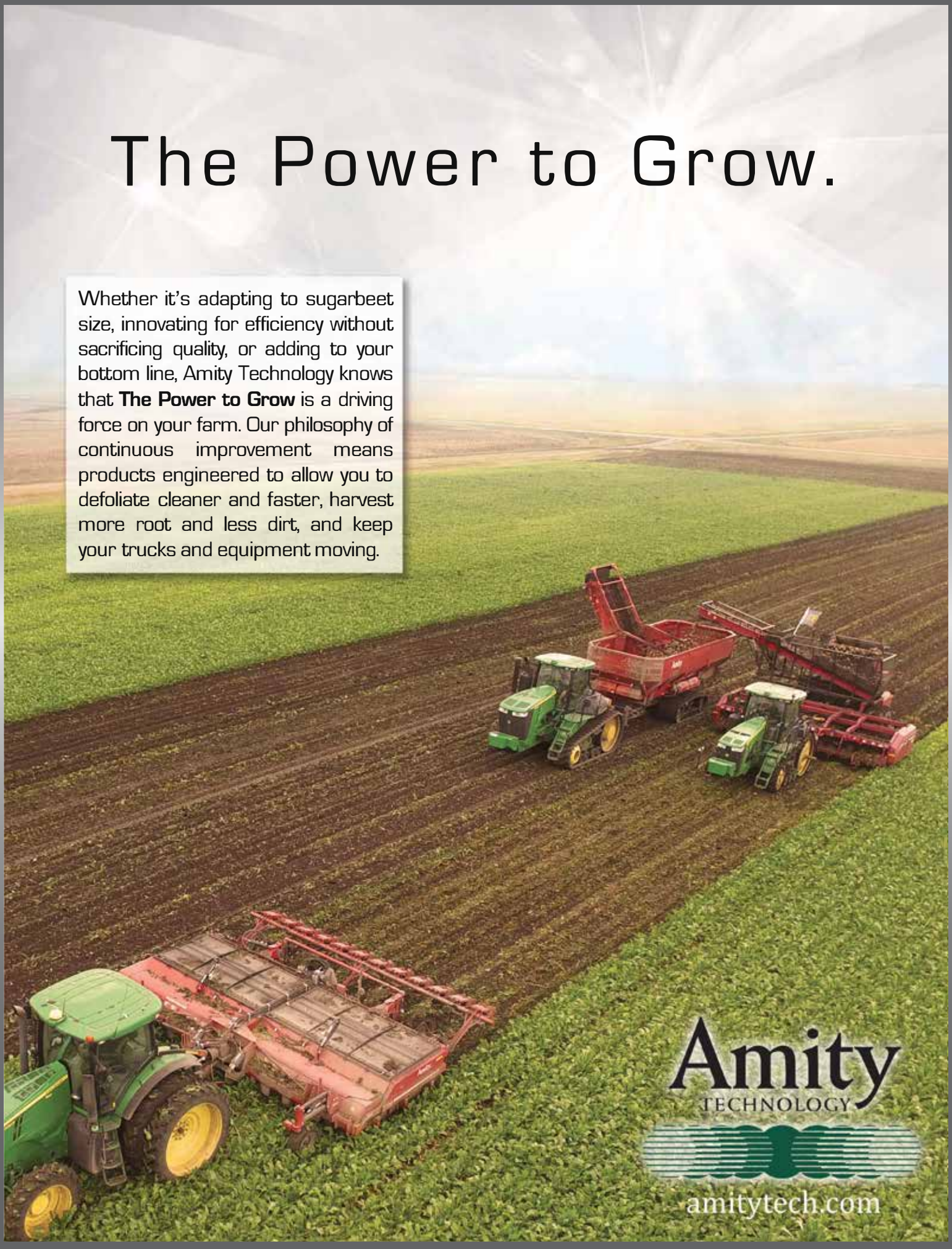

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TIME TO REFOCUS AND REFRESH

By Mark Flegenheimer, President and CEO

The Newsbeet magazine (formerly *The Pioneer News*) has been published since August 1945 and has had numerous editors and publishers during that time span. This year, *The Newsbeet* was awarded top honors at the annual meeting of the Cooperative Communicators Association which reviews publications from cooperatives across the United States. Congratulations to the entire team who puts together this exceptional magazine.

The focus of the magazine has changed over the years as our business has morphed from a stock company to grower-owned cooperative. The team that puts together this publication recently decided to change the emphasis back to its roots as an agronomic-focused periodical.

This journal allows Michigan Sugar Company to delve deeply into agronomic issues that are of interest to our growers. Articles will focus on everything from research, agronomic practices, equipment, and seed varieties all with a long-term goal of having growers produce a 30/300 crop (30 tons per acre and 300 pounds of recoverable white sugar per ton, or RWST). *The Newsbeet* will feature writeups from numerous experts within Michigan Sugar Company's agriculture and research group, as well as outside experts. Also, all articles will be enhanced with graphics, photographs, tables, and other visuals to make them easier to comprehend.

Many of the standard stories will continue to be covered in *The Newsbeet,* including reports for activities in Washington, D.C., factory updates on capital reinvestments and campaign results, grower features and community stories. Occasionally, updates on the sugar market, cooperative news and historic milestones will be added to the magazine when appropriate.

Our goal in refreshing *The Newsbeet* is to print a magazine twice a year that is thought-provoking and informational, and one all growers read from cover to cover. While we realize not all shareholders like reading printed material, we also realize everyone does not want to get all their information on a smartphone, iPad, or computer. *The Newsbeet* will be packed with information that takes our cooperative closer to our 30/300 goal while also keeping our grower-owners updated on other facets of our business.

We hope you enjoy the renewed look, feel, and focus of *The Newsbeet*. The team of contributors and editors have put together a magazine that is the premier periodical in the U.S. sugar industry. We thank our business partners who advertise in this publication as it allows us to print this exceptional quality magazine. If you have topics you would like to see included in future issues, please let us know. Also, let us know what you think of the "new" *Newsbeet*.

Our goal in refreshing The Newsbeet is to print a magazine twice a year that is thought-provoking and informational, and one all growers read from cover to cover. The Newsbeet will be packed with information that takes our cooperative closer to our 30/300 goal while also keeping our grower-owners updated on other facets of our business.

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PRODUCING A HIGH-QUALITY CROP; IT'S WHAT WE ARE FASHIONED TO DO

By James Ruhlman, Executive Vice President

In our quest to grow a top-quality, best-in-class crop, I find that our cooperative was built for it.

It starts with the farmer, the caretakers of the crop, and we have among the best in the country. This year, our growers once again fought off the elements and obstacles that Mother Nature put before them. Early plantings come with the risk of a heavy freeze, and 30,000 acres of our 2020 crop got hit hard. Without blinking an eye, replants went into the ground immediately and without question. Early summer saw massive rainfall and flooding. Some regions of our growing area had 6 inches of water covering entire fields. Through careful consulting from our ag staff and patience from our growers, only 1,000 acres were abandoned. The month of July brought blistering temperatures for the better part of three weeks with no rainfall, yet our shareholders stayed the course with our fungicide and herbicide spray programs. Timely rains came in early August and our crop responded beautifully. We began harvest on Aug. 11, which is the earliest start in history.

Our farmers were built to grow sugarbeets. Their tenacity to fight through adversity is a testament to their strength and faith. They were fashioned to proudly deliver high-yielding and high-quality crops.

When I look at the talent we have in our ag staff at Michigan Sugar Company, they, too, were fashioned for the sugar industry. Our Ag Operations group, led by Tommy Bignall, is built for maintenance and receiving our crop. His group knows the importance of readiness and quick turnaround times back to the field during harvest. They are strong and committed men and women.

Our Director of Agronomy Dennis Bischer leads an agronomy group that understands the need for customer service, rapid response, and expert advice. He also appreciates the need to respect and to be respected. His group has been molded to be the "trusted advisor" for our shareholders.

Our Research Department, led by Dr. Corey Guza, is known nationally for its knowledge of weed science, crop chemistry, and for formulating solutions to fight disease. Corey's love for sugarbeets is instilled in our West District agronomy staff and in our research technicians. He has fitted his group to test future advancements for the betterment of our cooperative.

Our Ag Relations and Communications Manager Elizabeth Taylor has shaped our ag communications platform to be of consistent messaging and timely feedback. She has a knack for listening, understanding and responding. We feel more connected to our shareholders through her guidance and direction.

We have a goal of achieving an average of 300 pounds of recoverable white sugar per ton for our sugarbeet crop. At first glance, this may seem unachievable, but as I look at the collective talent in our cooperative, it becomes easier to see it is attainable. We are all in positions that we are fashioned for … **We are built for it.** ▮

"Our farmers were built to grow sugarbeets. Their tenacity to fight through adversity is a testament to their strength and faith. They were fashioned to proudly deliver high-yielding and high-quality crops."

OVERVIEW OF CURRENT STATE, NATIONAL AND INTERNATIONAL POLITICAL ISSUES

CAPITOL BEET

By John Boothroyd, Manager, Government Relations

DISASTER ASSISTANCE

During spring, Michigan Sugar Company's contacts in the legislature made us aware of an attempt by some sugarbeet cooperatives to receive disaster assistance from the government due to the difficult crop conditions during the 2018 and 2019 seasons. Since Michigan Sugar Company had experienced similarly disadvantageous conditions, we moved quickly to join this effort. Fortunately, because of our robust political presence due to the growers' strong support of our Political Action Committee, Michigan Sugar Company had a voice at the table. As a result, we were able to ensure that, as negotiations on an aid package proceeded, our input was considered. Ultimately, Michigan Sugar Company growers received more than $27 million in disaster relief.

WASHINGTON, D.C.

In years when the Farm Bill is not up for renewal, it can be tempting to think the opponents of the sugar program have gone into hibernation; however, our adversaries look for any opportunity to allow subsidized, foreign, dump-market sugar into the United States. In the annual appropriations process, through which funding for government agencies is allocated, there were three proposed anti-sugar amendments. These amendments, if enacted, would have effectively repealed the sugar program by preventing the government from enforcing its key provisions. Fortunately, our friends in Congress were able to block these amendments from proceeding. This once again highlights the need for our industry to have constant vigilance and a strong political presence if we wish to maintain a domestic industry going forward.

ELECTIONS

Despite fears related to the COVID-19 pandemic, the Aug. 4 primary election went off without a hitch and no new COVID cases were traced to polling locations. In Congress, all of Michigan's incumbent members won their party's nomination, despite some tough races.

Michigan also had two open seats. In the 3rd District, which encompasses much of western Michigan in the Grand Rapids area, incumbent Justin Amash, a noted critic of the sugar program, and the first and only sitting Libertarian member of Congress, announced his retirement earlier this year. In the primary, Peter Meijer won the Republican Party's nomination and Hillary Scholten won the Democratic race. Meijer will be a strong favorite to win in the November general election as the 3rd District has long been considered a safe Republican seat.

In the 10th District, which encompasses the Thumb and northern Macomb County, Congressman Paul Mitchell declined to seek a third term. Self-funded political newcomer Lisa McClain won the Republican primary and will face Democrat Kimberly Bizon. Again, the Republican will be the favorite to win this heavily Republican-leaning district.

STATE OF MICHIGAN

State politics have, unsurprisingly, been dominated by discussions about the state's response to the COVID-19 pandemic. We have worked diligently to ensure the continued safety of our employees and growers during these uncertain times. Fortunately, the state has provided some assistance, and Michigan Sugar Company applied for and received a $200,000 grant through the CARES Act to help cover the cost of several measures we have taken to maintain a safe and healthy work environment. ■

ABOVE John Boothroyd, Manager of Government Relations at Michigan Sugar Company, has his temperature taken using a biometric scanner at the company's Bay City factory. Michigan Sugar Company applied for and received a $200,000 grant through the CARES Act to help cover the cost of several measures being taken to maintain a safe and healthy work environment.

***John Boothroyd** is Michigan Sugar Company's Manager of Government Relations. He joined the company in 2018 after working four years for U.S. Rep. John Moolenaar.*

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Catering to unprecedented demand during COVID-19

As safety protocols went into place, Michigan Sugar Company saw a spike in retail sales

By Rob Clark, Director of Communications and Community Relations

On March 13, 2020, Michigan Sugar Company officials had no idea the lengthy impact COVID-19 would have not only on operations, but on our state and our country.

That is the day Michigan Gov. Gretchen Whitmer ordered all k-12 schools across the state closed for three weeks, with an expected re-opening date of April 6.

Little did we know.

At the time, Michigan Sugar Company still had nearly 500,000 tons of sugarbeets to slice in what eventually became one of the company's longest processing campaigns in history — stretching into the second week of April. After a wet, muddy, and even snowy harvest, the challenges presented to employees during the home stretch of the campaign were already elevated.

And now, company leaders were spending their precious time digging deep into the Centers for Disease Control and Prevention website, talking with local health department officials, putting in place unique safety measures and writing letters to employees instructing them how to make a mask and properly wash their hands.

At Michigan Sugar Company's facilities, the job of cleaner took on new meaning as employees spent entire shifts wiping down and disinfecting surfaces. At Corporate Headquarters, employees were told to limit the number of non-essential visitors and consider rescheduling in-person meetings or holding them by phone or teleconference.

FAR LEFT Julie MacDonald, a General Laborer at Michigan Sugar Company's Bay City factory, wipes down a door handle as part of her daily cleaning routine instituted in response to the COVID-19 pandemic. **LEFT** Karen Witucki, a General Laborer at Michigan Sugar Company's Bay City factory, mops the floor as part of her daily cleaning routine. Cleaning efforts have been increased at all Michigan Sugar Company facilities in response to the COVID-19 pandemic.

LEFT Chris Boughner, an Industrial Cleaner at Michigan Sugar Company's Bay City factory, wipes down a table in the Packaging & Warehousing Department breakroom. Also visible are the Plexiglas dividers installed as part of the company's response to the COVID-19 pandemic.

Many quickly scrambled to figure out how programs like Zoom and Microsoft Teams worked. Though it seems like second nature now, it was all very new back then.

Of course, as a food manufacturer, Michigan Sugar Company employees were deemed essential workers by the Department of Homeland Security, which meant we had an obligation to keep our very important product — sugar — flowing into the marketplace at a time when it was needed most.

"Sugar, as you know, is an essential ingredient in a variety of food products and we are seeing increased demand from customers like Chelsea Milling, Dannon, General Mills, Nestlé, PepsiCo., Post, and Treehouse Foods who make highly sought-after products like Jiffy Mix, yogurt, cereal, coffee creamers and Gatorade," Michigan Sugar Company President and CEO Mark Flegenheimer wrote to employees in a letter dated March 17. "We also are seeing increased demand from our retail partners. If you've been in the aisles of your local supermarket this past week, you know what I'm talking about."

As it turned out, Michigan Sugar Company, in March, saw a year-over-year increase in retail sugar sales of 72%.

"During an unprecedented time in our country's history, we were catering to unprecedented demand for our sugar," Flegenheimer said.

"In March, everyone went to the grocery store to buy toilet paper. They also bought flour and sugar. We answered the call and we take a lot of pride in that."

According to Pedro Figueroa, Vice President of Sales and Marketing for Michigan Sugar Company, as the COVID-19 pandemic continued into summer, so did demand for sugar.

"Through July 2020, we sold 1.1 billion pounds of sugar, up from 990 million through the same month in 2019," Figueroa said. "That's 11 million more pounds. In July 2020 alone, our sales were up 24% from sales in July the previous year. In terms of deliverables to the market, Michigan Sugar Company was up 11% through July of this year, whereas the national average for year-over-year increase is 1%."

The challenges surrounding the pandemic continued into the start of this year's sugarbeet slicing campaign in August. New guidelines put into place included mandatory wearing of masks, daily biometric screenings and continued attention to cleaning and disinfecting. In September, Michigan Sugar Company was required to complete mandatory COVID-19 testing of more than 1,000 Michigan employees. This testing resulted in 18 positive results. As Michigan Sugar Company officials continue to navigate through these challenging and quickly changing times in a world forever changed by COVID-19, they will continue to evaluate safety protocols and make changes as needed to ensure our employees can stay focused on the task at hand of producing, packaging and shipping sugar — a vital ingredient in the food supply chain. ■

BELOW Bay City Factory Manager Kelly Scheffler gets a squirt of hand sanitizer from a dispenser in the factor's control room. Hand sanitizer and disinfectant wipes have been placed throughout Michigan Sugar Company's facilities in response to the COVID-19 pandemic.

Rob Clark *is Director of Communications and Community Relations for Michigan Sugar Company. He is a 1995 graduate of Knox College and worked for 22 years as a journalist before joining Michigan Sugar Company in 2018. He and his wife Claire have four sons.*

Think Nutrients

Having a strategy, especially during times of crop stress, can lead to improved sugarbeet yields

By Corey Guza, Ph.D., Director of Research & Agronomy

To achieve success growing a high-quality, high-yielding sugarbeet crop, planning and attention to detail are required. Generally, we think about adding nutrients to the soil and letting them work as needed. Nutrient availability to the plant, however, can be influenced by moisture and weather conditions. Designing an application strategy that makes nutrients more available in times of stress and throughout the growing season can help improve nutrient efficiency and sugarbeet yield.

MOBILE NUTRIENTS

Understanding nutrient availability can be challenging. All nutrients require some moisture to be available for root uptake from the soil. Too much or too little moisture can have a big impact on the nutrients available for uptake in the soil solution. Nutrients such as nitrogen (N), boron (B), and sulfur are examples of nutrients that are greatly dependent upon soil moisture for availability and uptake. These nutrients are generally considered mobile in the soil. Mobile nutrients can be temporarily moved out of the root zone if too much rain occurs early in the growing season. Conversely, in dry growing conditions these nutrients may be temporarily unavailable to the plants. In situations of moisture stress, too little or too much, it is important to understand what the sugarbeet crop is experiencing to determine if nutrient management is needed and when.

In a scenario where too much rainfall occurs early in the season, the mobile nutrients can be moved lower in the soil. If mobile nutrients are applied and incorporated within the top 1 to 2 inches of soil or in a 2-inch over by 2-inch down band from the soil surface and seed trench, these nutrients could be 1 to 2 inches deeper in the soil by the time the seed germinates. While the seedling can live off the seed nutrient reserves for a couple weeks after germination, it is very dependent upon soil available nutrients to thrive. This is one reason why sugarbeets may appear to "stand still" or "go backwards" early in the growing season only to grow rapidly from mid-June onward.

When the sugarbeets are not growing as quickly as desired, the first thought is to apply more N. While N availability to the plant may be low at the time, this may only be a temporary situation. In a scenario in which N is an inch or two out of reach of the roots, applying more N may result in a situation in which too much N is in the soil and the plant may not be able to utilize it properly, resulting in lower than expected recoverable white sugar per ton (RWST).

At the same time, or shortly after additional N is applied to get more to the sugarbeet crop, the opposite situation of too much moisture can occur; drought. If it is too dry after N application, the N may remain locked in the soil until the next significant rain event and that may be quite close to harvest. The rain and extra N can then trigger the sugarbeets to start growing rapidly, which is great for increasing tonnage, but this can also reduce RWST. This scenario of too wet to too dry in-season, unfortunately, seems to occur all too frequently in the Michigan Sugar Company growing region.

NON-MOBILE NUTRIENTS

Nutrients important to sugarbeets that are not considered mobile in the soil include phosphorus (P), potassium (K), manganese (Mn), zinc (Zn), magnesium, and calcium. They require close contact with the root to be available and require less water to move into the plant. In drought conditions, these nutrients also can be locked up and temporarily unavailable to the plant. These less-mobile nutrients also are important for utilization of the mobile nutrients.

Potassium, for example, is important for water and nutrient movement in plants. Potassium is needed to allow N to move efficiently through the plant to create roots and leaves. Potassium also is important for enzyme activation for adenosine triphosphate (ATP) synthesis, which is energy currency for the plant. ATP is needed for photosynthesis, the process by which sugars are produced in plants. Phosphorus is the key element that makes up ATP. Calcium and B are important for cell wall structure and phloem tube development. Phloem tubes are like "straws" that allow sugars to be moved from the leaves to the

Grower-owner Steve Hoard, left, and Michigan Sugar Company Field Consultant David Bailey discuss in-field nutrients.

Michigan Sugar Company Field Consultant Adam Maurer, left, and grower-owner Kurt Geiger discuss agronomy plans.

roots. This is very important when loading sugar in the roots in the fall. Magnesium is one of the building blocks for chlorophyll, which makes a plant green. Chlorophyll is needed to capture light energy for photosynthesis. Magnesium also can help with sugar movement in plants. Zinc and Mn both play roles in photosynthesis. Manganese is not very mobile within the plant and is one reason why foliar applications may be needed at different times throughout the growing season.

TISSUE TESTING

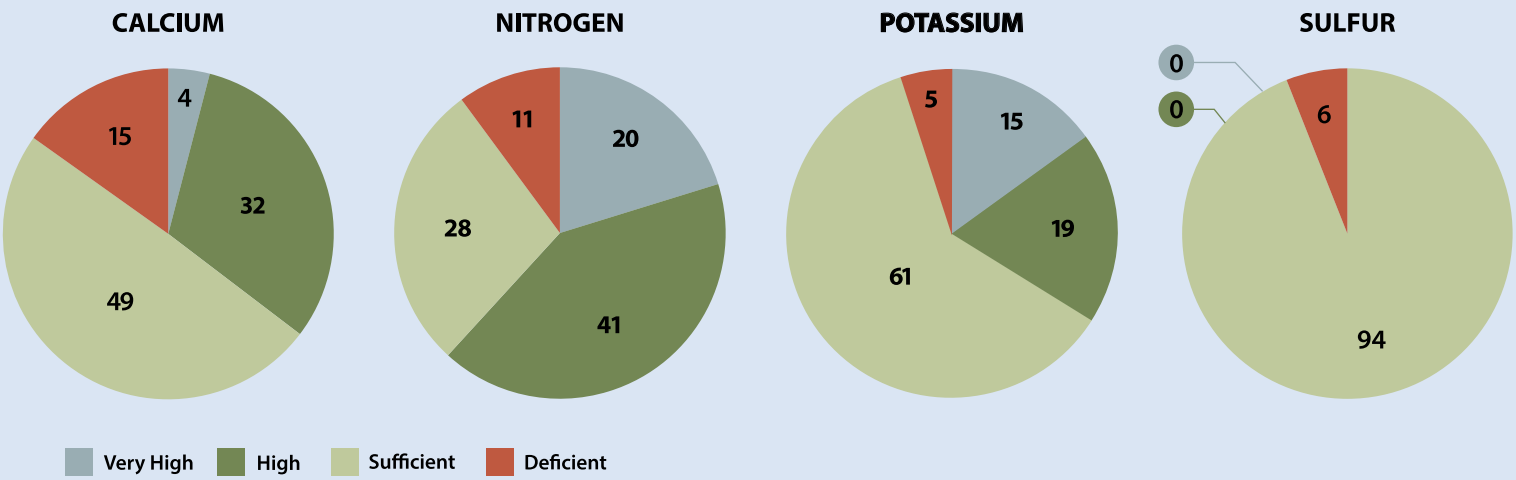
In-season, it is not uncommon to see temporary deficiency symptoms in times of stress or shortly before or after stress occurs. Tissue testing is a way to help understand what is happening within the plant in-season. There are two ways to utilize tissue sampling. First is a diagnostic tool. It can be used to compare good and not so good parts of fields to see if nutrient deficiency is an issue. Generally, it is best to take a soil sample with the tissue sample when doing diagnostic testing to see if a nutrient is deficient in the soil as well. Next is using tissue sampling as a report card for your sugarbeet nutrition program. Tissue samples can be taken at multiple times during the growing season to determine if you have the right amount of nutrition available to the crop at the right time.

If in-season nutrient deficiency is observed, foliar application of nutrients can be a strategy used to temporarily fix issues and supplement a strong sugarbeet nutrition program. Foliar N products are available that allow N to be readily available to the plant. Plants can use this N to keep growing in times of stress. The N from these products typically will not result in decreased RWST at the end of the growing season. Foliar products with N, P and K also are available if more nutrient balance is needed. Micronutrients, such as Mn and B are generally as effective when applied foliar versus to the soil. Foliar applications of key nutrients at critical times during the growing season can lead to balanced nutrition and high-yielding and high-RWST sugarbeets. ■

Corey Guza, Ph.D., *is Director of Research at Michigan Sugar Company. He works with staff to identify research opportunities, evaluate data, and assist field consultants and growers with educational training and support.*

2019 SUGARBEET TISSUE SAMPLE NUTRIENT SUMMARY

Here are the results of the 2019 Sugarbeet Tissue Sample Survey. Numbers are percentages of samples in each category.



VERY HIGH = Good nutrient levels in the plant; DEFICIENT = Low nutrient levels in the plant

Targeting Agronomic and Nutrient Strategies for More Intensive Management

By Kurt Steinke, Ph.D., Associate Professor, Michigan State University, and Seth Purucker, Designer, WEC Energy Group

Increased spring weather variability, more frequent disease occurrence, warmer autumn soil temperatures, and longer season management have increased the intensity of sugarbeet management. Over time, items that may require incremental adjustments as part of a sound agronomic program, may change.

As the sugarbeet industry continues toward the "30/300" goal of 30 tons per acre and 300 pounds of recoverable white sugar per ton (RWST) growers question how more intensive management strategies may improve yield, quality, and profitability. Management practices, nutrient strategies, and disease pressure have changed as tonnage has nearly doubled over the last two decades. In fact, since 2009, root yields increased 14% across the state while sugar concentrations decreased 11%. While weather variability, including excessive rainfall near harvest, may greatly influence fluctuating sugar concentrations, other more adaptive factors, including strategies involving greater plant populations, narrower row spacings, greater nitrogen (N) rates, and the use of starter N may play a role in building more resilient production systems.

Over the last two growing seasons, the Michigan State University Soil Fertility and Plant Nutrition Program partnered with Michigan Sugar Company to look at both individual practices and interactions between some intensive management strategies. Two separate studies evaluated 1) plant population, N rates, and subsurface-banded starter N, and 2) whether row spacing affected the need for subsurface-banded starter N. Both studies used Crystal 675.

PLANT POPULATION, NITROGEN RATE, AND SUBSURFACE BANDED NITROGEN STUDY

Plant population often has a greater direct impact on recoverable white sugar per acre (RWSA), rather than root yield which may impact other factors, including overall N rate and, ultimately, profitability. This study investigated the following:

- Two populations (50,000 and 60,000 seeds per acre).
- Four overall N rates (0, 80, 160, and 240 pounds of N per acre).
- With or without starter N (40 pounds of N per acre applied 2 inches below and 2 inches beside the seed) planted to 30-inch rows.

Despite few effects of population on yield and quality, overall N rate and starter N did interact in one of two years to impact yield and recoverable sugar (Table 1). In 2018, 160 pounds of N per acre produced the greatest root yield utilizing starter N as compared to the 240 pounds of N per acre required for greatest yield without starter N application. The 160 pounds of N rate with starter N increased yield six tons per acre compared to no starter N. In 2019, starter N did not influence yield or recoverable sugar but again the 160-pound N rate produced optimal yield and recoverable sugar.

So why the differential response to starter N across years?

The answer may be partially explained by spring weather variability. Starter fertilizer may enhance early season crop growth that can affect root yield depending upon several factors, including nutrients contained in the starter fertilizer, critical soil nutrient concentrations, and early to mid-season environmental conditions.

Kurt Steinke, Ph.D., *is an Associate Professor in Soil Fertility and Nutrient Management at Michigan State University, where he leads an extension, research, and teaching program.*

Seth Purucker *is a designer for the WEC Energy Group. He is a former graduate student in the Soil Fertility and Plant Nutrition program at Michigan State University..*

N RATE	ROOT YIELD		RWSA	
	Starter	No Starter	Starter	No Starter
(Pounds N per acre)	Tons per acre		Pounds per acre	
0	23 c†A‡	24 bA	6,046 cA	6,310 cA
80	31 bA	28 bA	8,255 bA	7,530 bB
160	36 aA	30 bB	9,253 aA	7,754 abB
240	34 aA	34 aA	8,385 bA	8,252 aA

TABLE 1 Starter nitrogen (N) fertilizer and N rate interaction on sugarbeet root yield and recoverable white sugar per acre, or RWSA, Richville, Michigan, 2018.

† Means in the same column followed by the same lowercase letter are not significantly different at P ≤ 0.10.
‡ Means in the same row followed by the same uppercase letter are not significantly different at P ≤ 0.10.

The May/June period was extremely dry in 2018 but excessively wet in 2019 (43% below and 88% above 30-year means, respectively). Dry soil conditions soon after planting can limit the movement of nutrients to the developing plant root. With subsurface starter N application, an opportunity existed to promote quicker vegetative growth as N placement near emerging roots may provide for increased canopy coverage, light interception, and sucrose production (Photo 1).

Starter N did not have an effect in 2019 likely due to wet soil conditions that impede root establishment and can limit access to starter fertilizer either through N movement or the physical lack of root to nutrient contact. Despite overall optimal root yield, N rates varying between 130 pounds (dry year, 2018) and 152 pounds (wet year, 2019), optimal recoverable sucrose averaged 25 pounds of N per acre less than N rates utilized to maximize yield.

Growers often perceive yield loss as a greater risk factor than profit loss. However, as Michigan Sugar Company moves closer to the "30/300" goal, growers may wish to consider N application rates that improve RWSA for management decisions.

ROW SPACING AND NITROGEN PLACEMENT STUDY

Greater root yield with narrower row spacing has been previously documented. However, a question that continues to arise is whether starter N may still benefit at a narrower row spacing. This study investigated the following:

- 22-inch and 30-inch rows.
- 40 pounds of N per acre applied 2 inches below and 2 inches beside the seed (2x2) as compared to surface applied with a urease inhibitor after planting but before emergence, also known as pre-emergence (PRE). All treatments received a total of 160 pounds of N per acre.

Narrower row spacing increased root yield across both years, which was not unexpected. Greater spacing between plants (22-inch rows) as compared to between rows (e.g., 30-inch) provides less plant-to-plant competition allowing for potentially better utilization of moisture and nutrients. Recoverable white sugar per ton was 12 pounds and 28 pounds per ton greater with 30-inch rows across 2018 and 2019, respectively, with greater RWSA using narrower rows in 2019 caused primarily by the greater yield difference between the two-row spacings.

However, one interesting outcome was that N placement did affect yield in one of two years (Table 2). In 2018, 2x2 placement increased yield 2 tons per acre across row spacings. Lack of soil moisture during May/June 2018 likely limited downward N movement from pre-emergence applications whereas 2x2 applications allowed greater access to soluble N for developing roots under moisture stress. Additionally, during the dry spring of 2018, 2x2 N placement increased canopy coverage at 37 and 51 days after plant within the narrow row spacing by 3% and 15%, as compared to pre-emergence N (Photo 2). Both 22- and 30-inch row spacing completed row closure at similar times across both years.

PHOTO 1. Benefits of starter N applied 2x2 at planting were observed throughout the 2018 growing season. Placing N near developing roots provided improved canopy coverage during dry May/June soil conditions and increased root yield. Pictured on the left are sugarbeets 31 days after planting with 40 pounds of N applied 2x2, compared to no 2x2 N application at right.

TREATMENT	Root Yield	RWSA	RWST
	Tons per acre	Pounds per acre	Pounds per ton
	2018		
Row Spacing			
22-inch	34 a †	7,815 a	232 b
30-inch	27 b	6706 a	244 a
N Placement			
2x2 N	32 a	7,506 a	238 a
PRE N	30 b	7,014 a	238 a
	2019		
Row Spacing			
22-inch	36 a	8,904 a	246 b
30-inch	25 b	6,960 b	274 a
N Placement			
2x2 N	31 a	7,890 a	258 a
PRE N	30 a	7,874 a	264 a

TABLE 2 Main effects of row spacing and starter nitrogen (N) fertilizer placement on sugarbeet root yield, recoverable white sugar per acre , or RWSA, and recoverable white sugar per ton, or RWST, Richville, Michigan, 2018-2019.

† Means in the same column followed by the same lowercase letter for each year are not significantly different at P ≤ 0.10.

GROWER IMPLICATIONS

Across the more than 160,000 acres of sugarbeet production in Michigan and Ontario, Canada, no single management practice, input, or research result will apply to every individual grower operation, but some results may apply in certain years or to specific fields.

- *Greater yield and quality benefits from 2x2 starter N applications occurred during dry May-June soil conditions, which correspondingly decreased the overall optimal N rate.*
- *Across tested N rates, 160 pounds of N per acre resulted in the best combination between yield, quality, and net return. Overall optimal N rate varied between 130 pounds (dry spring) and 152 pounds (wet spring).*
- *Peak RWSA averaged 25 pounds of N per acre less than N rates for peak root yield.*
- *N placement 2x2 still offered canopy coverage benefits in narrow rows and should not be abandoned simply due to less distance between rows.*

PHOTO 2. Sugarbeet 2018 canopy still displaying plant biomass response 10 weeks after planting. Pictured at left are 22-inch rows with 40 pounds of nitrogen (N) applied 2x2, compared to 22-inch rows without 2x2 N at right.

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A COMPLICATED DISEASE

Researchers learning more about the many groups of Rhizoctonia root and crown rot

By Linda E. Hanson, Ph.D., Douglas Minier, Daniel M. Bublitz, and Jaime F. Willbur, Ph.D., Michigan State University

Rhizoctonia root and crown rot of sugarbeets is an important soil-borne disease. It is caused by a fungi named *Rhizoctonia solani*. We now know that *Rhizoctonia solani* is actually a number of different species that vary in their host range and effects on plants but are very hard to tell apart with traditional methods. The application of newer molecular methods has allowed us to better understand the relationships within this important group of pathogens.

Currently, *Rhizoctonia solani* is divided into at least 13 different anastomosis groups (AG) that are essentially different species. On sugarbeets, the most prevalent groups are *R. solani* AG 4, that can cause seedling damping-off (Photo 1), and AG 2-2, that can cause both seedling damping-off and adult plant root and crown rot (Photos 2 A & B). Historically AG 4 was the most common cause of damping-off. While AG 4 still is present, recent surveys in Michigan have found AG 2-2 as the most common pathogen for both stages.

Of particular concern for sugarbeet growers is that most resistance breeding has only been for AG 2-2, and screening with breeding material indicates that resistance to AG 4 is not the same as for AG 2-2. In addition, resistance to the adult plant stage of the disease does not also give resistance to the seedling stage. Since there is little seedling disease resistance available, other management options need to be considered when damping-off is an issue.

Rhizoctonia root and crown rot can be recognized by above-ground symptoms such as a sudden, permanent wilt of leaves, which usually lie prostrate on the ground rather than drooping (Photo 2B). There often is a dark discoloration or rot on the base of the petioles of some leaves when this occurs. By the time foliar symptoms are evident, there usually is extensive rot occurring under-

PHOTO 1 Rhizoctonia damping-off (three beets on right) compared to a healthy seedling (on left). Note the very dark, dry rot and base of petioles also turning dark. **PHOTO 2A** Rhizoctonia root and crown rot in the field. **PHOTO 2B** Sugarbeet foliage showing severe Rhizoctonia root and crown rot symptoms. Note the dark base of many of the petioles and the collapse of the leaves.

ground (Photo 3). Root and crown rot caused by *R. solani* is characterized by a very dark rot that is mostly shallow and dry at first, and has a sharp separation between dark, rotted tissue and healthy, light colored tissue (Photos 3 and 4).

As disease progresses, there can be cracking in the beet (Photo 5) that allows the pathogen to penetrate deeper into the root or crown. When severe, the entire root can be rotted away. The disease often has a patchy distribution in the field and primarily expands along the rows. It can be spread through infected plant tissue and infested soil. Anything that moves infested plant material or soil, including cultivation and harvesting equipment or even footwear, can help to spread the pathogen. The pathogen can survive for several years in the soil even without a host.

Another challenge caused by this disease is that *R. solani* can allow other pathogens to enter the beet root, so other types of rots may occur with the Rhizoctonia root and crown rot. These combined rots can make diagnosing the disease more complicated, increase overall root losses, and reduce storability (Photos 6 A & B).

For root and crown rot, AG 2-2 is the most important pathogen. Historically, this has been further divided into intraspecific groups, with AG 2-2 IIIB and AG 2-2 IV being the groups that affect sugarbeets. These intraspecific groups were reported to differ, with AG 2-2 IIIB being more virulent on beets and able to infect corn, while AG 2-2 IV was generally less severe on beets and did not affect corn.

There have been several methods tested to identify what was present in the field, as this could impact what crop rotations would be recommended. Unfortunately, most of these methods provided inconsistent results. Recent genetic evidence shows that the groups IIIB and IV are not valid genetic groups. Instead, researchers have identified at least three genetic groups that do not correspond to IIIB and IV. These genetic groups have been screened using sugarbeet, dry bean, and soybean isolates and show variable virulence on these hosts (Figure 1).

Methods are being developed to consistently identify these genetic groups from soil and host tissue. Knowledge of what types are present in a field can help us understand the impact of different crop rotations on disease in sugarbeets. For example, in the 1980s and 1990s, corn was recommended as a rotation crop, but finding strains that can colonize corn and are highly virulent on sugarbeets have changed this recommendation.

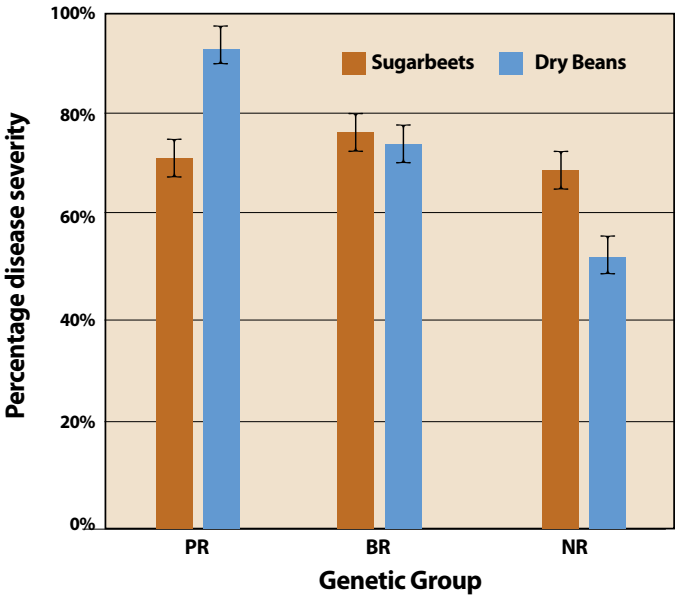
Despite the long history of Rhizoctonia-caused diseases in sugarbeets, little is known about the population biology of this pathogen. The realization that the traditional sub-groups of AG 2-2 are not valid genetic groups has further complicated our understanding of the situation. Therefore, the East Lansing, Mich., research group has developed a set of genetic markers known as microsatellites or simple sequence repeats for use in *Rhizoctonia solani* AG 2-2. These are the same type of markers used in human forensics for DNA fingerprinting and are particularly effective at distinguishing between very closely related individuals. Researchers currently are using these markers to determine distribution patterns of *R. solani* AG 2-2 in Michigan and other growing regions in the United States and examining the effect of crop rotation on population structure.

These projects should provide insights that will help inform management practices to better control losses to this important disease.

PHOTO 3 Sugarbeet root with Rhizoctonia root and crown rot symptoms. Observe very dark lesions. *(Photos by Daniel M. Bublitz)* **PHOTO 4** Sugarbeet root with Rhizoctonia root and crown rot. Note shallow, dark dry lesions with sharp separation between dark rot and healthy tissue. **PHOTO 5** Sugarbeet roots with Rhizoctonia root and crown rot showing cracking of the rotted tissue leading to penetration into the beet.

PHOTO 6A & 6B: Sugarbeets with combined Rhizoctonia root and crown rot and other diseases. Photo A shows a sugarbeet with bacterial rot *(photo courtesy of Malini A. Jayawardana);* Photo B shows a sugarbeet with Fusarium. *(Photos by Daniel M. Bublitz)*

FIGURE 1 Symptoms of Rhizoctonia root rot on dry bean roots (shown in photo below, left) and average disease severity of the three genetic groups of *Rhizoctonia solani* AG 2-2 on seedling sugarbeets and seedling dry beans (see chart below). Disease severity is expressed as a percentage of total possible disease with 100% indicating all plants dead.



Linda Hanson, Ph.D., *is a Research Plant Pathologist with the United States Department of Agriculture's Agricultural Research Service. She has been focusing on sugarbeet diseases for more than 20 years, specializing in diseases caused by fungi.*

Douglas Minier *is a Ph.D. student at Michigan State University working in Linda Hanson's Sugarbeet Pathology Lab. He is studying the genetic diversity of Rhizoctonia and the mechanisms by which the fungus can cause rotting of sugarbeet tissue.*

Daniel M. Bublitz *is Director of Sugarbeet Advancement and the Sugarbeet Extension Specialist at Michigan State University. He and the rest of the Sugarbeet Advancement team are stationed at the Saginaw Valley Research and Extension Center near Richville.*

Jaime F. Willbur, Ph.D., *is the Assistant Professor and Principal Investigator for the Michigan State University Potato and Sugarbeet Pathology research and extension program. Her laboratory is in East Lansing, Michigan, where undergraduate and graduate students and researchers focus on integrated management solutions for current and emerging disease concerns.*

YIELD-ROBBING PESTS

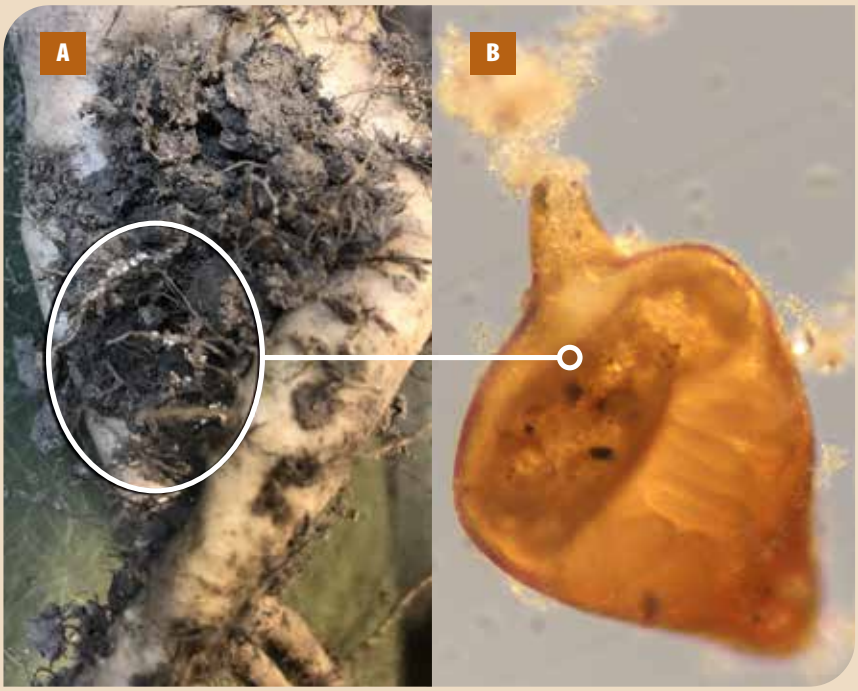


PHOTO 1 A) White dots inside the black circle are beet cyst nematode adult females visible to the naked eye. B) Sugarbeet nematodes cyst with eggs inside under the microscope.

Preventing and managing sugarbeet cyst nematodes

By Brian Levene, Ph.D., Sita Thapa, Ph.D., Emilie Cole and Marisol Quintanilla, Ph.D., Department of Entomology, Michigan State University

For many years, beet cyst nematodes (BCN) (Photos 1A and 1B) have been known to occur in Michigan. A field survey by Michigan Sugar Company in 2012 found these pests to be present in more than 30% of the fields sampled. It has been reported that low BCN infestations with no visible symptoms can reduce yield by 2 to 4 tons per acre, whereas heavy infestations can cause losses of up to 15 tons per acre.

Beet cyst nematodes can survive for several years as eggs inside the cysts (dead females). The annual rate of decline of cyst nematodes in the soil during a normal crop rotation is estimated to be 40% to 60%, but BCN can reproduce on more than 200 plant species in 23 different plant families, including turnip, kale, radish, spinach, broccoli, cabbage, cauliflower, tomatoes, brussels sprouts, table beets, kohlrabi, rhubarb, and other closely related crops. Moreover, many common weeds such as wild mustard, pigweed, common lambsquarters, shepherds' purse, and purslane can serve as alternate hosts.

Brian C. Levene, Ph.D., *has worked in Michigan agriculture since moving from Iowa in 1995. In 2015, he began working at Michigan State University in the Plant Soils and Microbiology Department and transferred to the Applied Nematology Laboratory in 2018.*

Sita Thapa, Ph.D., *earned her doctorate from University of Illinois, Urbana-Champaign and is a Research Associate at Michigan State University. Her projects typically focus on evaluation of different cover crops for the management of economically important plant parasitic nematodes in Michigan.*

PHOTO 2
A) Sugarbeet seedlings with fibrous root. B) 2019 sugarbeet field trial (Quanicassee, Michigan)

MANAGEMENT STRATEGIES TO REDUCE YIELD LOSS IN SUGARBEETS

Sugarbeet seedlings infected with cyst nematodes show stunting and reduced leaf growth symptoms, and older outer leaves become yellow and wilted during the hot period of the day. The taproots tend to be stunted with fibrous 'bearded roots' (Photo 2A), but symptoms may also not be noticeable in older sugar beets plants infected by cyst nematodes (Photo 2B). For confirmation, infested roots and soil should be sent to a diagnostic laboratory such as the Michigan State University Plant & Pest Diagnostics Lab for analysis.

Should your fields test positive for cyst nematodes, most of the current management options are cultural practices that can be implemented with only small changes in farming practices. Most practices take advantage of a natural loss of cyst nematode eggs stored in the soil each season sugarbeets are not produced. Additional management choices can reduce cyst nematode spread and potentially decrease their long-term survivability, too.

Emilie Cole *is the manager and technician at the Applied Nematology Laboratory at Michigan State University. Her goal is to find effective yet economically and environmentally friendly solutions to nematode control across many of Michigan's commodities.*

Marisol Quintanilla, Ph.D., *runs the nematology laboratory in the Entomology Department at Michigan State University. Her interests are finding solutions to plant parasitic nematodes in Michigan's field, vegetable, fruit, and ornamental crops, including sugarbeets.*

BCN management's goal is to increase or maintain a high sugarbeet yield for many years to come and can be achieved through:

SANITATION – Sanitize all equipment and even your shoes between fields to limit the movement of cyst nematodes, especially to fields without the presence of these nematodes, whenever possible.

WEED MANAGEMENT – Maintain good weed control during each growing season to limit the potential for cyst nematode survivorship and/or reproduction on alternate host plants during the seasons when sugarbeets are not produced.

CROP ROTATION – Rotate to non-host crops such as corn and wheat to limit the cyst nematode population increases. Also, utilize crop rotations of three or more years between the production of sugarbeets whenever possible to reduce cyst nematodes in the field.

CYST NEMATODE TOLERANT CULTIVARS – While the "tolerant" cyst nematode varieties offer high yields, these varieties can also allow some level of nematodes to reproduce and potentially increase populations when used. Utilize cyst nematode tolerant/resistant seed varieties when sugarbeets are grown. Contact Michigan Sugar Company or your local seed dealers for the best varieties for your fields and production practices.

COVER (TRAP) CROPS – Some cyst nematode tolerant cultivars of oilseed radish-like "Defender" and "Image" have trap crop properties that can stimulate cyst nematode hatching but prevent their development and reproduction. This can be best implemented after wheat in the rotation. During Michigan State University's field research, scientists found recoverable white sugar per acre (RWSA) increased by approximately 400 pounds per acre when using oilseed radish "Defender" as a trap crop (Figure 1).

NEMATICIDES/CHEMICALS – Seed treatments and/or in-furrow pesticide applications at the time of planting can provide the sugarbeets protection from cyst nematodes and lead to enhanced yields in nematode-infested soils. There are only a few commercially available seed treatments for cyst nematodes at the present time, including Clariva pn (Syngenta), NemaStrike (Bayer — currently on hold), and Abamectin (not yet registered for sugarbeets). When these products are used, they often protect the roots in the early season, but they do not eliminate the potential for cyst nematode development for the entire season. Still, these can provide an advantage that results in greater tonnage and higher sugar yield when they are utilized (Figure 2). Also consider combining seed treatments at planting with specific foliar insecticide/fungicide applications which has also been associated with increased sugar yield per acre (Figure 3).

SUMMARY

Overall, it is always a good idea to soil sample to and consult with experts if you suspect you have cyst nematodes. If you do have cyst nematodes, using an integrated approach of the strategies can be helpful to manage nematode populations and prevent further spread. Continuous evaluation of all sugarbeet acreage and some changes in crop management can protect sugarbeet yields from this yield-robbing pest.

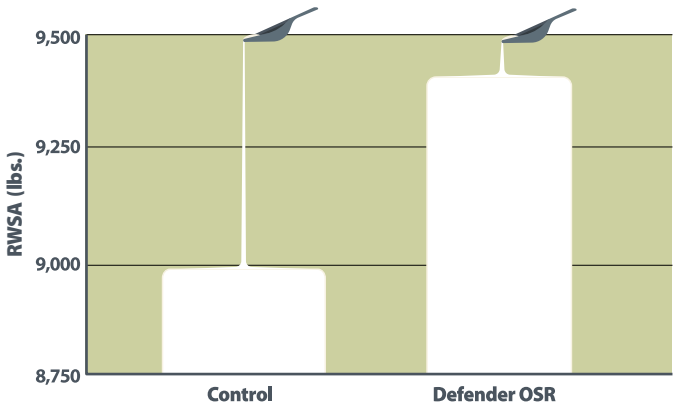


FIGURE 1 Effect of planting oilseed radish cover crop after wheat harvest on RWSA the following season.

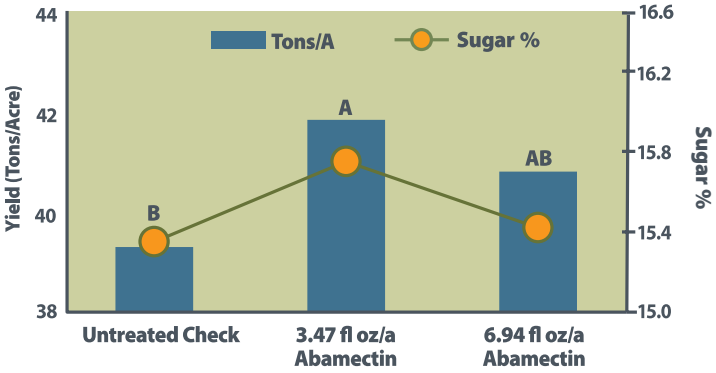


FIGURE 2 Effect of two rates of abamectin applied in-furrow on sugarbeeet yield (Tons/A) and quality (Sugar %).

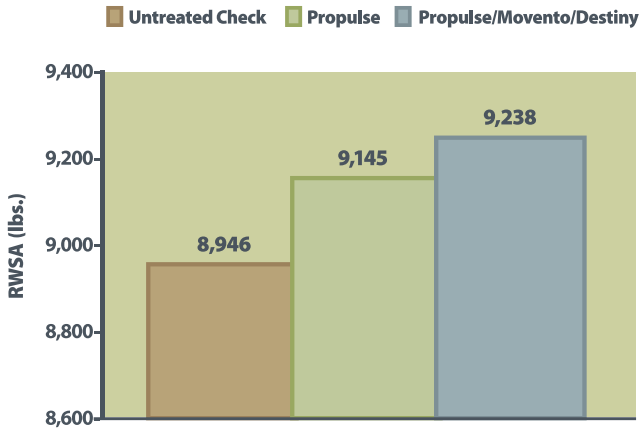


FIGURE 3 Effect of Propulse applied in-furrow only or the addition of Movento HL and Destiny HC applied foliar on RWSA.

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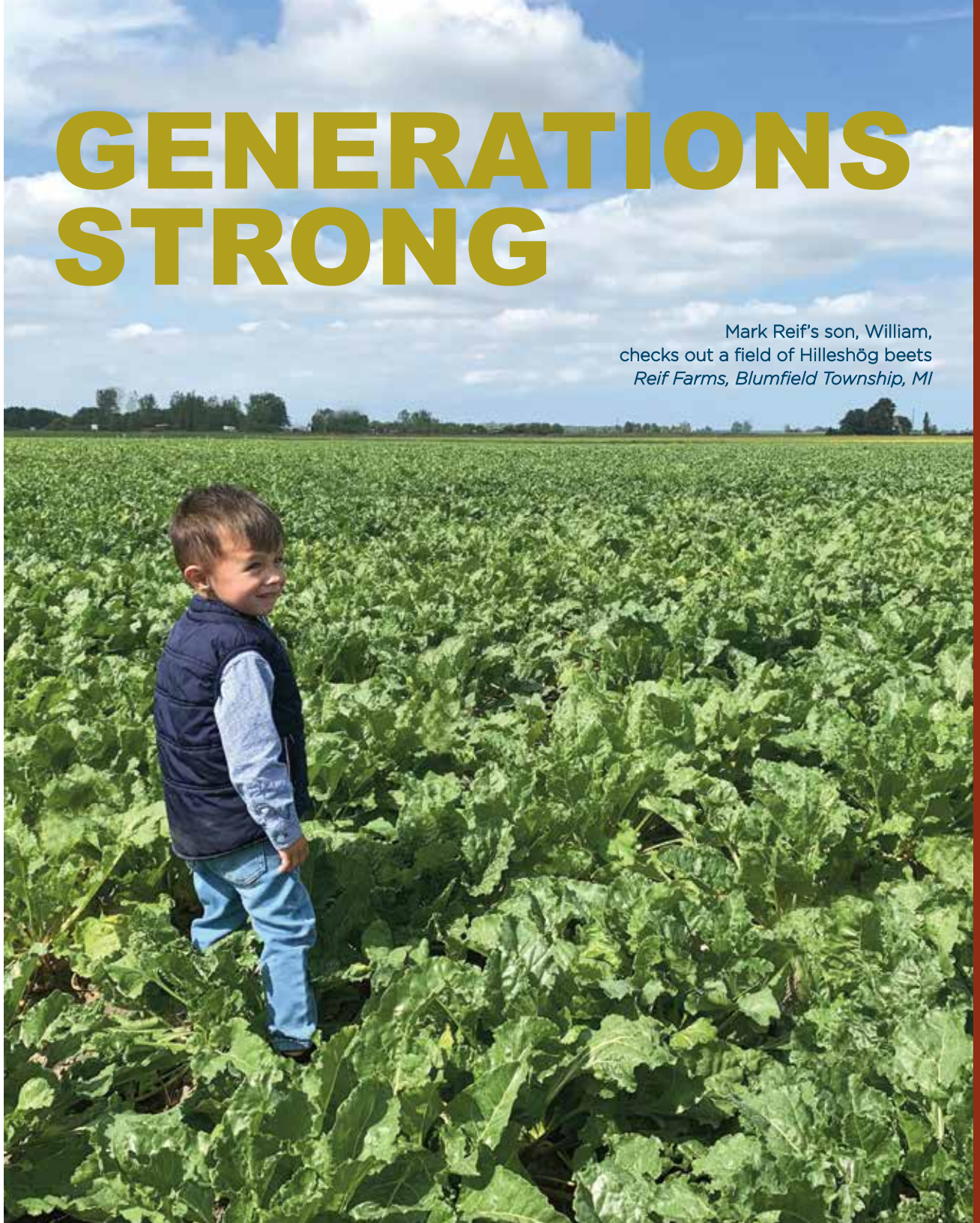

Mark Reif's son, William, checks out a field of Hilleshög beets
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HOST PREFERENCES OF ALTERNARIA LEAFSPOT PATHOGENS

Crop rotation practices indicated for best disease control

By Jaime F. Willbur, Ph.D., Malini A. Jayawardana, Daniel M. Bublitz, and Linda E. Hanson, Ph.D., Michigan State University

Alternaria leafspot has become one of the top foliar disease concerns for Michigan sugarbeet growers. In favorable conditions, the initially small, irregularly shaped spots can rapidly grow and multiply in number (Photo 1). Severe infections can lead to significant damage and defoliation, reducing yield and increasing impurities that impede sugar extraction.

Infections begin from inoculum that survived the winter in infected leaf debris. This inoculum can produce abundant spores the following spring. Generally, older plants and leaves tend to be more susceptible. Wounds, nutrient deficiencies, and other diseases, however, also may increase the risk of infection.

Alternaria leafspot is favored by cool (70-80°F) and humid (>90%) or rainy weather. In contrast, Cercospora leafspot, caused by *Cercospora beticola*, tends to favor slightly warmer temperatures (75-95°F), although both leafspots can occur together (Photo 2). Where Cercospora is typically an issue in the warmer weather of mid- to late-summer, Alternaria generally favors the cooler weather associated with early spring or late fall.

Alternaria leafspot is caused by a group of highly similar fungi referred to as the "*A. alternata* species complex" or AASC. These pathogens can infect sugarbeets, table beets, and Swiss chard. The AASC is sometimes reported to have a broad host range, potentially infecting vegetable crops such as cauliflower, cabbage, kale, dry beans, broccoli, tomatoes, potatoes, and onions, as well as some common weeds, including wild mustard, radish, and turnip. However, other reports have identified limited host ranges or host specificity in the AASC. To inform crop rotation practices for Alternaria leafspot management, Michigan State University and United States Department of Agriculture's Agricultural Research Service (USDA-ARS) sugarbeet pathology researchers began to investigate the host preference of AASC isolates affecting Michigan crops.

PHOTO 1 Alternaria leafspot symptoms on sugarbeets. Notice the characteristic rings forming within the irregular-shaped lesions. *(Photos by Daniel M. Bublitz)*

Malini A. Jayawardana is an MSU graduate student conducting this research with Linda E. Hanson, a Research Plant Pathologist with the USDA-ARS. Jayawardana collected AASC isolates from two common host crops: sugarbeets and potatoes. She then monitored disease progress in five different hosts: sugarbeets, tomatoes, potatoes, apples, and dry beans (black, navy, and pinto). Her research has found that each of the collected AASC isolates caused disease on all tested hosts (Figure 1).

Interestingly, the disease progression rate was highest in beans though preliminary experiments suggest certain dry bean classes may be more resistant to infection.

These results suggest the AASC affecting Michigan sugarbeets have a wide host range. This means that other crops (such as dry beans and potatoes) can serve as sources and reservoirs for Alternaria leafspot inoculum. In areas where Alternaria leafspot is a

Though strobilurin and tin products can help to effectively manage Alternaria leafspot, use of appropriate weed management to control weedy hosts, such as wild mustard and wild radish, can also improve Alternaria management.

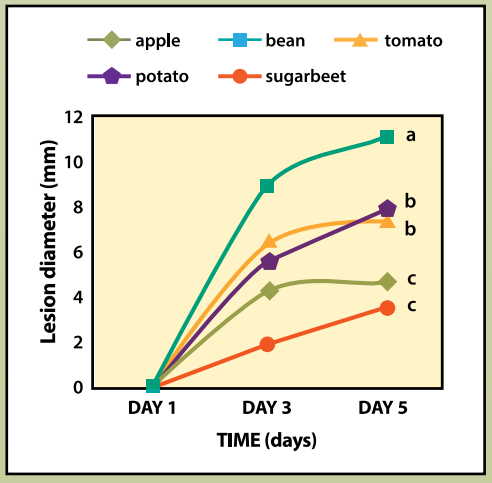


FIGURE 1 Disease progress for AASC isolates on five different hosts. Trendlines with the same letters are not significantly different based on Fisher's protected LSD at 0.05. *(Chart by Malini A. Jayawardana)*

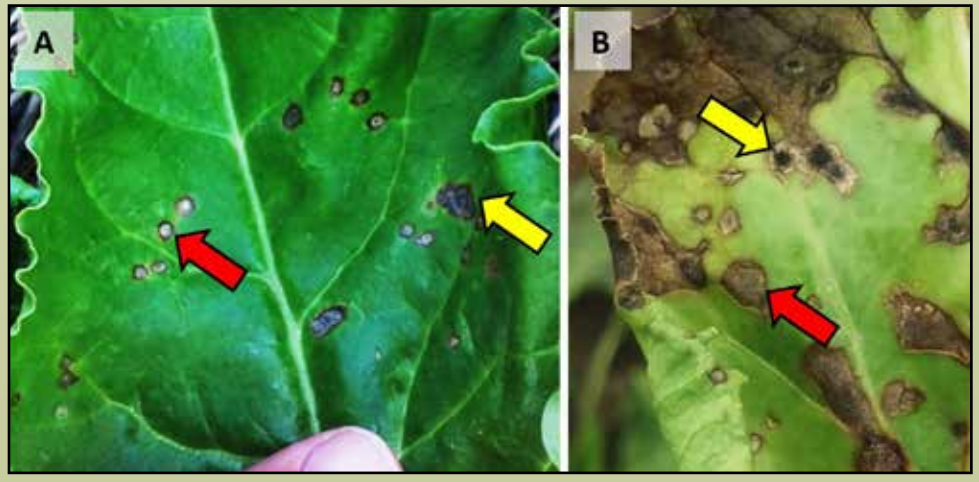


PHOTO 2 Comparison of Cercospora (red arrows) and Alternaria (yellow arrows) leafspots (A) and associated silver-gray or black sporulation (B) on sugarbeets. *(Photos by Daniel M. Bublitz)*

concern, management programs should consider limiting the use of these crops in a rotation. Based on preliminary observations, additional experiments will be done to help researchers understand potential levels of resistance within and between dry bean classes. Ongoing research will validate these observations and evaluate impacts on Alternaria leafspot management.

Because of fungicide resistance concerns, it is important to consider crop rotation and variety resistance in a management program. Resistance by AASC to several fungicide classes is repeatedly detected in annual screenings (recent results available in the 2019 REACh Research Results, pp. 69-70), though strobilurin and tin products can help to effectively manage Alternaria leafspot. Use of appropriate weed management to control weedy hosts, such as wild mustard and wild radish, can also improve Alternaria management.

In other ongoing studies, MSU and USDA-ARS researchers are developing greenhouse and field screening methods to help identify resistant sugarbeet varieties and other management tools that will one day improve the ability to control this disease.

Malini A. Jayawardana *is a graduate student in the Department of Plant, Soil and Microbial Sciences at Michigan State University. She is originally from Sri Lanka and is working in Linda E. Hanson's lab focusing on diversity of Alternaria alternata species complex associated with Alternaria leafspot in sugarbeets.*

MISSION: Weed Control

Horseweed and waterhemp pose major challenges for Michigan sugarbeet growers

By Christy Sprague, Ph.D, Professor and Weed Extension Specialist, Michigan State University

Three years ago, an article published in *The Newsbeet* highlighted weed control issues on the horizon for Michigan sugarbeet farmers. Most of these issues were related to the increased development and spread of glyphosate- and multiple-resistant weeds throughout Michigan's sugarbeet growing region.

The good news is no new glyphosate-resistant weed species have been identified in Michigan since that article was written. The bad news is we have seen the expansion of our current glyphosate- and multiple-resistant weed populations across much of Michigan, including into sugarbeet fields. Of these species, horseweed and waterhemp are the two most frequently found in sugarbeet fields. Because of these issues, we have continued to look for new strategies to manage these weeds. Below are current recommendations from the Department of Plant, Soil and Microbial Science at Michigan State University and highlights of new research on potential management strategies.

HORSEWEED

Horseweed is by far the biggest and most common herbicide-resistant weed challenge for Michigan sugarbeet farmers. Glyphosate (Group 9) resistance, and early and continued emergence of horseweed seedlings throughout the growing season have made management increasingly difficult in sugarbeets. While there are no perfect options for horseweed control, it is the one glyphosate-resistant weed species that we have a better chance managing in sugarbeets. From our research we know we can get good control of horseweed with the Group 4 herbicide Stinger (clopyralid). However, control is rate- and horseweed size-dependent.

To effectively manage horseweed, it is important to follow these recommendations:

- Plant sugarbeets into a horseweed-free seedbed.
  - For example: tillage, Gramoxone, Liberty
- Apply Stinger tank-mixed with glyphosate in at least two of the glyphosate applications. Good results have been observed with:
  - 3 fluid ounces per acre, followed by 3 fluid ounces per acre of Stinger, or
  - 2 fluid ounces per acre, followed by 4 fluid ounces per acre.

While following these recommendations can provide good control of horseweed, there are some precautions that growers need to follow. It is important to remember Stinger has a 45-day preharvest interval. It also is important to not exceed a total of 10.7 fluid ounces per acre of Stinger per year and to be mindful of crop rotation restrictions. Stinger is dissipated by microbes and the speed of degradation is dependent on rainfall, temperature, and soil organic matter.

PHOTO 1 Horseweed suppression with a cereal rye cover crop terminated with glyphosate and followed with a roller crimper just prior to planting, left, compared with a no cover crop control, right. Photo was taken two weeks after planting.

All these factors impact which crops can be planted the year following Stinger application. The crop rotation restriction for soybeans and dry beans is 10.5 months for soils with greater than 2% organic matter and 15 inches of rainfall is needed during the 12 months following application. If soil organic matter is less than 2% and rainfall is less than 15 inches, the rotation restrictions for dry beans and soybeans are lengthened to 18 months. Corn can be planted at any time. Removing plant residues and deep plowing can help alleviate the chances for Stinger carryover. Remember if you are concerned about the potential for carryover, a field bioassay can be conducted.

NEW RESEARCH ON INTEGRATING COVER CROPS

Since Stinger is the only herbicide option for in-season horseweed control, relying on this herbicide alone to control horseweed increases selection pressure that could lead to the development of additional resistances. One potential approach to improve management of herbicide-resistant horseweed is to utilize a fall-planted cereal cover crop to suppress growth of fall and early spring emerging horseweed.

Currently, Michigan State University is in its second year of research examining multiple management strategies, including a cereal rye cover crop, to help improve horseweed control. In this study, researchers have examined the use of cereal rye planted in the fall and terminated with glyphosate at three different timings: one to two weeks prior to planting (early); at planting, and one to two weeks after planting (a delayed burndown treatment). These treatments were compared with a no cover crop control. Within each cover crop treatment there were three different postemergence herbicide strategies examined: glyphosate applied twice (control); glyphosate followed by glyphosate + Stinger (4 fluid ounces per acre); and glyphosate + Stinger twice (2 fluid ounces per acre followed by 4 fluid ounces per acre).

From Michigan State University's 2019 research, we found that cereal rye suppressed horseweed by at least 11 times more than the no cover control, 14 days after planting, regardless of termination method (Photo 1). Overall, horseweed biomass was lower for all the treatments, except the one application of clopyralid without a cereal rye cover crop compared with the no cover crop control. This indicated that the cereal rye helped suppress horseweed to where the first application of Stinger was not needed. The delayed burndown treatment with either of the Stinger treatments reduced horseweed biomass by 99%.

At harvest, regardless of termination, cereal rye cover crop reduced horseweed biomass up to 75%. Even though horseweed biomass was lowest in the delayed burndown treatment, sugarbeet yield was also reduced and was not different compared with the no cover control. Sugarbeet yield was highest when the cereal rye was terminated at sugarbeet planting. In this year's research, Michigan State University has also included treatments that are examining the effects of strip-tillage in these systems.

WATERHEMP

Ten years ago, waterhemp was rarely talked about in Michigan. Over the last few years, however, waterhemp has become more prevalent across the state and because of herbicide-resistance issues it is one of the most challenging weeds to control in several crops including sugarbeets (Photo 2).

The majority of waterhemp populations in Michigan are resistant to glyphosate (Group 9) and the ALS-inhibiting (Group 2) herbicides. In addition, some populations have developed resistance to the triazine (Group 5) and PPO-inhibiting (Group 14) herbicides. Resistance issues combined with rapid growth rates, long emergence patterns, and high seed production make waterhemp extremely difficult to control.

Over the past couple of years, Michigan State University has focused its research efforts on examining strategies to manage waterhemp. Researchers have looked at potential older herbicides, including Goltix and Ultra Blazer, that currently are not labeled for use in sugarbeets, using higher rates of currently labeled herbicides postemergence (ethofumesate), and the use of overlapping residual soil-applied herbicides like Warrant, Dual Magnum, and Outlook. To date, the use of overlapping residual herbicides tank-mixed with POST glyphosate applications has been the most promising. These applications are made when a sugarbeet plant has two fully expanded leaves and then again when the plant is in the six- to eight-leaf stage.

PHOTO 2 Waterhemp in a commercial Michigan sugarbeet field three weeks before harvest.

It is important to remember that the residual herbicide will not control emerged waterhemp. That is where understanding the time of waterhemp emergence in relation to sugarbeet planting is important. Most of Michigan's waterhemp populations start to emerge the third or fourth week of May. The first application of a residual herbicide would need to be applied before waterhemp emergence. If sugarbeets are planted later, the use of a pre-emergence herbicide, like ethofumesate, would be needed.

While we have been focusing on strategies to manage waterhemp in sugarbeets and other crops, the best way to manage waterhemp is to never let it become established. Proper identification of waterhemp from many of our native pigweed species is critical. It is essential for all growers to scout for waterhemp in their fields. If initial glyphosate applications are not controlling pigweed, it may be waterhemp or Palmer amaranth. It is important to get confirmation of this early to allow for potential management with herbicides or hand-weeding before seed production.

Remember one female plant can produce an average of 100,000 to 400,000 seeds. In many cases, if identified early, there may only be a few plants scattered throughout the field and removal of these weeds before they produce seeds is extremely important. To help with the identification of waterhemp and Palmer amaranth, Michigan State University has developed fact sheets and a video clip that can be viewed online at www.msuweeds.com.

Christy Sprague, Ph.D., *is a professor and Weed Extension Specialist at Michigan State University, in the Department of Plant, Soil and Microbial Science. Christy provides leadership and expertise, working to educate on management strategies for emerging problematic weeds in sugarbeets, soybeans, small grains, and dry beans. She specializes in management of herbicide-resistant weeds.*

Investing Their Lives

Michigan Sugar Company Grower-Owners Chris and Angie Guza 'make hay while the sun shines'

By Rob Clark, Director of Communications and Community Relations

At age 5, Chris Guza knew he wanted to be a farmer.

But he did not take a traditional path to get there.

In fact, his father Marty — who worked as a builder primarily constructing agriculture buildings — discouraged him from choosing that life. Sure, the family had about 70 acres of farmland, but it was a hobby farm designed to help teach the Guza children — Chris, Tony, Marty Jr., Jake, and Angie — life lessons and skills.

"We putzed around with it," said Chris, the oldest of the Guza children. "The farming we do now is much different from what my parents did."

Based in Ubly, Guza Farms LLC today comprises 2,800 acres in Huron, Sanilac, and Tuscola counties. Chris and his wife Angie — who never dreamed as a child of being a farmer — grow 850 acres of sugarbeets, as well as corn, wheat, and edible dry beans. They also custom farm 1,000 acres of corn for Dekker Farms.

"In our family we like to say we make hay while the sun shines," said Angie. "It's a lot of hard work and it doesn't just happen by some miracle. Luckily, we have and have had a great group of employees who are willing to help get the job done because when something needs to be done, you do it.

"Your whole life is invested in what you're doing."

'EVERYBODY HAD LITTLE FARMS'

Growing up, Chris Guza was exposed to farming at an early age. Both sets of his grandparents — Ed and Elizabeth Guza and Zig and Maggie Leppek — owned farmland, Ed and Elizabeth in the Verona area and Zig and Maggie in the Rapson area. Both couples had come back to the Thumb during the Great Depression.

"Everybody had little farms," said Chris, explaining that Ed and Elizabeth Guza were full-time farmers, but Zig and Maggie Leppek worked other jobs in addition to farming.

Because his parents were not full-time farmers either, Chris got his first real taste of working on a farm while he was a student at Ubly High School.

"I had a friend from Gentner Dairy in Minden City. I wanted to farm, so I started working for them," he said, noting at the time the farm was owned by the late Jim Gentner.

After graduating from high school in 1991, Chris attended Great Lakes Junior College in Bad Axe taking part in an agriculture technology program being run in partnership with Michigan State University. After one semester, the program folded, and Chris headed south to work for an excavating company in the Brighton area. When the owner of the company died, Chris went to work for D & R Heating and Cooling in Pinckney, where he spent a year on the job.

Chris and Angie Guza in a sugarbeet field located in Huron County's Paris Township. The couple was married on July 20, 2002, at St. Columbkille Church in Sheridan Corners.

Chris Guza, who serves as Vice President of Michigan Sugar Company's East District Board of Directors, inspects the sugarbeets in a Huron County field on July 22, 2020. Guza said he began planting beets this year on March 27 and had to do some replanting on April 24.

"I came back to work with my dad as a builder," he said. "We ended up doing some work for Gentner Dairy and one thing led to another and I found myself back working for them."

By that time, the dairy farm had been taken over by Mark and Keith Gentner. Chris said it eventually became clear to him that to create the life he had always wanted as a farmer he would have to strike out on his own. In 1998, while continuing to work for the Gentners, he did just that, purchasing his first 100 acres of farmland near Parisville, where he was born and spent a good portion of his childhood.

"I established Guza Farms and also rented some acres," Guza said. "I planted 250 acres that first year."

CHRIS MEETS ANGIE

Meanwhile, Angie Guza, a farm girl from Ivanhoe, was one year out of Bad Axe High School and attending Hope College in Holland, where she would earn her bachelor's degree in biology and chemistry in 2001.

"In college, I was doing plant genetic research and I figured I was heading toward a life in a place like Indianapolis," she said. "I wasn't sure I wanted to live and work in a city that big."

Chris and Angie started dating while she was in college.

"I knew Chris' younger brother, Marty, and Chris knew my sister, Amy. Our circles overlapped and the planets aligned."

The union would prove to play an important role in the future of Guza Farms as Chris came to know Angie's grandparents Ken and Laura McRae, who farmed about 1,600 acres in Huron and Sanilac counties.

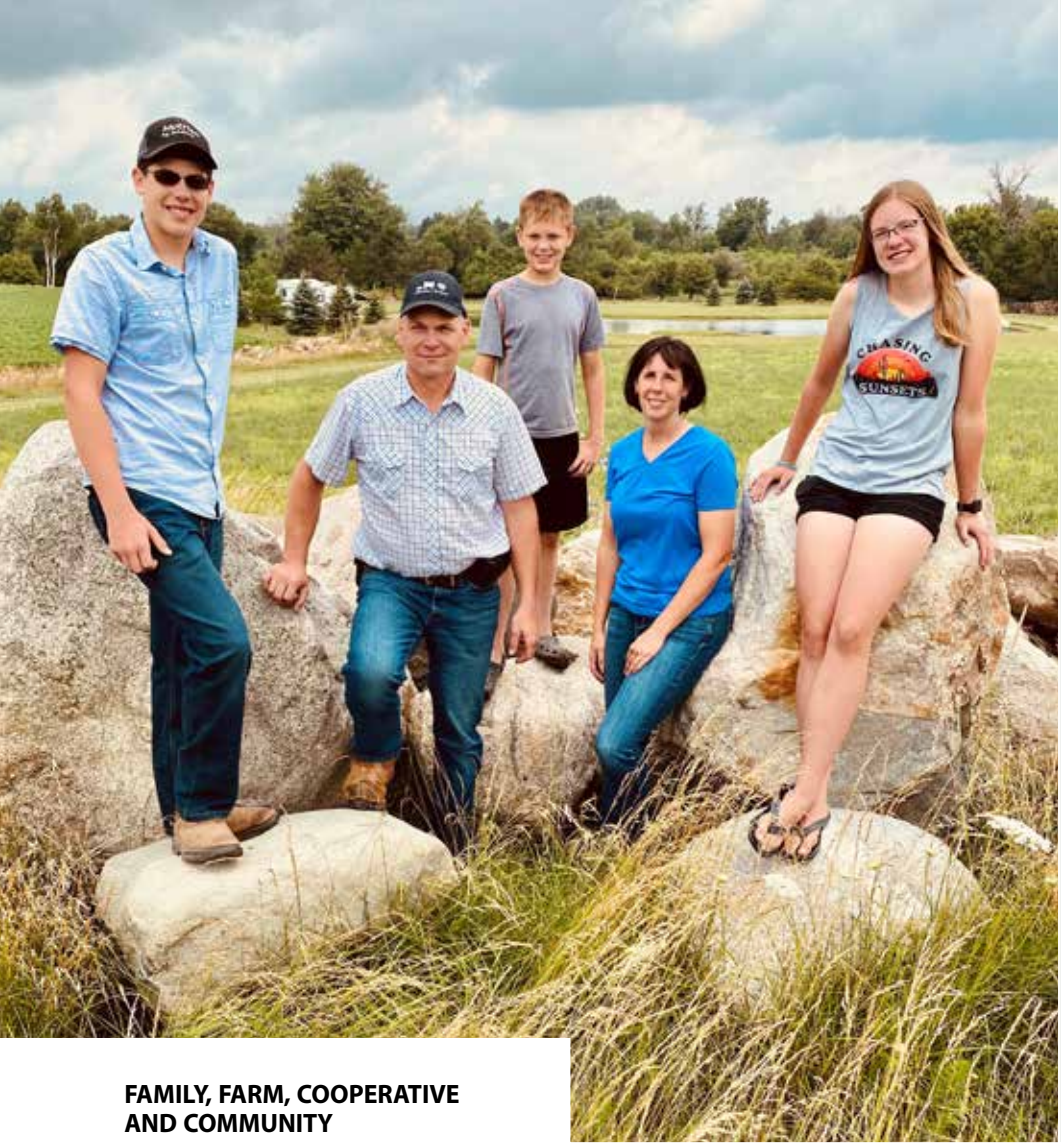
"Ken and Chris really clicked," said Angie. "Ken was hoping to slow down a bit and wondered what to do with some of the land. They ended up renting us about 600 acres to farm beginning in the spring of 2002."

By that time, Chris had left Gentner Dairy and he and Angie were engaged to be married. Angie had completed a one-year program at University of Michigan, earning her master's degree and said she was thinking about becoming a biology teacher.

When they were married on July 20, 2002, Chris Guza was farming about 1,650 acres, including 300 acres of sugarbeets he had contracted as a shareholder just after Michigan Sugar Company became a cooperative.

"I wound up substitute teaching at Cass City High School for $65 a day and I was keeping my eyes open for a permanent teaching job," said Angie. "But Chris needed help, so I learned to drive a tractor and do bookwork. Back then, we didn't have any employees; it was just the two of us.

"I didn't know what I was getting into," she added with a laugh.



ABOVE Chris and Angie Guza, along with their son Grant, 13, inspect a field of sugarbeets located at the intersection of McDonald and Atwater roads in Huron County's Paris Township. This year, the family planted 850 acres of sugarbeets.

LEFT Chris and Angie Guza with their children, from left, Grant, 13; John, 11 and Abbie, 15. The family owns Guza Farms LLC in Ubly and grows 2,800 acres of sugarbeets, corn, wheat, and dry beans in Huron, Sanilac, and Tuscola counties.

FAMILY, FARM, COOPERATIVE AND COMMUNITY

Fast forward 18 years and the Chris and Angie Guza family now includes three children — Abbie, Grant, and John.

Abbie, 15, is a sophomore at Ubly High School where she is a member of FFA, runs cross country and track and plays bass clarinet in the band. Grant, 13, is in eighth grade at Ubly Middle School, where he is a member of FFA, runs track, competes in robotics, and plays baritone horn in the band. John, 11, is in sixth grade at Ubly Middle School, where he participates in cross country and plays trombone in the school band and also plans to compete in track and robotics.

All three of the children are active in the Country Corners 4-H Club and can usually be found for a week each summer at the Huron Community Fair showing their animals.

Abbie hopes to go to college and says she is interested in veterinary science. Grant says he hopes to follow in his father's footsteps as a farmer. John has not yet decided what his future might hold.

In many ways, Guza Farms has been a pioneer.

The farm was one of the first in Michigan to earn Michigan Agriculture Environmental Assurance Program certification. The certification is given through a volunteer program that tracks things like nutrient and erosion standards, crop mapping and where and how fertilizer is applied, among other benchmarks. Of the more than 50,000 farms in Michigan, 5,645 are MAEAP Certified. Guza Farms was honored with an award last year for being one of the first to earn certification.

Guza Farms also was one of the first farms growing sugarbeets for Michigan Sugar Company to begin utilizing a MAUS during early harvest about 10 years ago. Today, in partnership with Doug and Les Volmering, Guza Farms is part of Thumb MAUS LLC and owns two MAUS loaders.

Chris Guza has been active in helping lead the cooperative as well. He has been on the East District Board of Directors for 11 years and currently serves as Vice President. He also is a past member of the cooperative's Political Action Committee, past Chairman of the REACh Committee, and currently serves on the Grower Relations Committee.

He said down the road he may be interested in running for a position on the Co-op Board of Directors.

Chris and Angie also are involved in their community and their church — St. Mary's-St. Isidore Catholic Church in Parisville, where Angie serves on the Finance Council and teaches religious education classes and Chris is a member of the Men's Club.

Angie is a former Trustee for Paris Township and currently works as the Assessor for Bingham and Sheridan townships. Chris is a former member of the Paris Township Planning Commission.

With all these responsibilities, it is easy to understand why it is important that the Guza family makes hay when the sun shines, but Angie offers one other bit of advice the family follows:

"You have to go with the flow." ■

The Newsbeet **asked Chris and Angie Guza of Guza Farms LLC in Ubly a few questions so readers can get better acquainted with the family. Here is what they had to say:**

Q: Tell us about your 2019 sugarbeet crop.

A: 32.8 tons per acre and 18.12% sugar. Our best field produced 10,250 pounds of sugar per acre.

Q: What is something innovative you do on your farm?

A: We install our own drainage tile and we also were among the first growers to begin MAUSing sugarbeets about a decade ago in the Ruth District. We are part of Thumb MAUS LLC with Doug and Les Volmering. Together, we own two MAUS loaders.

Q: How did you earn the sign on the outside of your farm shop?

A: We were one of the first farms in the state of Michigan to earn Michigan Agriculture Environmental Assurance Program certification. It is a voluntary program that honors farms with strong sustainability practices. We renew the certification every three years.

Q: Are you a red or green family?

A: Both. We have red tractors and green planters. We have a little bit of everything.

Q: What is your favorite recipe using Pioneer Sugar?

A: Banana bread and Grant's Homemade Lemonade. The secret is to cut the lemons in half and then microwave them for 1 ½ to 2 minutes.

Grant's Homemade Lemonade Recipe

Mix the following ingredients

- 4 cups of cold water
- 1 lemon, cut in half, microwaved for 1 ½ to 2 minutes, then squeezed into water
- ½ cup Pioneer Sugar
- Zest optional

Q: Where is your favorite spot in Michigan?

A: At home … or camping. We camp somewhere every year. This year, we are going to Carsonville.

Q: Where did you honeymoon?

A: There was no honeymoon because we got married in the middle of farming season. We went to Port Austin for the night, then we were back to farming the next day. That winter we went to Las Vegas.

Chris Guza pitches a horseshoe at one of the three pits he recently constructed on his homestead in Ubly. He plays horseshoes with his farmer friends about once a week.

Q: What is your favorite type of music?

A: Polka. We love to go out dancing. The St. Stan's festival in Bay City has always been a favorite.

Q: What are your hobbies?

A: **Chris:** Bowling and horseshoes.
Angie: Reading, gardening, and kids' stuff.

Q: Do you have any pets?

A: Yes. We have an old shop dog named Dawg.

Bay City

Work to replace significant sections of the steel shell and walkways of the lime kiln began this past summer. The project also involves repainting the lime kiln.

By Jason Lowry, Vice President of Operations, and Nick Klein, Director of Engineering

More than $2 million in capital was spent during the last inter-campaign at the Bay City factory.

The largest project by far was to repair and repaint the lime kiln external shell at a total cost of $1.25 million. The brick liner in the kiln was replaced last year and at that time an inspection of the external shell and stairways showed that refurbishment was required.

Another $420,000 was spent inside the factory to replace and repair steel support beams that had corroded over time due to the damp and warm environment. The beams in question were located under the smaller pulp press installation, and the job was expanded in scope to ensure that risks to equipment and personnel were mitigated.

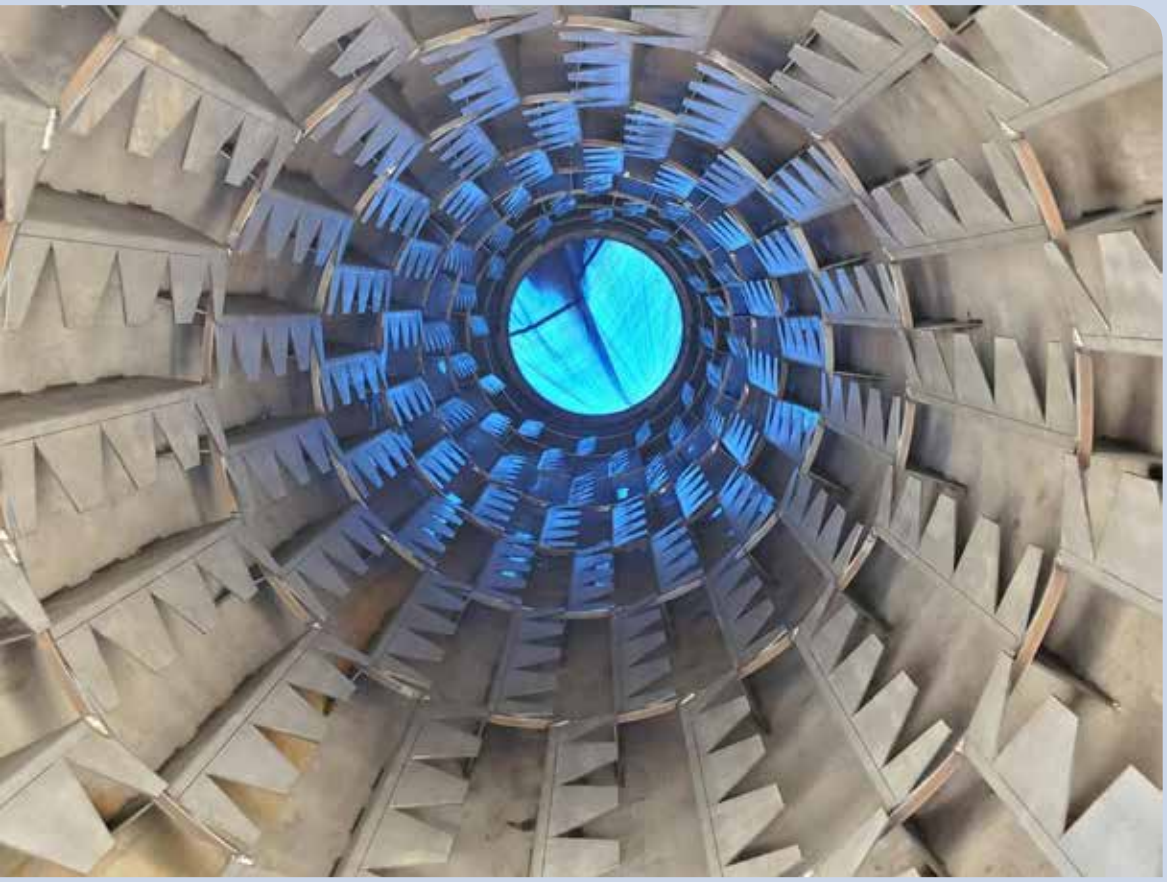
These two projects have absorbed much of the available funding for the Bay City factory to refurbish existing assets, and while they do not provide additional throughput or recovery, they are necessary to ensure the company's continuing ability to process the sugarbeet crop for the coming year and into the future.

An additional $135,000 has been spent to explore the costs, feasibility and returns associated with an expansion of the molasses desugarization process, also known as "desug." This effort has involved the equipment supplier and engineering team that recently installed a very similar process in Russia, that is working very efficiently.

Another $100,000 was spent to explore the costs and returns associated with replacing the granulator and dryer with a new style granulator like the one installed recently in Caro. If Michigan Sugar Company moves ahead with the full-scale project in the coming year, it will eliminate the need for the fluid bed dryer at Bay City. This will result in significant savings and risk mitigation for the factory.

The remaining capital expenditure was spent on multiple projects to replace mobile equipment that has exceeded its useful life, improve the spray table water filtration system, and relocate magnets in the pellet flows to improve metal capture.

Here is a look at the beam replacement project from above (above) and from below (right). Michigan Sugar Company invested $420,000 to replace corroded beams inside the Bay City factory.



LEFT & BELOW
A view inside the new granulator at the Caro factory (left) shows the series of baskets used to tumble dry sugar before it is stored or packaged. Below is an exterior photo of the granulator that was built in 1977 by Stearns-Roger Engineering Corp. and refurbished by Sugar Technology International.

A new variable frequency drive-controlled carbon dioxide blower was installed at the Caro factory to replace two gas blowers manufactured in the 1940s and installed in Caro in the 1950s. The new blower simplifies maintenance and optimizes the control process.

Michigan Sugar Company invested more than $1.4 million in new capital equipment this year to improve operations and extend asset life in Caro.

Almost half of this money was spent to finish the improved sugar granulator installation that occurred throughout the year. This new granulator design uses a compact, yet efficient, air exchange system to dry and cool the sugar, and initial tests at the end of last campaign showed good results.

A total of $275,000 was spent to install a new carbon dioxide gas blower that allowed the factory to remove some old, inefficient units and improve the control and operation of the lime kilns.

Additional pond aerators were added to the wastewater system at a cost of $100,000 to allow for environmental compliance with the longer campaigns and shorter treatment times.

The remainder of the capital was spent to replace obsolete or worn out assets, including the control server for the operating system, the leaking roof of one of the final product molasses tanks, and two site loaders needed for the continued operation of the factory. ■

Caro

Jason Lowry *is Michigan Sugar Company's Vice President of Operations. In this role, Jason provides leadership and direction to the areas of Factory Operations, Engineering, Asset Management, Environmental Compliance, and Quality for the company. Jason joined Michigan Sugar in early 2019 and has worked in the global sugar industry in both beet and cane sugar milling and refining.*

Nick Klein *is the Director of Engineering for Michigan Sugar Company. He is a 2003 graduate of Ferris State University and joined Michigan Sugar Company in 2009. He currently serves on the Board of Directors for the American Society of Sugar Beet Technologists. He and his wife Megan have three children.*

Croswell

As part of a multi-year, $65 million expansion project aimed at increasing sugarbeet slicing capacity by 50%, staff at Michigan Sugar Company's Croswell factory have worked closely with the corporate Engineering Department to plan and install projects during the last fiscal year that represent an investment of more than $14.5 million.

The largest project by far was in the beet receiving, washing and chip recovery area where more than $11.5 million was spent. Previous updates have shown the progress of the project that includes a new structure to house a shortened wet flume complete with rock catcher, weed catcher, gravel catcher, sand catcher and new spray table. Before and after these assets are dry conveying belts that reduce the length of time the beet is immersed in flume water, again reducing the losses experienced in a traditional wash system. Additionally, a large concrete slab is being installed to allow for effective staging and dumping of beets into the process.

Another $1.8 million has been spent to replace older, small, and inefficient pulp presses with a larger capacity and highly efficient pulp press. Through this project, the factory aims to reduce the amount of assets to maintain while increasing capacity of pressing for the future needs of the business.

The remaining money was spent to commence engineering efforts for next year's final phase of the expansion, as well as replace old assets ranging from masonry building walls to mobile equipment loaders needed for the continued operation of the factory.

TOP A view of the new Croswell beet receiving and washing system taken from atop the sugar silo. **MIDDLE** Sugarbeets are transported from the new hopper in Croswell up a conveyor to the new handling and washing system. **BOTTOM** Sugarbeets are washed on the new high-pressure roller spray table in Croswell.

New opportunities take us to Toledo

Sebewaing

Sebewaing's new thin juice heating station, complete with highly efficient plate and frame exchangers to replace non-serviceable shell and tube exchangers.

The Sebewaing factory received just under $1.4 million in new capital investment this year that primarily went toward refurbishing or replacing assets for the continued operation and success of the site.

The largest capital spend at the site was $500,000 to upgrade the drive for one of the larger pulp presses. Formerly driven by steam, this drive failed during the last campaign. Quick investigation by the site staff and corporate Engineering Department determined that the quickest way to get this press back online was to convert the drive to an electric motor and purchase a new gearbox that one of Michigan Sugar Company's vendors had on hand. The project was completed quickly, returning the site to full pressing capability.

Another $200,000 was spent to replace shell and tube heat exchangers for thin juice that were no longer serviceable with new and more efficient plate-and-frame exchangers. This will improve the heating of the thin juice compared to previous years, allowing for more evaporation in the evaporators.

An industrial vacuum system for the pellet building was added at a cost of $165,000. This project was required for dust abatement to reduce the risk of fire in the area and will close out an issue raised by Michigan Sugar Company's insurance providers in the past.

The remaining funds were used to replace aging assets like non-serviceable air compressors, remove and replace asbestos-containing insulation, and refurbish the primary control room and interfaces used continuously by the operators during the slice campaign. ▮

Michigan Sugar Company producing liquid cane sugar at Ohio facility

By Pedro L. Figueroa, Vice President of Sales and Marketing

As part of the AmCane acquisition in 2016, Michigan Sugar Company acquired a subsidiary called Arbor Foods Inc. at the Port of Toledo in Ohio. Arbor Foods' beginnings date back to the 1980s, when its founders set up an operation to import sugar from the international markets for the manufacturing of high sugar-containing blends, like iced-tea and hot cocoa mixes, into the United States.

With more of the blend market assigned to Canada in recent years under concessions through the North American Free Trade Agreement, as well as the newly implemented U.S., Mexico & Canada Free Trade Agreement, Arbor Foods' business model evolved under Michigan Sugar Company's ownership to include other revenue streams that also cater to the company's core geographic market.

Benefitting from the recent closure of Michigan Sugar Company's facility in Taylor, Mich., the Toledo facility — known as MSC Toledo — is now the cooperative's cane-only sugar hub, servicing a significant market need right in Michigan Sugar Company's backyard for cane-specific products.

The Toledo location offers liquid sucrose for industrial food manufacturers in both conventional and high color varieties (depending on customer formulation needs) and serves as Michigan Sugar Company's import hub for organic granulated sugars that are distributed throughout the Midwest. So far this year, the operation has sourced its refined sugar for melting through the importation of 80 million pounds in two large vessels from Morocco and 20 million pounds from Mexico via rail.

The Toledo operation comprises about 140,000 square feet and employs close to 25 people.

Companies like Dannon, Nestlé, Dean Foods, Red Gold, and General Mills act as Michigan Sugar Company's main partners, so company officials are confident there is potential to grow this segment of the market, while also protecting Michigan Sugar Company's core geographic area from would-be competitors. The port location makes Toledo a great hub and extension for Michigan Sugar Company's business, with new projects, like 50-pound bags and liquid organic sugar, scheduled to come online soon. ▮

LEFT Large totes of refined sugar are unloaded from a Moroccan vessel at Michigan Sugar Company's Toledo facility on July 13, 2020.

***Pedro L. Figueroa** is Michigan Sugar Company's Vice President of Sales and Marketing. He joined the company in 2018 and has been active in commercial efforts within the North American sugar market for more than 25 years.*

WE ♥ OUR PEOPLE

Hitting the Road to Honor Employees

Michigan Sugar Company Celebrates Milestone Work Anniversaries

By Rob Clark, Director of Communications and Community Relations

Flexibility was the key word this summer as Michigan Sugar Company officials hit the road to thank employees and honor those celebrating milestone work anniversaries.

In recent years, Michigan Sugar has held its annual Employee Service Awards presentation in May at Saginaw Valley State University, inviting employees from across the company's footprint to come to Saginaw County for the day. This year, due to concerns over the COVID-19 pandemic, such a ceremony was not feasible.

So, company leaders decided to take the show on the road and host nine outdoor ceremonies in Bay City, Caro, Croswell and Sebewaing to honor 174 employees celebrating five, 10, 15, 20, 25, 30, 35, 40 and 45 years of service to the company. The ceremonies — designed to ensure proper social distancing — began July 27 at Bieth Memorial Park in Caro, and continued July 28 in a tent outside Michigan Sugar Company's Croswell factory; July 29 in Sebewaing Village Park; and July 31, Aug. 3, and Aug. 6 in the Nickless Family Community Pavilion at Wenonah Park in downtown Bay City. During the events in Bay City, employees from the Bay City factory, Packaging and Warehousing and Agriculture departments, as well as those from Michigan Sugar Company's Corporate Headquarters and Carrollton facility were honored.

Each event included welcome remarks from Michigan Sugar Company Executive Vice President James Ruhlman and a presentation about the company's purpose, mission, and values by President and CEO Mark Flegenheimer. A barbecue lunch was provided to each group of employees.

"While we take time to honor those employees celebrating significant milestones, these ceremonies also provide us an opportunity to thank our entire workforce of essential employees," said Flegenheimer, noting all active employees were invited to take part in one of the ceremonies. "Especially during the COVID-19 pandemic, our employees have risen to meet the challenges and keep our product flowing during a time of great demand. Simply put, they have been outstanding."

Here is a look at the employees recognized during the events. To them, and to all our employees, thank you for your service!

NAME	DEPT.	LOCATION
5 YEARS		
Alfredo Garcia	Ag	Bay City
Lucas Houghtaling	Ag	Bay City
Joshua Kozlowski	Ag	Bay City
Mark Melchi	Ag	Bay City
Thomas Post	Ag	Bay City
Michael Bloye	Operating	Bay City
Trent Damm	Operating	Bay City
Jordan Gaeth	Operating	Bay City
Robert Kennedy	Operating	Bay City
Derrick Kolba	Operating	Bay City
Bryan Laleman	Operating	Bay City
Thomas Owczarzak	Operating	Bay City
Devin Scheffler	Operating	Bay City
William Wise	Operating	Bay City
Wayne Wright	Operating	Bay City
Kevin Bourcier	Operating	Carrollton
Andrew Furlo	Operating	Carrollton
AnnMarie Poineau	Operating	Carrollton
Gerard Poineau	Operating	Carrollton
Greg Eremia	P&W	Bay City
Jonathan Amthor	P&W	Bay City
Christopher Blair	P&W	Bay City
Anthony Brown	P&W	Bay City
Kristi Callahan	P&W	Bay City
Jeffrey Case	P&W	Bay City
Michael Dehring	P&W	Bay City
Andrew Dronsella	P&W	Bay City
Jad Dyjak	P&W	Bay City
Tyler Erickson	P&W	Bay City
Juan Escobedo	P&W	Bay City
James Gonzales	P&W	Bay City
John Gosselin	P&W	Bay City
Lori Harris	P&W	Bay City
Miguel Hernandez	P&W	Bay City
Derrick Jackson	P&W	Bay City
Michael Kaczmarek	P&W	Bay City
Jennifer Keyser	P&W	Bay City
Shawn McClorey	P&W	Bay City
David Morley	P&W	Bay City
Adriana Nunez	P&W	Bay City
John Hamilton	Operating	Caro
Melania Ross	Operating	Caro
Jason Sopchik	Operating	Caro
Timothy Babcock	P&W	Caro
Andrew Barnett	P&W	Caro
Timothy Bodeis	P&W	Caro
Joshua Damm	P&W	Caro
Lee Dibble	P&W	Caro
Jordan Hall	P&W	Caro
Rodney Jacques	P&W	Caro
Tonya Johnson	P&W	Caro
Wayne Phillips	P&W	Caro
Jack Putnam	P&W	Caro
Arturo Reynero	P&W	Caro
Jeffery Ruppal	P&W	Caro
Thomas Sharko	P&W	Caro
Michael Smith	P&W	Caro
Joseph Hodder	Research	Corporate
David Kern	Research	Corporate
Andrew Junga	Ag	Croswell
Micah Coburn	P&W	Croswell
Michael Sherlock	P&W	Croswell
Robert Zimmerman	P&W	Croswell
Tim Bales	Operating	Croswell
David Drummond	Operating	Croswell
Richard Drummond	Operating	Croswell
Thomas Frostick	Operating	Croswell
Heather Gordon	Operating	Croswell
Robert Grabbitt	Operating	Croswell
Thomas Guizar	Operating	Croswell
Jeffrey Hollenbeck	Operating	Croswell
William Inman	Operating	Croswell
Luke Schroeder	Operating	Croswell
Ron Bentley	Ag Admin.	Sebewaing
Matthew Terrill	Ag	Sebewaing
Todd Clark	P&W	Sebewaing
Ryan Cox	P&W	Sebewaing
Aaron Duever	Operating	Sebewaing
Jason Eisiliones	Operating	Sebewaing
Aaron Eurich	Operating	Sebewaing
Kerry Grifka	Operating	Sebewaing
Zachary Hoppe	Operating	Sebewaing
Robin Martens	Operating	Sebewaing
Christina Matthews	Operating	Sebewaing
Darrell Myers	Operating	Sebewaing
Michael Nast	Operating	Sebewaing
Kyle Reed	Operating	Sebewaing
Stephanie Wolf	Operating	Sebewaing

10 YEARS

Benjamin Bowers	Operating	Bay City
Gary Laleman	Operating	Bay City
Doug Sesler	Operating	Bay City
Kenneth Stevens	Operating	Bay City
Brett Tews	Operating	Bay City
James Bird	P&W	Bay City
Robert Brooks	P&W	Bay City
Arthur Chatfield	P&W	Bay City
Randy Delestowicz	P&W	Bay City
Juanita Fernandez	P&W	Bay City
Christopher Fitch	P&W	Bay City
Pate Hollis	P&W	Bay City
Gene Keyser	P&W	Bay City
Karl Kurzer	P&W	Bay City
Robin Moffitt	P&W	Bay City
Brendan Nichol	P&W	Bay City
Ronald Ramon	P&W	Bay City
Heather Reed	P&W	Bay City
Emilio Reyes	P&W	Bay City
Jarrad Schwart	P&W	Bay City
Douglas VanWormer	P&W	Bay City
Manuel Villarreal	P&W	Bay City
Christina Winchell	P&W	Bay City
Dexter Auernhamer	Ag Admin.	Caro
Morris Molnar	Ag	Caro
Daniel Austin	Operating	Caro
John Hacker	Operating	Caro
Gary Montgomery	Operating	Caro
William Sweet	Operating	Caro
Alan Stephenson	P&W	Caro
Rachael Grandmaison	Operating	Corporate
Karyn Niemi	Sales & Mktg.	Corporate
William Bevins	Operating	Croswell
James Junga	Operating	Croswell
David Tait	Operating	Croswell
Paul Ballard	P&W	Sebewaing
Trevor Gross	Operating	Sebewaing
Bryce Osterbeck	Operating	Sebewaing
Ronald Pacheco	Operating	Sebewaing
Eva Saenz	Operating	Sebewaing
Jeff Wolf	Operating	Sebewaing

15 Years

Martin Wisniewski	Operating	Bay City
Kevin Desrosier	P&W	Bay City
Shanta Hoosier	P&W	Bay City
Keith Katt	P&W	Bay City
Kenneth Kirkpatrick	Operating	Caro
Sandy Farmer	Accounting	Corporate
Robert Brown	Operating	Croswell
Eileen Wait	Operating	Croswell
Joshua Parker	Operating	Sebewaing
James Rabun	Operating	Sebewaing

20 Years

Candelario Cantu	Operating	Bay City
Raul Martinez	Operating	Bay City
Isauro Damian	P&W	Bay City
Kris Czapla	Operating	Caro
William Diehl	Operating	Caro
Todd Holzhei	Operating	Caro
Stephen Matuszak	Operating	Caro
Kristi Sauer	Accounting	Corporate
Steve Smock	Operating	Corporate
Jerry Meddaugh	Operating	Croswell
Robert Heidt	Operating	Sebewaing
Terry Kurzer	Operating	Sebewaing
Rodney Schmitt	Operating	Sebewaing
Terry Wood	Operating	Sebewaing

25 Years

Andrew Hollibaugh	Operating	Bay City
Cindy Schuhmacher	P&W	Bay City
Charles Hoag	Operating	Caro
Ross Voelker	Operating	Caro
Brenda Perkins	Sales & Mktg.	Corporate
Wanita Junga	Accounting	Croswell
Dennis Davis	Operating	Croswell
Troy Adams	Operating	Sebewaing
Terry Winter	Operating	Sebewaing

30 Years

Daniel Schwab	Operating	Bay City
Barney Torzynski	Operating	Bay City
Jim Martin	Operating	Corporate
Richard Malmyga	Sales & Mktg.	Corporate
Tony Moeggenberg	Sales & Mktg.	Corporate
Mark Kelcher	Ag	Sebewaing
Russell Eurich	P&W	Sebewaing

35 Years

Clarence Shepard	P&W	Bay City
Patrick Ewald	Ag	Caro
John Matthews	Operating	Sebewaing

40 Years

Adam Oswald	P&W	Bay City

45 Years

Gary McFarland	Operating	Bay City

Ernest Flegenheimer Award Winners 2006-2020

The following employees have received the prestigious Ernest Flegenheimer Award in recognition of their wisdom, integrity, and character while serving Michigan Sugar Company:

2006 – John Wyett
2007 – Jim Martin
2008 – Chris Dunham
2009 – Robert Arnold
2010 – Keith Kalso
2011 – Carol Kunitzer
2012 – Julie Perry
2013 – Eugene Stewart
2014 – Rick List
2015 – George Painter
2016 – Gerald Sorenson
2017 – Ann Kovacs
2018 – Tanya Richard
2019 – Tricia DeGroat
2020 – Pat Terrill

TOP Michigan Sugar Company President and CEO Mark Flegenheimer, right, and Executive Vice President James Ruhlman, left, honor Pat Terrill with the company's 2020 Ernest Flegenheimer Award during a ceremony held Wednesday, July 29, in Sebewaing.

Pat Terrill Honored with 2020 Ernest Flegenheimer Award

Agriculture A Mechanic started with Michigan Sugar Company in 1983

By Rob Clark, Director of Communications and Community Relations

As a young man, Pat Terrill knew what he wanted to do with his life: work for Michigan Sugar Company. Nearly four decades later, the 56-year-old Sebewaing resident was presented with the company's highest honor — the 2020 Ernest Flegenheimer Award.

The award is given each year during Michigan Sugar's Employee Service Awards ceremonies to honor an employee for their outstanding wisdom, integrity, and character — the same qualities Ernest Flegenheimer brought to the company as President and CEO from 1963 to 1993.

Terrill was presented with the award during a ceremony held Wednesday, July 29, in Sebewaing Village Park.

"After 37 years of impeccable workmanship he has become the wise one we turn to for advice and direction, not just in Sebewaing but company-wide," said Michigan Sugar Company Executive Vice President James Ruhlman in presenting the award. "His humility, quietness and sincerity make him approachable and connectable. He lets his actions speak, for he understands that they are truly louder than his words. He understands the value of setting an example."

Ruhlman continued, "He is as honest as the day is long which allows us to trust him. He's a man of his word and when you look in his eyes you know he's real and you know that he's sincere. He knows what works and what doesn't through his careful study and engineering of the machines that pile sugarbeets delivered from our grower-shareholders."

Terrill is an Agriculture A Mechanic at Michigan Sugar's Sebewaing location and has been with the company since 1983, the same year he graduated from Reese High School.

A native of Pigeon, Pat's first job with the company was working as a piler helper during the 1983 campaign. After three days, he was moved inside the factory as an Extra completing any tasks that needed to be done.

Over the past 37 years, he also worked in the Sebewaing lab and as a welder before becoming an Ag mechanic. He has been in his current position for 29 years.

Pat's grandparents Arthur and Doris Terrill were farmers in the Bayport Area and grew sugarbeets. His father Art worked for Saginaw Steering Gear and his mother Carol worked on the packaging line at Michigan Sugar's Sebewaing factory.

"She worked third shift, so dad would take us over to the factory and we'd go in and watch her work," said Pat. "I learned how the packaging operation worked as a kid."

Pat's brother Matt also works for Michigan Sugar and received his five-year service award this year.

Asked what it means to receive the Ernest Flegenheimer Award, Pat was speechless and said he is overwhelmed by the honor. He added Michigan Sugar has given him a very good life.

"It's been great. It has been my whole life. This is what I wanted to do, and I was lucky enough to have the old guys take me under their wing when I started out of high school. They taught me what I should do and what I shouldn't do."

Ruhlman noted you can often find Terrill in his red work truck pulling the Michigan Sugar Company float in parades across Michigan. And almost always at his side is Chris Dutcher, who works as the Ag Office Manager at the Sebewaing factory. They met in 1997 and have been a couple for the past 10 years.

"When you look at his pickup truck, his motorcycle, his ag shop, or the Michigan Sugar Company float, you immediately know that he takes tremendous pride and care of those things that he treasures most," said Ruhlman. "He's a man that we love, a man that we care for and a man that we admire for his genuineness and his thoughtful actions." ▮

LEFT Michigan Sugar Company's 2020 Ernest Flegenheimer Award recipient Pat Terrill arrives at this year's Employee Service Awards presentation in Sebewaing riding his yellow Harley-Davidson motorcycle.

GIVING BACK during a pandemic

Restaurant gift cards, PPE, and sugar donations help during COVID-19

By Rob Clark, Director of Communications and Community Relations

Earlier this year, Michigan Sugar Company purchased and distributed more than 2,600 restaurant gift cards to its employees as a "thank-you" and to provide a much-needed boost to local businesses. Each of the company's approximately 1,300 employees received $100 in gift cards that were purchased from more than 50 restaurants in communities like Bay City, Caro, Croswell and Sebewaing, as well as Fremont, Findlay and Toledo, Ohio, where Michigan Sugar also has facilities.

Michigan Sugar Company President and CEO Mark Flegenheimer likes to tell the story about what happened when he took his idea to purchase $100 in local restaurant gift cards for every active employee to the Co-op Board of Directors earlier this year, just after the COVID-19 pandemic exploded.

"There was no discussion," Flegenheimer said. "They just said, 'Absolutely, that's what we should be doing.'"

It is with that spirit a small team of company leaders set out to purchase nearly $135,000 worth of gift cards from more than 50 restaurants in Michigan Sugar Company's factory towns of Bay City, Caro, Croswell and Sebewaing, as well as a few other locations in Michigan and Ohio where the company has employees. In many cases, the total purchase at individual restaurants was $5,000 or more.

In some cases, the owners of these restaurants were speechless.

Some cried.

A few acknowledged that without the sale, they may not have been able to make it another month.

"When we got the phone call to order the gift cards is was a Godsend," said Greg Buzzard, owner of That Guy's BBQ & Grill in Bay City. "We didn't know how we were going to pay our rent and bills that month. We were just praying and saying, 'Lord, help us figure this out.' When you have local companies like Michigan Sugar Company stepping up and taking care of the little companies like ours, that's how we make it through things like this pandemic together. "It was amazing what you did for us."

The reasons behind the gift card giveaway were simple, according to Flegenheimer and Michigan Sugar Company Co-op Board Chairman Adam Herford.

"As a food manufacturer, Michigan Sugar Company has been designated by the Department of Homeland Security as a critical infrastructure industry, which means we have a responsibility to do what we are able to maintain a healthy workforce and keep our production lines operating," Flegenheimer said. "During this stressful and challenging time related to the COVID-19 pandemic, our employees have stayed focused on the task at hand and shown incredible determination as we continue to produce, package and ship sugar daily. I can't thank them enough for the dedication they have shown and the efforts they have made to keep our products flowing into the marketplace."

In looking for a way to say an extra "thank-you" to employees, company officials said they took into consideration the fact that many restaurants had to close their doors, lay off employees and figure out how to operate under new conditions during the COVID-19 pandemic.

"We hope this helped ease the pain of this pandemic for those businesses just a little bit," said Herford.

"We were so grateful for the incredible act of kindness and support by Michigan Sugar to buy

LEFT Michigan Sugar Company Croswell Factory Manager Bob Powers, left, and Sebewaing Agriculture Operations Manager Mike Alderson drop off a donation of Personal Protection Equipment to Sara Tait at McLaren Port Huron hospital on Monday, March 30, 2020. Michigan Sugar also donated PPE to McLaren Bay Region in Bay City, Covenant HealthCare in Saginaw, Scheurer Hospital in Pigeon, McLaren Caro, and Hills & Dales General Hospital in Cass City.

gift cards during a very difficult time for the businesses and downtown Bay City during the COVID-19 shutdown," said Dave Dittenber, who owns several restaurants in the Great Lakes Bay Region, including Old City Hall and Tavern 101, both of which benefited from the gift card purchase. "We cannot thank them enough for all they do to not only support our businesses, and employees, but also the entire Great Lakes Bay Region."

Michigan Sugar Company also kept a focus on the doctors, nurses, first responders, and other health care professionals in need of personal protection equipment during the pandemic. Early on, the company donated more than 1,000 masks, nearly 800 pairs of safety glasses and 550 pairs of gloves to six hospitals — McLaren Bay Region in Bay City, Covenant HealthCare in Saginaw, Scheurer Hospital in Pigeon, McLaren Caro, McLaren Port Huron, and Hills & Dales General Hospital in Cass City.

"We know these professionals are on the front lines in the battle against COVID-19," said Herford, a grower-owner from Elkton. "They are true heroes in our communities."

As the pandemic continued into the summer months, it also became apparent there was an opportunity to make life sweeter for families by donating sugar to those in need.

Michigan Sugar Company called on two partners to help make that happen.

On July 16, with trucking services donated by Countryside Transportation of Sebewaing, Michigan Sugar Company donated more than 46,000 pounds of white granulated, brown, and powdered sugar to Hidden Harvest, a food rescue and redistribution agency serving the Great Lakes Bay Region and beyond.

"It's amazing how fast you can get that much sugar out into the community when there is great need and great agencies working together to provide for those needs," said Samantha McKenzie, President and CEO of Hidden Harvest, noting the sugar was donated to agencies like The Salvation Army of Bay County, Stone Soup Food Bank in Lapeer County, and Arnold Center's Midland Fresh program, along with a slew of area soup kitchens, homeless shelters and food pantries. "Hidden Harvest shared this huge donation with 25 agencies throughout the Great Lakes Bay Region and the Thumb.

"Thank you to Michigan Sugar for being such a blessing to Hidden Harvest, the agencies we serve and most importantly, those in need in our community."

BELOW Curt Hecht, Warehouse Coordinator for Hidden Harvest, drives a pallet of white granulated Pioneer Sugar into the organization's warehouse in Saginaw on Thursday, July 16, 2020. Michigan Sugar donated more than 46,000 pounds of white granulated, light brown and powdered sugar that was redistributed to 25 agencies, food pantries, shelters and soup kitchens in the Great Lakes Bay Region and Thumb.

Students Awarded Annual Scholarships

ALBERT FLEGENHEIMER SCHOLARSHIP

Kenton Stoutenburg of Sandusky is the recipient of the Albert Flegenheimer Memorial Scholarship. He is the son of Clint and Carolyn Stoutenburg. Kenton attends Michigan State University where he is pursuing a degree in agribusiness.

NEXT GENERATION SCHOLARSHIP

Lily Wendland of Reese is the recipient of the Next Generation Scholarship. She is the daughter of Mark and Amy Wendland. Lily attends Michigan State University where she is pursuing a degree in agribusiness management.

LOREN HUMM MEMORIAL SUGAR BEET GROWER'S SCHOLARSHIP

Elliana Hardman of Ithaca is the recipient of the Loren Humm Memorial Sugar Beet Grower's Scholarship. She is the daughter of John and Jill Hardman and a 2020 graduate of Ithaca High School. She attends Northwood University in Midland, pursuing a degree in business management.

MICHIGAN SUGAR EMPLOYEE SCHOLARSHIPS

Kadyn Blanchard of Freeland, **Sydney Deutsch** of Hemlock, and **James Hax** of Merrill are the recipients of the Michigan Sugar Employee Scholarships.

Kadyn is the daughter of Doug Blanchard and Amelia Bender. A graduate of Freeland High School, Kadyn attends Ferris State University where she is studying biology and pre-med. She hopes to one day work as a chiropractor.

Sydney is the daughter of Brian Deutsch. She graduated from Valley Lutheran High School and attends Concordia University-Ann Arbor where she is majoring in digital media design with a minor in marketing. She hopes to become a professional photographer.

James is the son of Troy Enciso. He graduated from Saginaw Arts & Sciences Academy and attends Saginaw Valley State University where he is pursuing a degree in computer information systems. He hopes to work as a network architect overseeing internal and external cyber affairs.

CENTRAL DISTRICT SCHOLARSHIP

Addy Battel (top photo) of Cass City and **Kadee Karst** of Frankenmuth are the recipients of the Central District Scholarship. Addy is the daughter of Bob and Sue Battel. She is majoring in environmental studies and sustainability at Michigan State University with minors in leadership in integrated learning and environmental science. Kadee is the daughter of Jeff and Sheri Karst. She is studying advertising at Michigan State University.

BRIAN FOX MEMORIAL AGRICULTURE SCHOLARSHIP

Molly Sayers (top photo) of Ridgetown, Ontario, and **Lydia Fenton** of Highgate, Ontario, are the recipients of the Brian Fox Memorial Agriculture Scholarship from the Ontario Sugarbeet Grower's Association. Molly is the daughter of Paul and Amber Sayers. She attends Lakeland College in Vermilion, Alberta, where she is studying animal science technology in the dairy major. Lydia is the daughter of Shawn and Marianne Fenton. She is a 2020 graduate of the University of Guelph where she earned her bachelor's degree in commerce in food and agricultural business.

LEARN MORE...

You can learn more about all of these scholarships on the Michigan Sugar Company website at www.michigansugar.com/community/scholarships/.

Shaelynn Lavrack of Montrose Crowned 2020 Michigan Sugar Queen

By Rob Clark, Director of Communications and Community Relations

Haley Bell of Bay City, Alayna Celestini of Macomb also named to Queen's Court

There may not have been a Michigan Sugar Festival this year, but there is a 2020 Michigan Sugar Queen.

Shaelynn Lavrack of Montrose was crowned the 2020 Michigan Sugar Queen during a private ceremony held Friday, June 19, at Michigan Sugar Company's headquarters at Uptown Bay City. The private event took place after the annual Michigan Sugar Festival in Sebewaing was canceled due to concerns over the COVID-19 pandemic.

Lavrack, 19, is a 2019 graduate of Hill-McCloy High School and attends Mott Community College where she is pursuing an associate degree in nursing. She is the daughter of William Lavrack and Angela Youmans.

"Being crowned Michigan Sugar Queen is both a huge honor and responsibility," said Lavrack. I feel honored to have been chosen to become part of the Michigan Sugar family and I feel an important responsibility to represent the company well, while learning and growing my knowledge of agriculture, especially the sugarbeet industry.

"I look forward to meeting new people and being an advocate for Michigan Sugar by sharing what I know. Most importantly, I look forward to continuing the important job of making life sweeter for those I encounter during my year-long journey."

Also crowned during the June 19 ceremony were two Queen's Court Attendants — Haley Bell of Bay City and Alayna Celestini of Macomb. They, too, are serving as ambassadors for Michigan Sugar Company for the next year.

Bell, 19, is a 2019 graduate of Bangor Township John Glenn High School and attends Delta College where she is studying social work. She is the daughter of Melissa and Jamie Scherf and Rob Bell.

Celestini, 18, is a 2020 graduate of Dakota High School and attends Michigan State University where she is studying engineering. She is the daughter of Jamie and Angela Celestini.

The new Queen and Court Attendants jumped right into their year of service appearing Saturday, June 20, in a mini parade through the streets of Sebewaing. They were joined by representatives of the Sebewaing Police and Fire departments and Sebewaing Township EMS, as well as 2019 Michigan Sugar Queen Channon Turrell and 2019 Attendants Linde Bolle and Emily Jaremba who passed out 2-pound bags of Pioneer Sugar to Sebewaing residents who came out to say hello as the Michigan Sugar Company float passed by.

"With the Michigan Sugar Festival being canceled this year, we still wanted to do something special and create a memorable experience both for our new Queen's Court and the residents of Sebewaing," said Rob Clark, Director of Communications and Community Relations for Michigan Sugar Company. "There may not have been a big festival and a big parade, but we wanted to be sure that Sebewaing was the first to meet our new Queen and Attendants."

This year, Michigan Sugar Company received 15 applications through its Michigan Sugar Queen Scholarship Program with 11 selected as finalists.

Through the Michigan Sugar Queen Scholarship Program, a Queen and two Attendants are chosen to serve for one year as ambassadors for Michigan Sugar Company. Their duties include public appearances, community service projects, interaction with lawmakers and agriculture leaders and helping to represent Michigan Sugar Company throughout the state.

After completing the requirements of the program, the Queen receives a $2,000 scholarship and each attendant a $1,000 scholarship to be used to help pay for college.

"Michigan Sugar Company is so fortunate to have found three young women who we know will be excellent representatives and ambassadors for our company," said Clark. "Due to the COVID-19 pandemic, planning for this year will include unique challenges, but we are determined to have our Queen and Attendants out in our communities as much as possible.

"When you meet them, you'll understand quickly why they were selected to this year's Court," Clark added. "I am always in awe of the level of knowledge our Michigan Sugar Queen and Attendants demonstrate in the areas of our company and agriculture in general. I am even more impressed by the quality of their character, which once again shined through during this year's selection process.

"We are looking forward to a great year with Shaelynn as the Michigan Sugar Queen and Haley and Alayna as members of the Queen's Court."

Shaelynn Lavrack, center, of Montrose, is the 2020 Michigan Sugar Queen. She is surrounded here by 2020 Queen's Court Attendants Haley Bell, left, of Bay City, and Alayna Celestini of Macomb.

Children plant their own seeds through Youth Sugarbeet Project

By Elizabeth Taylor, Ag Relations & Communications Manager

Like most things in 2020, our Youth Sugarbeet Project looks very different than we expected.

Without the ability to host our normal events, we considered delaying the events and even canceling the program for the year. Luckily, we found a way to engage our participants this year by encouraging them to complete a sugarbeet-related project. Children were given the choice to take part in a sugarbeet scavenger hunt, or they were given a packet of seeds to plant and asked to record the progress of their crop from May until August.

Almost 40 children participated in this year's program and all were given Michigan Sugar Company sweatshirts in appreciation.

We appreciate the understanding of all the children and parents and their willingness to participate in this unexpected way. We very much look forward to resuming our normal project programming next year.

RIGHT John Guza, a participant in Michigan Sugar Company's Youth Sugarbeet Project, searches for Rhizoctonia in a field.

ABOVE From left, Nash Lupcke, Kinsley Lupcke, and Ben Taylor proudly show off their sugarbeets they grew as part of Michigan Sugar Company's Youth Sugarbeet Project.

***Elizabeth Taylor** is the Ag Relations & Communications Manager at Michigan Sugar Company. She joined the company in 2016, and works closely with the Agronomy Department to create and share meaningful information with its growers.*

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