

Growing Together

4Q | 2015

# thrive<sup>®</sup>

## Root of the Matter

Multipronged Approach  
Manages Soybean Cyst Nematode  
and Sudden Death Syndrome

NATIVE GENES HELP  
AGRISURE ARTESIAN<sup>®</sup>  
CORN OPTIMIZE WATER

SYNGENTA SEEDCARE  
INSTITUTE OFFERS  
CUSTOMERS  
WORLD-CLASS  
TRAINING

syngenta<sup>®</sup>



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Even if you love your print edition of *Thrive*, you'll still want to check out the magazine's website. You'll find more content and links to important resources to help you succeed in today's marketplace. The online version also makes it easy to share specific articles with others.

Scan this QR code to take the fast track to the *Thrive* website, or go to [www.syngentathrive.com](http://www.syngentathrive.com).



**ON THE COVER** Protecting roots from soybean cyst nematode and sudden death syndrome is an important step to boosting soybean yield. Photo: Jay Fram

**THIS PAGE** The Syngenta Managed Stress Environment site in LaSalle, Colorado, is an ideal location for testing crops in managed irrigation trials. Photo: Willie Peterson

**CORRECTION:** In the third-quarter 2015 issue of *Thrive*, we misidentified Bo Brooker with Syngenta on page 13. We apologize for the error.

**We welcome your story suggestions and comments about *Thrive*.**

Please send them to [thrive@syngenta.com](mailto:thrive@syngenta.com). For more information, visit the Syngenta U.S. website at [www.syngenta-us.com](http://www.syngenta-us.com), or call the Syngenta Customer Center at 1-866-SYNGENT(A) (796-4368).

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*Thrive* is produced quarterly for a nationwide agricultural audience. Its purposes are to update readers on Syngenta products, research, services and solutions, and to provide them with the information they need to succeed in today's complex marketplace.



# We're Here for You

As the twilight of 2015 approaches, the U.S. agricultural industry eagerly awaits the dawn of a new growing season with unwavering resolve. After all, the weather, pest and market challenges that threaten your profitability each year are no match for your grit and determination to persevere.

At Syngenta, we're here for you with the technologies and services that can help your business or farm succeed. Our \$1.3 billion annual investment in research and development is proof positive that our commitment to you runs deep—not just for next season, but for many seasons to come.

Our Seedcare business perfectly demonstrates the strength of our long-term customer commitment. Since 1979, Syngenta has led the wave of seed treatment innovation.

What began as on-seed, fungicide-only treatments that provided growers with optional “disease insurance” for crops has evolved into combinations of products that are essential to increasing yields, quality and profits. These technologies protect high-value seed and vulnerable young crops from agriculture’s most destructive diseases and underground pests. They also enable growers to plant earlier, which maximizes yield potential, with less cultivation and more confidence.


“Our \$1.3 billion annual investment in research and development is proof positive that our commitment to you runs deep—not just for next season, but for many seasons to come.”



PALLE PEDERSEN

In this issue of *Thrive*, you'll see how Clariva® Complete Beans seed treatment is revolutionizing season-long protection from soybean cyst nematode, the No. 1 cause of yield loss in soybeans. At the same time, you'll see how this latest combination of separately registered products protects plants from a broad range of early-season insects and diseases. Another featured technology is Vibrance® seed treatment fungicide. Already available in many crops, including corn, soybeans and cereals, Vibrance will give sugarbeet growers a new tool to battle their most devastating disease—*Rhizoctonia*—in 2016.

But best-in-class seed treatments are only half of the Syngenta Seedcare story. We also offer exceptional service through our experts in the field, who can give you one-on-one advice on building a value-add, seed-treating service to your business. Additionally, our state-of-the-art North America Seedcare Institute in Stanton, Minnesota, serves as a center of excellence in product application, quality management, training, seed science and product support for customers. A \$20 million, 38,000-square-foot expansion already underway will establish this facility as one of the most advanced seed treatment education and research centers in the world.

As you ramp up your operation for the next growing season, we understand that choosing a Syngenta brand is just that—a choice. Our goal is to continue earning your trust with an outstanding portfolio, a pipeline of promising new solutions and the industry’s highest level of service. In 2016 and beyond, we’re committed to offering you more, because you deserve nothing less. 

*Palle Pedersen*

**PALLE PEDERSEN, PH.D.**

Head, Seedcare Product Marketing  
Syngenta, North America

➤ Read article online at [www.syngentathrive.com](http://www.syngentathrive.com).





# What's in Store

Stay ahead of the game with new and updated products, the latest reports and upcoming events.

## NEW TECHNOLOGIES

### > New 2016 NK Soybeans

For the 2016 planting season, Syngenta will offer U.S. growers 22 new performance-class NK<sup>®</sup> Soybean varieties, ranging in relative maturity from very early 0.009 to late 7.6. The higher-yielding varieties are reaching the market more quickly than in the past, thanks in part to the award-winning Y.E.S. Yield Engineering System<sup>™</sup>. (See "Hitting the Bull's-Eye" on page 14 for more information.)

In addition to increased yield potential, NK Soybeans lead the industry in sudden death syndrome genetic resistance scores<sup>1</sup>. The new varieties also offer resistance packages targeting common early-season diseases and pests, including soybean cyst nematode, iron deficiency chlorosis and *Phytophthora* root rot.

For more information about the NK Soybean portfolio, speak with your local NK retailer or Syngenta Seed Advisor<sup>™</sup> or visit [www.nksoybeans.com](http://www.nksoybeans.com).

1. Based on the average SDS genetic resistance scores from Syngenta, Monsanto and Pioneer.



### >> New 2016 Corn Hybrids

For the 2016 growing season, Syngenta has debuted 63 new Golden Harvest<sup>®</sup>, NK<sup>®</sup> and Enogen<sup>®</sup> corn hybrids. This class features state-of-the-art traits and technologies, including Agrisure Artesian<sup>®</sup> hybrids and hybrids containing the Agrisure Viptera<sup>®</sup> and Agrisure Duracade<sup>®</sup> traits. The company has also introduced two new Enogen hybrids. Enogen corn enzyme technology is an exclusive in-seed innovation from Syngenta that helps make ethanol more sustainable.

Syngenta developed these hybrids using the Y.E.S. Yield Engineering System<sup>™</sup>, which converts a pool of genetics tested globally into hybrids that can meet the unique needs of any local field. Combining intelligent analytics, testing and technology, the Y.E.S. Yield Engineering System allows Syngenta scientists to quickly adjust hybrid development to meet nature's ever-changing environmental pressures.

The result is a portfolio of corn hybrids that delivers improved standability, better disease tolerance and the flexibility to adapt to various soil and production environments. The Syngenta lineup also offers a variety of maturities and key agronomic characteristics, giving growers consistency, high performance and strong yield potential.

To learn more about these new hybrids and how they may fit your customers' fields, contact your Syngenta sales representative or Seed Advisor manager. You also can check out these online resources: [www.goldenharvestseeds.com](http://www.goldenharvestseeds.com), [www.nkcorn.com](http://www.nkcorn.com) and [www.enogen.net](http://www.enogen.net).





Grower Roger Elmore inspects an ear of corn.

## >>> Syngenta Names Newest Corn Herbicide

Acuron® Flexi is the name of the newest Syngenta corn herbicide premix. With Environmental Protection Agency registration anticipated for the 2016 growing season, Acuron Flexi will combine three active ingredients, including bicyclopyrone, and two complementary modes of action. This multitargeted approach to weed control is especially important as resistance expands and weeds, such as giant ragweed, waterhemp and Palmer amaranth, become more difficult to manage.

“This summer, I visited field trials across the U.S.,” says Gordon Vail, Ph.D., technical product lead for herbicides at Syngenta. “No matter where we were, what soil type

**“No matter where we were, what soil type we were in or what the weed pressure was, Acuron Flexi provided better, more consistent control of tough weeds than competitive herbicide programs tested.”**

—GORDON VAIL

we were in or what the weed pressure was, Acuron Flexi provided better, more consistent control of tough weeds than competitive herbicide programs tested.”

As its name indicates, Acuron Flexi also will provide greater flexibility. “Acuron Flexi will have no geographic or soil-type restrictions in the areas where it’s registered,” Vail says. “Additionally, growers can rotate to a variety of crops following an application of the herbicide, which can take place from 28 days pre-plant up to 30-inch corn.”

And because Acuron Flexi does not contain atrazine or glyphosate, growers will be able to tank mix it with other herbicides, including AAtrex® and Touchdown® brands. This is critical in certain areas of the Corn Belt, including parts of Iowa, Minnesota and Wisconsin, where the use of atrazine is limited because of carryover.

For more information on Acuron Flexi, visit [www.syngentaus.com/acuronflexi](http://www.syngentaus.com/acuronflexi).

 **Acuron® Flexi**



## >>>> New Winter Wheat Varieties

Syngenta will introduce four new AgriPro® brand winter wheat varieties for 2015 fall planting:

- > **SY 547**, a soft red winter wheat variety, has an excellent combination of yield and test weight and is adaptable to most soil types. Well-suited for conditions in the eastern Corn Belt, it offers above-average stripe and leaf rust tolerance, as well as Septoria leaf blotch tolerance.
- > **SY Cypress**, a soft red winter wheat, was developed for performance in the Deep South, including Louisiana, southern Georgia and eastern South Carolina. An early-maturing semi-dwarf variety, it has shown moderate tolerance to leaf rust and powdery mildew.
- > **SY Llano**, a hard red winter wheat variety, is an excellent dual-purpose, graze-and-grain wheat. Due to its early maturity, it is a good choice for growers who double crop, especially in the central corridor—Texas and Oklahoma into south-central Kansas, as far north as Wichita. SY Llano has excellent test weights and good tolerance traits to diseases, including leaf and stripe rust, as well as soilborne mosaic virus.
- > **SY Monument**, a hard red winter wheat variety, offers drought tolerance and a disease package that includes tolerance to leaf and stripe rust, barley yellow dwarf virus, and soilborne mosaic virus. With good winter hardiness and test weight patterns, SY Monument is best adapted to the central and western high plains of Colorado, Kansas, Nebraska and Oklahoma, and the Texas Panhandle.

A field of AgriPro® winter wheat variety SY Monument grows strong in central Kansas.



For more information, visit [www.agriproheat.com](http://www.agriproheat.com).



## PRODUCT UPDATES

### > Syngenta Introduces Sugarbeet Seed Treatment

Vibrance® seed treatment fungicide is now registered for use in sugarbeets and will be available beginning this fall for 2016 planting. Vibrance optimizes root health and helps increase stands and yield by protecting plants against *Rhizoctonia*, the most common and destructive sugarbeet disease in the U.S.

While tolerant sugarbeet varieties are helpful, protection during germination and stand establishment is key, because genetic tolerance generally doesn't express in young seedlings. In 2014 trials, Vibrance-treated sugarbeets realized a 28 percent increase in sugar tons per acre compared with an inoculated control, and an 8 percent increase compared with competing products<sup>1</sup>.

Vibrance contains the active ingredient sedaxane—a member of the succinate dehydrogenase inhibitor (SDHI) class of fungicides—and is compatible with other seed treatment products, including CruiserMaxx® Sugarbeets seed treatment, a combination of separately registered products. For more information on Vibrance or to check its availability in your area, please contact your Syngenta representative or local co-op agronomist.

1. Average of three third-party trials in Michigan and Nebraska.



## NEWS AND EVENTS

### > Drive to Thrive Winner's Circle

In January, we asked our readers to describe how agriculture drives their communities to thrive. Five months later, our panel of judges chose 10 finalists, each of whom received a mini touch-screen tablet. Now, your votes, along with our judges' scores, have determined the grand prizewinner of a \$500 gift card and \$1,000 donation to his or her favorite local charity or civic organization. Go to [www.syngentathrive.com](http://www.syngentathrive.com) to find out which of the following finalists is standing in the 2015 Drive to Thrive winner's circle:



- > **Nicholas Blevins** from Hiawatha, Kansas
- > **Mike Dierickx** from Long Grove, Iowa
- > **Rachel Fishback** from Washington, Iowa
- > **Cheryl Groenwold** from Norcross, Minnesota
- > **Stacey Lilja** from Leonard, North Dakota
- > **Krista Lottinville** from Sheldon, Illinois
- > **Jeremy Wayne Moore** from Pope, Mississippi
- > **Kevin Rempp** from Montezuma, Iowa
- > **Jared Larry Skelton** from Larned, Kansas
- > **Ernest Waldner** from Raymond, South Dakota

## CELEBRATING YOU

Up before dawn and not done until dark, you work hard every day with persistence, grit and pride. Syngenta recognizes that drive and wants to celebrate it in the Not Afraid to Work photo contest.

To enter, visit [notafraidtowork.com](http://notafraidtowork.com) and submit a photo that depicts what "Not Afraid to Work" means to you. In exchange, Syngenta will send you free #NotAfraidToWork gear (while supplies last) and give you a chance to win multiple prizes that can help make your well-earned downtime more enjoyable. The website also gives examples of contest submissions. To join the conversation on social media, use #NotAfraidToWork.

Additionally, your participation can help a future farmer. Each time you share the contest link ([notafraidtowork.com](http://notafraidtowork.com)) on Facebook or Twitter, Syngenta will donate \$5—up to a total of \$10,000—to support the National FFA Organization through the mikeroweWORKS Foundation.

In conjunction with the photo contest, Syngenta is introducing Trivapro™ fungicide, the company's latest disease-management innovation, which will be available for the 2016 season. Trivapro pairs Solatenol® fungicide, an active ingredient 10 times more potent than market competitors, with proven performers azoxystrobin and propiconazole. With three active ingredients and three modes of action, Trivapro will work hard for you by delivering preventive and curative action for long-lasting disease protection in corn, soybeans and wheat. To learn more, visit [www.syngentaus.com/Trivapro](http://www.syngentaus.com/Trivapro).



Scan this QR code to find out more about the Not Afraid to Work photo contest.

**#NotAfraidToWork**

## TRADE SHOWS AND CONFERENCES

Syngenta is previewing its 2016 technologies and solutions at upcoming events across the country. To find a location convenient for you, check out the calendar of trade shows and conferences below:

### OCTOBER 2015

- 26–31 **ASFMRA Annual Meeting/AgroNomics, Vision for 2016, San Antonio, Texas**
- 28–31 **National FFA Convention & Expo, Louisville, Kentucky**

### DECEMBER 2015

- 1–3 **ARA Conference & Expo, Palm Desert, California**
- 7–10 **NAAA Annual Convention & Exposition, Savannah, Georgia**
- 7–11 **ASTA CSS 2015 & Seed Expo, Chicago, Illinois**

### JANUARY 2016

- 6–9 **National No-Tillage Conference, Indianapolis, Indiana**
- 12–14 **Potato Expo, Las Vegas, Nevada**

## Your Opinion Matters

At Syngenta, one of our top priorities is giving you information that can help your farm or agribusiness thrive. Please let us know how we're doing by taking a few moments to complete our simple online readership survey. In exchange, you could **win one of three mini touch-screen tablets** in our grand-prize drawing.



The **first 25 people** who complete the survey will receive a **\$50 gift card**, compliments of Syngenta.

No purchase necessary to participate. Purchase does not improve your chances of winning. Void where prohibited. Must be 18 years or older and resident of the continental United States to be eligible. Employees of Syngenta, its affiliates and agents are not eligible to win. Estimated retail value of each grand prize: \$350. Winners will be selected by random drawing to be held on December 30, 2015. Winner need not be present to win. Estimated retail value of gift cards, which will be awarded to first 25 survey respondents: \$50. All prizes will be delivered to Winners. The odds of winning will be determined by the number of entries. Only one entry per person. All entries will become the property of Syngenta. In accepting prizes, Winners grant Syngenta and its advertising and promotional companies associated with the giveaway a license to use Winners' names, likenesses, quotes and photographs. All taxes and other expenses associated with the receipt and use of all prizes are the sole responsibility of Winners. Awarded prizes are not transferable and cannot be redeemed for cash. No substitute prizes will be given. See official rules for more details.

# Tackling Toxins

Syngenta experts assess the toll aflatoxins can take on crops and prescribe preventive measures that can help minimize the damage.

**Q. What are aflatoxins and why should growers be concerned about them?**

**A. Eric Tedford, Ph.D., technical product lead, fungicides, Syngenta:** Aflatoxins are a type of mycotoxin produced by the soilborne fungi *Aspergillus flavus* and *Aspergillus parasiticus*. The term mycotoxin literally means “poison produced by a fungus.” Aflatoxins, among the most naturally occurring carcinogenic substances, are toxic to animals and humans, even at very low doses. For this reason, the Food and Drug Administration (FDA) regulates levels of aflatoxins in food products for human consumption

and feed for animals. During outbreak years, the potential economic impact on growers is great: Aflatoxin contamination may force growers to accept lower prices at market or even destroy their crops completely if levels are too high. The U.S. Department of Agriculture estimates that aflatoxins cost U.S. corn growers alone \$200 million annually.

**Q. Why, when and where do aflatoxins occur?**

**A. Miloud Araba, Ph.D., technical product lead, traits, Syngenta:** Aflatoxins can be found in several important crops, including cotton, peanuts and corn. Corn is particularly susceptible to these molds and, consequently, to aflatoxin contamination. Aflatoxins can occur anywhere these crops are grown, but they tend to occur more frequently in areas under drought or high-heat-stress conditions. Aflatoxins are also more likely to occur in corn that is damaged from ear-feeding insects, such as corn earworm and western bean cutworm. After harvest, molds and aflatoxin production can continue in storage bins under the right conditions, such as excessive moisture, high temperatures or poor aeration. While controlling these conditions in storage is possible, growers cannot accurately predict or control drought or heat in the field; therefore, consideration of other preventive measures becomes necessary.

“Aflatoxin contamination may force growers to accept lower prices at market or even destroy their crops completely if levels are too high.”

—ERIC TEDFORD

Aflatoxins enter through the silk of the corn.

**ERIC TEDFORD, PH.D.**  
Technical Product Lead, Fungicides, Syngenta, North America



**Q. What regulations are in place to protect growers, livestock and consumers?**

**A. Araba:** The FDA has important regulations on aflatoxins for grain elevators, feed manufacturers, grain processors and exporters. These regulations mandate acceptable amounts of aflatoxins in grains, foods, feed ingredients and finished feed. The FDA has issued regulatory limits, which it calls action levels, to convey its regulatory policy on aflatoxins. For example, the extremely small amount of 0.5 parts per billion (ppb) represents the action level for aflatoxins in milk for human consumption, while 20 ppb is the action level for corn that immature and dairy animals can consume. To appreciate how low a concentration that is, 1 ppb is



**“Hybrids containing the Agrisure Viptera trait showed reduced aflatoxin levels by as much as 70 percent, compared to hybrids without insect traits.”** —MILOUD ARABA

the equivalent of a penny in \$10 million dollars. The FDA website ([www.fda.gov](http://www.fda.gov)) offers more detailed information on aflatoxin regulations.

**Q. How do growers know they have a problem?**

**A. Tedford:** The challenge for growers is that the presence of aflatoxins is oftentimes not visible. This situation is particularly true for corn. Most growers don't discover they have a problem until they deliver their harvest for sale. There are ways to detect the presence of aflatoxins, but many of these methods don't provide quantitative information that would indicate how many ppb are in the grain. The methods for precisely quantifying aflatoxins are expensive and can only be done by laboratory professionals.

**Q. What can growers do to reduce aflatoxins in their crops?**

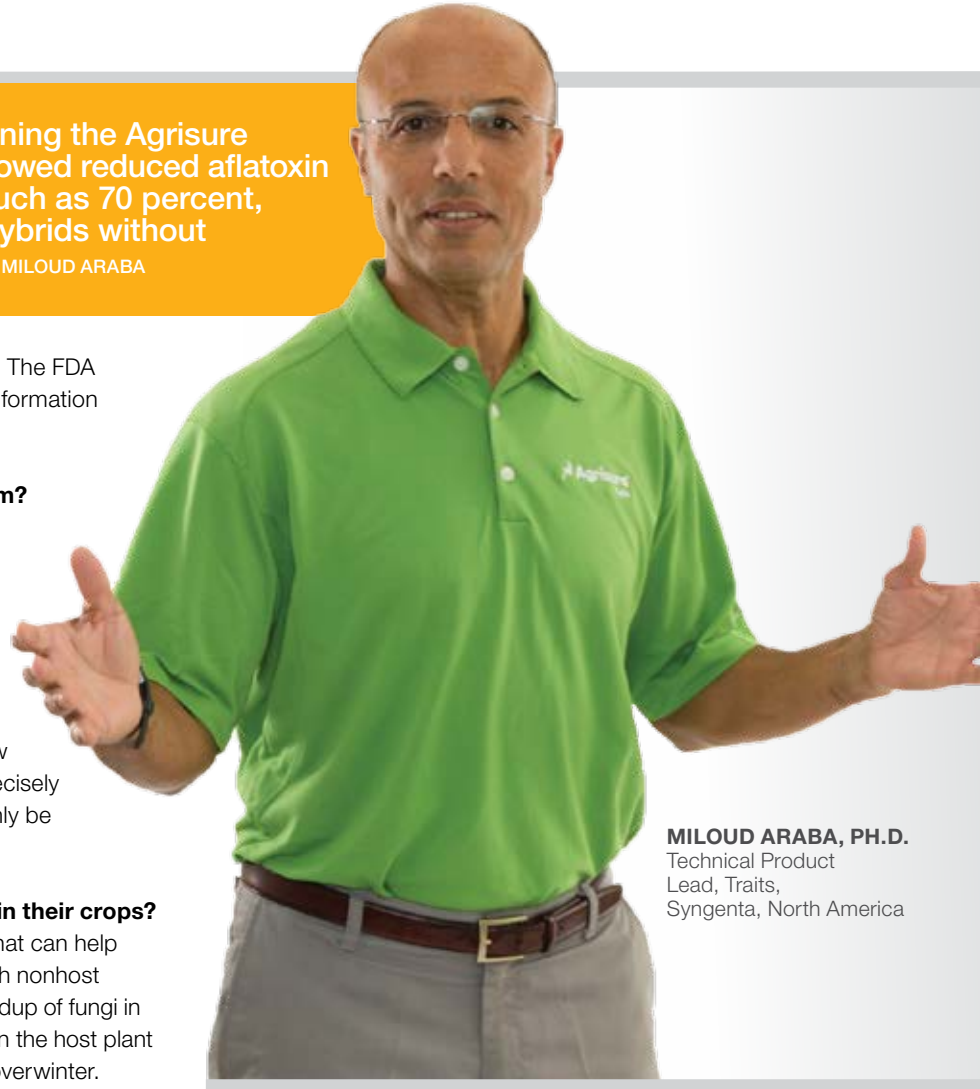
**A. Tedford:** There are several cultural practices that can help growers reduce their risk. By rotating crops with nonhost crops, growers can substantially lessen the buildup of fungi in the soil. Burying residues also helps break down the host plant materials on which the fungus can otherwise overwinter. Irrigation helps as well, because unlike most other fungi, *A. flavus* favors hot, dry conditions.

Growers can also use technological innovations, such as Afla-Guard® biocontrol agent, to reduce aflatoxins. Afla-Guard is a biological product from Syngenta that contains a nontoxic strain of *A. flavus*. This strain competes against the resident toxigenic strains via competitive exclusion. What this means is the good guys colonize the silks of corn and prevent the bad guys from establishing. The end result is a decreased aflatoxin level in corn. Across 247 corn trials over five years of testing in Texas, Afla-Guard consistently reduced aflatoxin levels by roughly 88 percent, which represents a significant mitigation of toxin levels.

Another preventive measure is controlling insects and reducing their feeding wounds, which become the fungus' entry points to the crop. Growers can reduce this damage by choosing the right hybrid and applying Endigo® ZC or Warrior II with Zeon Technology® insecticides.

**A. Araba:** To reduce the occurrence of aflatoxins in corn, the choice of hybrid and its trait stack is critical. The Agrisure Viptera® trait is particularly effective against key ear-feeding lepidopteran insects, including corn earworm and western bean cutworm, and has demonstrated an ability to significantly reduce aflatoxins. In these trials, conducted by Texas A&M University and Syngenta, researchers correlated aflatoxin levels in corn with grain damage from corn earworm feeding. Hybrids containing the Agrisure Viptera trait showed reduced aflatoxin levels by as much as 70 percent, compared to hybrids without insect traits. Research has also shown that Afla-Guard and corn hybrids with the Agrisure Viptera trait complement each other to provide a more comprehensive approach to reducing aflatoxins in corn. 🌱

INTERVIEWS BY SUSAN FISHER



**MILOUD ARABA, PH.D.**  
Technical Product  
Lead, Traits,  
Syngenta, North America

# Get Schooled

The Syngenta Seedcare Institute helps customers enhance their skills through hands-on training.

**B**eing on the forefront of seed treatment research and innovation has been a priority for Syngenta for more than 35 years. In 2014 alone, Syngenta registered six new seed treatment products in the U.S., bringing its current total of active product registrations to 54.

While the company continues to expand its line of Seedcare technologies, Syngenta also has become a world leader in seed treatment training and education. That intense focus on learning is especially apparent in Stanton, Minnesota, at the Syngenta North America Seedcare Institute. The facility, just an hour outside Minneapolis, is where customers and Syngenta personnel alike come to experience the latest in seed treatment technology and innovation.

## Training is Key

“Providing seed applicators with training and tools to achieve the highest-quality treated seed is at the heart of what we do at the Seedcare Institute in Stanton,” says Palle Pedersen, Ph.D., head of Seedcare product marketing at Syngenta.

Customers come to Stanton to learn the basic principles related to seed treatment and application technology, as well as exchange ideas with Syngenta experts. For example, the facility has a laboratory where technicians can adjust environmental conditions, such as temperature and humidity, to demonstrate what treatment applicators should and should not do to obtain best results. Even those customers who are seasoned professionals can advance their knowledge.

In 2013, 250 growers, retailers, applicators and other industry partners made their way to Stanton for training. A year later, that number jumped to more than 700.

## One Retailer’s Experience

One customer who recently received training in Stanton was Deanna Smith, Ph.D., who began a new role with MFA Inc. in Columbia, Missouri, earlier this year. As a crop protection marketing specialist with a focus on seed treatment and foliar fungicides, she wanted proper instruction on seed treatment application, so she headed to Stanton this past June for a two-day course.

“I knew our own personnel had a lot of questions, and it’s my position to make sure they have proper training,” says Smith. “I figured, why not learn from the experts at Syngenta?”

At Stanton, Smith went through the introductory-level course, which gives participants the opportunity to handle a variety of field-crop seeds and seed treatment product combinations. There is also an advanced-level course, designed for industry veterans. Regardless of experience, customers, like Smith, who come to Stanton have access to services, including application training, seed testing/quality assurance and recipe customization.

During her stay, the attention to detail, professionalism and approachability of the staff impressed Smith. “There wasn’t a question that we threw at them that they didn’t have an answer for,” she says. “And the teaching doesn’t stop when you leave the institute. I still count them as a strong resource.”

## Growing Stronger

It is a resource that promises to grow even stronger with the planned expansion of the Stanton facility. The additional 38,000-square-foot structure is nearly five times larger than the existing space and will include a Seedcare technology laboratory, a treating equipment and planter performance testing facility, and seed quality assessment lab. The new structure also will feature a unique multimedia demonstration space with interactive screens



The 38,000-square-foot expansion of the Syngenta Seedcare Institute in Stanton, Minnesota, should be completed by the end of 2016.



In 2013,  
**250** | In 2014, more than  
**700**

The number of growers, retailers, applicators and other industry partners trained at the Syngenta Seedcare Institute in Stanton, Minnesota, nearly tripled in one year's time.

to help visiting customers learn more about Syngenta Seedcare products and services. In short, the expansion will help improve the overall quality of Syngenta seed treatment technologies, while accommodating customer education and training. Syngenta has already broken ground

on the new facility and expects construction to be completed by the end of 2016.

Of course, one of the institute's most important audiences is Syngenta personnel. The knowledge that sales representatives and agronomic service representatives can gain in Stanton is invaluable to the customers they support in the field.

"Our continuous investment in infrastructure and people is a measure of our dedication to seed treatment innovation," says Jeff Cecil, head of crop protection product marketing at Syngenta. "Our mission is to create a competitive advantage for our customers, which we can only achieve through industry-leading technical support, customer service and technology."

#### Online Convenience

One 2015 technological achievement is the launch of the Seedcare Application and Resource Center ([www.seedcareresourcecenter.com](http://www.seedcareresourcecenter.com)). Syngenta designed this website exclusively for its Seedcare customers.

"The Seedcare Application and Resource Center offers an efficient way for treaters to prepare their own unique seed treatment recipes within labeled rate ranges and retain records," says Pat Foley, Seedcare specialist manager at Syngenta. "It significantly expands our ability to serve our treater customers."

Information available through the site includes recipe calculators—initially for corn, soybeans and wheat—along with the capability to save and email seed treatment recipes. Online calculators help ensure recipes are based on the most up-to-date information. In the future, the site will contain links to technical bulletins and product information.

All of these enhancements, whether they occur in Stanton or online, have the customer's best interest in mind. "Our Seedcare customers need to know how to treat seed, service and calibrate equipment, and apply the right dose on the seed to produce high-quality treated seeds," says Ravi Ramachandran, Ph.D., head of the Syngenta Seedcare Institute in Stanton. "Our expansion and growth will address these needs and enhance what we are currently offering. At the end of the day, it's all about providing the best possible customer experience." 🌱

STORY BY MATT LAIL

## WORKS TEN TIMES HARDER FOR A WHOLE LOT LONGER.

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# Double Duty

A multifaceted solution helps growers win the battle against soybean cyst nematode and sudden death syndrome. | BY DANIELLE BONICHE

**U.S.** soybean growers have always searched for tools to help them achieve greater yields. As early as the 1800s, growers understood that the nitrogen level in soil could play a leading role in producing more bushels per acre.

As a result, American growers began importing soil containing *Rhizobium*, a beneficial symbiotic bacteria that naturally supplies soybean plants with nitrogen. Little did they know that those shipments from Asia, where the bacteria was particularly plentiful, contained a pathogen that would become the No. 1 source of yield loss in soybeans<sup>1</sup>—the soybean cyst nematode (SCN).

## A Complex Relationship

The first report of this microscopic, parasitic pathogen in U.S. soil occurred more than six decades ago near Wilmington, North Carolina. Today, the pest can be found in every soybean-producing state in the country.

Jeff Simmons, a research and development scientist at Syngenta in Vero Beach, Florida, focuses his research on nematodes. The effects SCN has on soybean yields, he says, are threefold. “The roots are damaged when nematodes feed on them. Their feeding takes away vital water and nutrients from the plant. Punctures made by nematode feeding also allow diseases to enter the roots.”

Roots provide soybeans with a strong foundation and, if compromised, can leave plants vulnerable to diseases. It is through puncture wounds that SCN's partner in crime, sudden death syndrome (SDS), is able to wreak havoc on yields. SDS is one of the five most damaging soybean pathogenic pests<sup>2</sup> and is almost always worse in fields with SCN.

1. Source: Ohio State University Extension.

2. Source: Koenning, S.R., and Wrather, J.A. 2010; United Soybean Board, 2011.



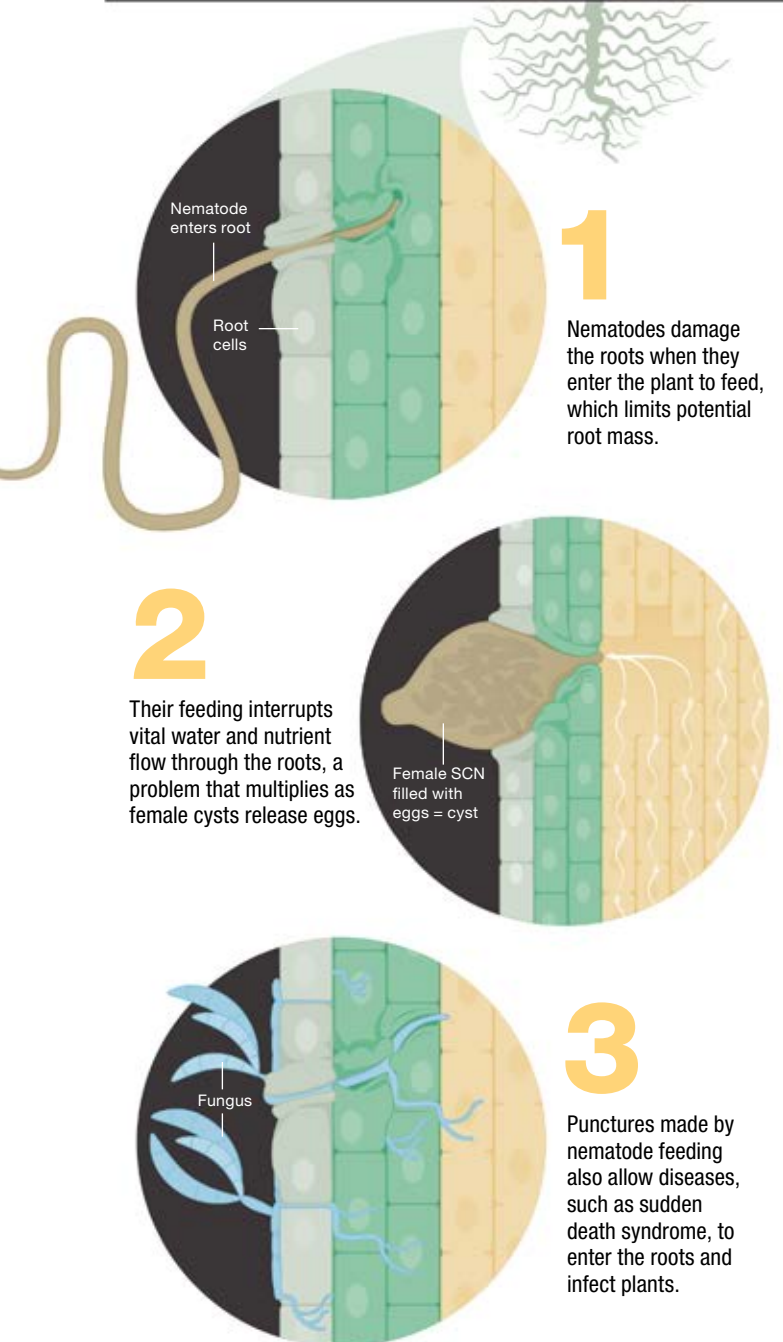


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Grower Brad Weger of Weger Farm in Robinson, Illinois, examines soybean roots to assess plant health.

## Three Ways Soybean Cyst Nematodes (SCN) Stress Plants and Reduce Yield



Unlike SCN, SDS is typically only an issue every four to six years because it is highly environmentally dependent—cooler, moister weather at planting, followed by cooler, moister weather during seed. But when it strikes, it can significantly impact yield. The causal agent of SDS, *Fusarium virguliforme*, also has the ability to overwinter.

Unfortunately, there are no in-season management options for SDS, and symptoms do not appear until mid- to late-August, well after infection first occurs.

“SCN normally leads to SDS being much worse,” says Dale Ireland, Ph.D., Seedcare technical product lead at Syngenta. “Any time you have a parasite, such as SCN, it reduces your plant’s ability to resist other problems, not only because of its direct impact, but also because of the significant plant stress caused by the parasitic infection. While there are exceptions, more than 95 percent of the time when SDS is yield-limiting, SCN is also involved.”

### Best Strategic Options

Due to the nature of the relationship between SCN and SDS, experts recommend that growers manage them together, which requires a combination of strategies. Most growers are familiar with rotating with nonhost crops and planting resistant varieties as a way to reduce the odds of seeing SCN damage in their fields. But applying an effective nematicide seed treatment is a newer strategy that is rapidly gaining momentum across the university and extension research community, as well as throughout the seed and crop protection industry.

In 2014, the first commercial use of Clariva® Complete Beans seed treatment, a combination of separately registered products, marked a milestone in SCN management. Clariva Complete Beans includes a lethal nematicide that provides season-long protection from SCN and also contains market-leading CruiserMaxx® Beans with Vibrance® seed treatment, also a combination of separately registered products. Over the last two years, Syngenta on-farm testing at 50 locations shows that because it manages SCN so effectively, Clariva Complete Beans increases yields by an average of 2.6 bushels per acre, or 4.6 percent, over an insecticide/fungicide seed treatment.

“Using SCN-resistant varieties, crop rotation and Clariva Complete Beans combines all of the tools in your toolbox to manage SCN,” says Ireland. (See “Managing Resistance,” page 13.)

**“Any time you have a parasite, such as SCN, it reduces your plant’s ability to resist other problems. ... While there are exceptions, more than 95 percent of the time when SDS is yield-limiting, SCN is also involved.”**

—DALE IRELAND



## SDS Management: A One-Two Punch

To prevent SDS, one of the most important factors is the use of resistant varieties. The NK<sup>®</sup> Soybean portfolio offers industry-leading SDS-resistant varieties<sup>3</sup> to help growers manage the disease. For Syngenta Seed Advisor™ and grower Jake Hoalt of Flat Rock, Illinois, this strategy is at the top of his list.

“The biggest thing you can do to manage SDS is select the right variety,” he says. “Adding Clariva Complete Beans makes it the full package deal. You have one of the best soybeans on the market, healthwise, and the nematicide protects the soybean from SCN, which goes hand-in-hand with keeping out SDS.”

An additional option that works in combination with choosing the right variety is adding Mertect<sup>®</sup> 340-F fungicide to the seed treatment, which can be used on soybeans as of this year. According to Ireland, Mertect 340-F is a reliable solution to manage SDS, because it provides early-season protection from *Fusarium virguliforme* and works in conjunction with Clariva Complete Beans to minimize the early infection and damage that SDS can cause.

NK brand retailer and grower Marc Mummelthel of Waverly, Iowa, is relying on the co-application of Clariva Complete Beans with Mertect 340-F to protect his customers' soybeans from the ravages of SCN and SDS. In 2015, he recommended that growers in his area treat all of their soybeans with this combination to help maximize their yields.

“If you want to get the highest yield possible, you have to put everything you can into your crop—whether it be fertilizer, fungicides, seed treatments—and give it every opportunity to yield best,” Mummelthel says. “2015 has been a great year for us to watch Clariva Complete Beans with Mertect 340-F. The weather set us up for a potential SDS nightmare. It's been exciting to see how well they performed.”

## The Value of Prevention

Decreased commodity prices in 2015 have many growers considering cutting back on inputs, such as seed treatments, to reduce costs in 2016. While paying less upfront might seem like an avenue to save money, the impact of leaving plants vulnerable to prevalent pathogens like SCN and SDS is not worth the risk.

“We saw really heavy SDS in 2014,” says Hoalt. “Growers experienced how yield-dropping the disease can be. Whenever you're talking about seed treatment, which only adds a couple of dollars to your expenses, I think it's pretty easy for growers to pull the trigger on the extra cost.”

SCN can often go undetected. Identifying population thresholds can help growers choose an effective course of action to manage the nematode. To determine populations, Simmons recommends sampling at the end of the season when populations are the highest.

Brad Weger, a grower from Robinson, Illinois, is familiar with the importance of soil sampling. “We've never had much of an issue with SCN, but last year we had a few hot spots show up

3. Based on the average SDS genetic resistance scores from Syngenta, Monsanto and Pioneer.

## Managing Resistance

When it comes to pest management, too much of a good thing can cause problems. PI 88788, a soybean breeding line introduced in the 1980s as a source to combat soybean cyst nematode (SCN), is found in more than 95 percent of SCN-resistant varieties today. Overreliance on this single breeding line—once hailed as a silver bullet—has reduced its ability to offer protection from SCN. In essence, the SCN population can reproduce on varieties with PI 88788 resistance more successfully today, and now SCN is rapidly building up in fields.

With no new sources of genetic resistance available, technologies like Clariva<sup>®</sup> Complete Beans seed treatment, a combination of separately registered products, can supplement the effectiveness of current resistant varieties and help prevent yield loss from SCN.

“We are on the edge of a resistance disaster,” says Palle Pedersen, Ph.D., head of Seedcare product marketing at Syngenta. “The time is now to take proactive steps to preserve the effectiveness of SCN-resistant varieties. Implementing a multi-pronged solution that includes Clariva Complete Beans is an excellent strategy for managing this costly pest.”



that we'd never seen before,” he says. “That got us thinking: How much damage do we actually have that we don't notice?”

Realizing the potential of SCN-related damage, Weger, who plants 100 percent NK Soybeans, treated every acre with Clariva Complete Beans in 2015. “We are big on preventive maintenance. We think that if something is going to work, we are not scared to spend a little extra money.”

The quest for new tools to maximize yields and return on investment is one that will never end for soybean growers—or Syngenta. “From disease-resistant varieties to new seed treatments, we are always on the hunt for game-changing solutions to growers' most challenging problems,” says Ireland. “It's exciting when our technologies can positively impact yields and improve our customers' bottom line.”

**FOR MORE INFORMATION** on managing soybean cyst nematode and related diseases, including sudden death syndrome, visit the following online resources:

- > Clariva<sup>®</sup> Complete Beans, [www.clarivacompletebeans.com](http://www.clarivacompletebeans.com)
- > Mertect<sup>®</sup> 340-F, [www.syngentacropprotection.com/mertect-340-f-fungicide](http://www.syngentacropprotection.com/mertect-340-f-fungicide)
- > NK<sup>®</sup> Soybeans, [www.NKSoybeans.com](http://www.NKSoybeans.com)
- > Soybean Insider, [www.farmassist.com/blogs](http://www.farmassist.com/blogs)
- > Tools to Grow More Soybeans, [www.farmassist.com/promo/pest\\_solutions](http://www.farmassist.com/promo/pest_solutions)





YES!  
SAY



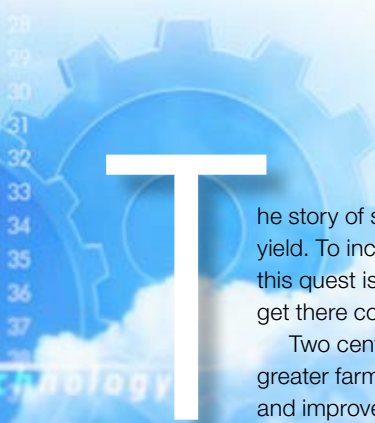
# HITTING THE Bull's-Eye

Syngenta

BREEDERS

Soybean breeders use analytical tools to target traits that can contribute to higher-yielding varieties.

*By Joel Richardson*



T

he story of successful farming is told in the language of yield. To increase yield is to increase farmer profit. While this quest is not new, the tools used to clear the path to get there continue to shift and improve.

Two centuries ago, the Industrial Revolution ignited greater farm productivity in the form of better equipment and improved processes to manufacture crop inputs. Today's digital revolution, which ushered in the Information Age, is also contributing to increased productivity on the farm. Telecommunications, computer programming, the Internet and social media, all products of this age, have improved the way agricultural professionals exchange and collect information. Beyond making more information available, this age has also introduced advanced analytical and mathematical methods that can help comb through the data and find answers to multiple crop production questions with greater precision and speed.

To modernize plant breeding, Syngenta is tapping into these revolutionary resources to improve breeding efficiency and success.

### Innovative Problem Solving

Leading this effort is Joseph Byrum, Ph.D., head of soybean research and development (R&D) at Syngenta. His intense commitment to building better, higher-yielding soybeans has driven him and his team to look beyond traditional agricultural sources for answers.

"Agriculture can be an insular industry," he says. "Open innovation, which involves engaging a much broader cross-section of the population and utilizing their expertise to create new solutions for farmers, was a new concept just

five years ago. Regardless of where the technology comes from, we at Syngenta want the best solutions."

In 2009, Byrum introduced open innovation to Syngenta as a problem-solving technique. It brought to life the Thoughtseeders™ program, a Web portal where scientists and other innovative thinkers, both inside and outside agriculture, can share their ideas with the company. This first program, aimed at collaborating with nonagriculture experts, was a groundbreaking step in redefining the way Syngenta responds to farmers' needs.

"Open innovation means different things to different people," Byrum says. "To me, it means being open to any form of problem-solving or offer of technology across Syngenta as well as outside the company."

### Unconventional Partnerships

One of the first outside partnerships that Byrum's team formed was with KROMITE, a New Jersey-based decision analytics firm. Syngenta and KROMITE set out to develop new analytical systems to improve the process of breeding a wide variety of crops with greater yield. But KROMITE's prior experience was within the pharmaceutical industry, not agriculture.

"Syngenta was the first ag company KROMITE had ever worked with," says Bruce Luzzi, Ph.D., soybean seeds project lead at Syngenta. "KROMITE had no knowledge of plants, but it had vast knowledge of data analysis."

With support from KROMITE, Syngenta set out to model its plant breeding system to be more predictive. The result was the creation of a new system designed to anticipate the impacts of breeders' decisions.



Left to right: Jack Kloeber of KROMITE, a decision-analytics firm that partners with Syngenta, and Bruce Luzzi, Dan Dyer and Joseph Byrum of Syngenta accept the 2015 Franz Adelman Award for a soybean breeding team initiative.

### A Win-Win

When the Syngenta soybean breeding team won the 2015 INFORMS Franz Adelman Award for Achievement in Operations Research and the Management Sciences, it beat out major competitors known for their operational excellence, including IBM and the U.S. Army. Syngenta was the first-ever agricultural company to receive the award, which acknowledges significant contributions of analytics and operations research in the for-profit and nonprofit sectors.

"The Adelman Award is rigorous and merit-based," says Joseph Byrum, Ph.D., head of soybean research and development at Syngenta. "To receive the award means Syngenta is keeping up with organizations outside our industry and is clearly leading the charge within it."

The winning Syngenta soybean breeding team initiative, called the Y.E.S. Yield Engineering System™, uses advanced mathematics and state-of-the-art technologies to develop higher-yielding soybean varieties.

The recognition is a win for growers and resellers as well, notes Doug Tigges, soybean genetics product manager at Syngenta. "An award like the Franz Adelman confirms that our scientific approach to soybean breeding will help us continue to build a strong portfolio of NK® Soybeans with the herbicide tolerance and agronomic traits that growers have come to expect."



## The Tools

Imagine working on a three-year project only to see it fail in the final moments. All your work is lost, and you're forced to start over. What if you could have predicted the critical errors or mistakes that caused failure? What if you could have made smarter, more informed decisions throughout the process, avoiding failure altogether?

For Syngenta soybean breeders, this is precisely the benefit of the company's newly developed breeding program, called Y.E.S. Yield Engineering System™, which currently features four newly developed analytical and planning tools:

- > **Trait Introgression Tool.** This tool allows breeders to enter different scenarios of the trait introgression process into a computer model and identify where in the process their plan may fail. For example, the tool will indicate if the number of breeding crosses is insufficient to develop a population large enough to identify the desired combination of traits. The tool pinpoints missteps before Syngenta begins a multiyear breeding project.
- > **Breeding Project Lead Tool.** Success not only relies on effectively and efficiently identifying and improving genetic traits, but also on where and when to conduct field trial activities. The Breeding Project Lead Tool determines the best combination of geographies to maximize the success of early-generation and yield trial activities, based on information that the breeders enter.
- > **Yield Trial Design Optimizer.** From the two previous tools, Syngenta breeders know the best trait introgression scenario and best use of field locations to achieve breeding success. The Yield Trial Design Optimizer uses historical yield trial data and costs associated with yield trial designs (number of entries, replications and locations) to plot design cost against maximum yield output. The breeders can choose the design that effectively uses resources to identify varieties with the highest yield potential.
- > **Data Quality Cart Tool.** Farmers know that no two fields are exactly the same. Variations in moisture levels, soil type, pest and disease pressure, and agronomic practices impact the uniformity and quality of data collected in the field. The Data Quality Cart Tool takes into account these environmental variations and makes adjustments to or eliminates data from a trial that may cause an inaccurate interpretation of the results.

## Far-Reaching Effects

These tools are all part of a scientific discipline using advanced analytics and mathematics to optimize work

processes. Known as operations research (OR), this concept is not new to certain segments of the agricultural industry, but it is a novel approach for plant breeders.

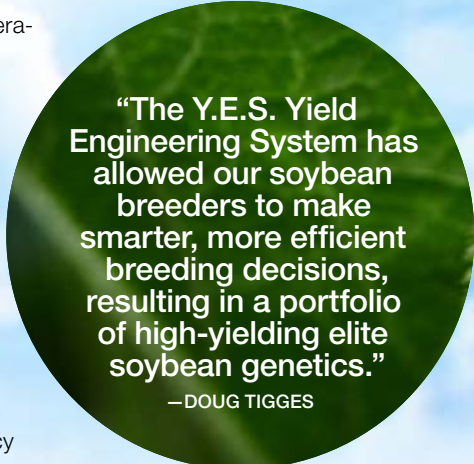
"Over the past 60 years, OR has been used in agriculture to optimize the feeding of livestock, to improve crop rotation, to manage farms and to assess public policy goals," says Byrum. "Analytics has made farms and farmers more efficient, but we're doing something unique at Syngenta. We're applying OR to breeding to make the plants themselves more efficient. Each of our four tools comes into play at various phases of the development pipeline, with the end goal of giving growers better varieties to plant."

This innovative approach to breeding is already making an impact in the field by bringing higher-yielding NK® Soybean varieties to market. "The yield potential of NK Soybeans has never been higher than with our new 2016 performance-class varieties," says Doug Tigges, soybean genetics product manager at Syngenta. "The Y.E.S. Yield Engineering System has allowed our soybean breeders to make smarter, more efficient breeding decisions, resulting in a portfolio of high-yielding elite soybean genetics."

Chris Blome, a Syngenta Seed Advisor™ in Alden, Iowa, has experienced firsthand the benefits of planting NK Soybeans. "NK Soybeans have the best genetic lineup, the most consistent yield and the strongest defensive packages throughout the industry," he says. "Plus, the NK Soybeans pipeline is second to none."

One of the biggest threats Blome faces each year is damage from soybean cyst nematodes (SCN). "We have heavy SCN pressure in this area," he says. "The best way to manage the pressure is by planting SCN-resistant NK Soybean varieties. We also encourage other growers to treat their seed with Clariva® Complete Beans seed treatment, a combination of separately registered products. In trials on our farm, this combination has given us positive yield results—3.5 bushels per acre more than the untreated." (For more information on SCN, see "Double Duty," page 10.)

To build on the success of the Y.E.S. Yield Engineering System on soybeans, Syngenta is beginning to use similar programs on all major crops, including corn, sunflowers and watermelons. Go to [www.syngentaseeds.com](http://www.syngentaseeds.com) for updates. 🌱



**"The Y.E.S. Yield Engineering System has allowed our soybean breeders to make smarter, more efficient breeding decisions, resulting in a portfolio of high-yielding elite soybean genetics."**

—DOUG TIGGES

# The Science of



Syngenta researchers reflect on the discovery and development efforts that have contributed to the success of Artesian corn hybrids. | *By Karyn Ostrom*

**G**iven this season's excessive rain throughout much of the Corn Belt, choosing a 2016 corn hybrid based on its ability to optimize water may seem counterintuitive. But 2015's rainfall underscores the reality that weather remains the most unpredictable factor in growing a successful crop, explains Duane Martin, Ph.D., commercial traits lead at Syngenta.

Fortunately for growers, the benefits of water-optimized Agrisure Artesian® corn hybrids from Syngenta are twofold. During years like 2015, when in-season rainfall is sufficient to grow a successful crop, Artesian™ hybrids deliver top-end yield. And during seasons when available water is limited, they have demonstrated a nearly 12 percent yield advantage over non-Artesian hybrids. Much of the success can be attributed to the research and development (R&D) efforts that helped produce this elite lineup of hybrids—and the contributions of the Syngenta native traits water optimization team.

## **More Listening, Less Talking**

There's a reason why Syngenta took a native gene approach when the company's water optimization R&D efforts in corn commenced a decade ago. By that time, advances in biotechnology had produced hybrids that could deliver specific outcomes, such as resisting herbicides and controlling pests. Building a hybrid to manage water stress, however, was different. Researchers agreed that a successful outcome would require a sophisticated understanding of how water stress affects corn at the gene level. It would be difficult and inefficient, they reasoned, to begin breeding plants to manage water stress without knowing more about the nature of the stress they were trying to manage.

"Studying native traits allows corn to teach us how it has adapted to respond to stress," says Adrian Lund, Ph.D., a principal research scientist and plant physiologist on the genetics team at Syngenta. "Biotechnologists sometimes assume they know everything about corn—and thus we believe we can tell corn exactly what we want it to do. While this approach has been successful in some cases, we are finding that there is so much more we can learn when we stop telling corn what we want it to do and start listening to what it's trying to tell us. The true power of native trait technology is that we now can rapidly identify and combine the best of these ancient adaptive strategies into modern high-performance corn hybrid products."



# Artesian corn

“Studying native traits allows corn to teach us how it has adapted to respond to stress.”

—ADRIAN LUND



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MANAGED STRESS ENVIRONMENT SITE.  
[www.syngentathrive.com/research](http://www.syngentathrive.com/research)



Photos from the Colorado Managed Stress Environment (CMSE) site in LaSalle, Colorado. Clockwise from left: An Artesian™ corn plant flourishes in the field; (left to right) Daniel Willis, Aubrey Weiland, Randy Lebsack and Christine Chaulk-Grace, full-time employees at the site, pause during a morning visit to the field; below-ground drip tape delivers water to field trials with maximum precision; a researcher measures the diameter of a corn stalk with a digital caliper.

Golden Harvest® hybrid G01P52  
Artesian brand grows at the  
Managed Stress Environment  
site in Colorado.



During the discovery stage, Syngenta scientists analyze the native corn genome to identify genes that are involved in the ability to manage water stress. According to Allison Weber, Ph.D., senior research scientist at Syngenta, it's a tedious yet rewarding endeavor. "Discovering and understanding how a gene contributes to a drought-tolerant Artesian hybrid is uncovering part of the truth," she says. "As a scientist, that's an exciting feeling."

### Testing for Stress Management

The groundwork for Artesian hybrids begins in a lab, but it doesn't end there. Genes that test well for stress management during discovery become "candidate genes." Syngenta researchers then evaluate hybrids containing these genes at Managed Stress Environment (MSE) sites around the world to determine whether the genes will perform in a field setting.

"The main purpose of operating MSE sites is to replicate our trials in real-world environments," says Christine Chaulk-Grace, lead North America MSE trialing and station manager at Syngenta.

One of the MSE sites Chaulk-Grace manages is in LaSalle, Colorado. It is the first Syngenta research site dedicated to testing crops in managed irrigation trials and includes roughly 80 acres of land, outfitted with below-ground drip tape. This setup enables Chaulk-Grace and her team of three full-time researchers to deliver irrigation with maximum precision, from a volume and timing perspective. Because LaSalle receives little in-season rainfall, her team can induce drought by withholding water at various growth stages and at different levels of severity to observe how the crop—and, specifically, the candidate genes—can manage water stress.

The researchers at MSE sites communicate field observations and performance results to Syngenta corn breeders, who then move validated genes into hybrids with compatible genetic backgrounds.

Shepherding Artesian hybrids from discovery to development—and then to commercialization—is a defining career highlight for the LaSalle research team, says Aubrey Weiland, associate scientist at Syngenta. For the past nine years—spanning much of the native traits water-optimization effort—Weiland has monitored, managed and harvested the trials. "When you work on a project

like this with such intensity, it's really exciting to know that actual growers are benefiting from the technology," she says.

### Optimizing the Conversion of Water to Grain

About 115 miles east of the LaSalle MSE site is Yuma County, Colorado—consistently ranked among the top corn-producing counties in the nation. Here, the Ogallala Aquifer, which nourishes much of the High Plains, provides the lifeblood for crops, as center pivot irrigation units transform the landscape from dry prairie grasses to vibrant green circles of crops.

Syngenta Seed Advisor™ and grower Nathan Armstrong, who maintains a 2,500-acre operation in Yuma County, recognizes that the aquifer is a finite resource. Doing his part to help extend its life, he embraces wireless irrigation management technology and agronomic practices that help him apply irrigation wisely.

In 2014, Armstrong planted Golden Harvest® Corn hybrid G07B39 Artesian brand in one field. "I love that hybrid," he says. "It ended up being my highest-yielding field. And this hybrid simply doesn't need as much water, so I don't need to apply as much irrigation. I've found that, from my experience, it requires about 30 percent less water than other hybrids because it uses water so much more efficiently."

The ability to achieve optimal yields while saving a significant amount of water motivated Armstrong to convert 70 percent of his corn acres to G07B39 Artesian in 2015.

Growers across the entire Corn Belt report that Artesian hybrids help them manage gaps in rainfall better than other hybrids—and that the plant's ability to optimize the conversion of water to grain translates to improved yield consistency. "I like the fact that an Artesian hybrid is very consistent across every acre that we plant here," says Mitch Agre, a Syngenta Seed Advisor and grower from Sacred Heart, Minnesota. "We can plant it on corn-on-corn acres, less productive acres—even sandy ground—and it seems to do all right. We don't have to worry about running out of water in the middle of the summer, as that hybrid will kick into high gear for us and help finish out the season."

### The Next Wave

As growers like Armstrong and Agre embrace Artesian technology as a simple, effective way to manage the unpredictability of weather, the Syngenta native traits water optimization team continues to actively research, identify and validate additional genes. "The pipeline works, and we want to extend it," says Dirk Benson, Ph.D., head of seeds product development at Syngenta.

The Artesian footprint now extends beyond North America, having been launched as HYVIDO® corn in southeastern Europe. Other regions anticipating Artesian product launches in the coming years include Latin America and Southeast Asia.

"We're in a great place," says Ben Ford, Ph.D., germplasm team lead at Syngenta. "As part of the breeding team, it's exciting to develop such an elite lineup of hybrids. When growers are seeing success, it's that much more fulfilling." 🌱



# MANAGING WATER ALL SEASON LONG

Dry conditions at any growth stage can result in reduced yield. The good news is that Agrisure Artesian® corn hybrids help the crop optimize the use of available water all season long, converting water to grain more effectively than other hybrids.

## How insufficient water affects the corn plant:



Can delay silk emergence, resulting in unsuccessful fertilization



May produce fewer carbohydrates, resulting in less harvestable grain to fill the ear



May cause leaves to wilt and curl, disrupting photosynthesis and normal plant development



May inhibit cell expansion and division within the plant, resulting in reduced plant height and ear size



Can reduce plant's uptake of water and soluble nutrients



## How Artesian™ hybrids help the corn plant manage water:



Better regulate synchronization of pollen shed and silking, resulting in successful fertilization



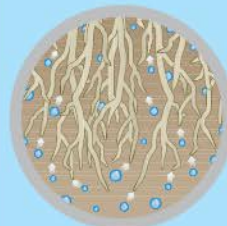
Better control of how resources are allocated within the plant, increasing the volume of harvestable grain per ear



Maintain normal growth and development longer into a dry spell



Optimize growth and health of developing shoot and floral tissues



Improve water and nutrient uptake through robust root system

# Troubled Waters

A new rule within the Clean Water Act is proving controversial and worrisome to many growers and ag professionals.

**A** rule intended to clarify the federal Clean Water Act appears to have instead muddied the waters.

“This is clearly the largest reordering of the Clean Water Act since it was initially passed in 1972,” says Don Parrish, senior director of regulatory relations with the American Farm Bureau Federation. “For someone who is a Clean Water Act practitioner, it is extremely frustrating.”

Parrish has worked on Clean Water Act issues for more than two decades. His frustrations stem from both how the new rule was written and his belief that its implementation is likely to impact land management. There’s not a farm or ranch in America that won’t be affected, Parrish adds.

## Differing Interpretations

In May 2015, the Environmental Protection Agency (EPA) released the Waters of the United States (WOTUS) final rule under the Clean Water Act. EPA officials say that WOTUS is an effort to restore—not expand—the federal government’s authority to limit pollution in the nation’s rivers, lakes, streams and wetlands.

But many agricultural groups and trade associations see WOTUS as an attempt to increase the EPA’s jurisdiction to

regulate waters not originally covered by the Clean Water Act. Under the new rule, federal regulations would expand to ephemeral or short-lived water sources that only flow during rain events and headwaters that show physical features of flowing water—such as a bed, bank or high-water mark. Regulations also would apply to waters that are next to rivers and lakes and their tributaries. Previously, only perennial and intermittent tributaries and adjacent wetlands were deemed jurisdictional, absent a case-specific finding.

“Clearly, this will make the Clean Water Act a super-statute,” Parrish says.

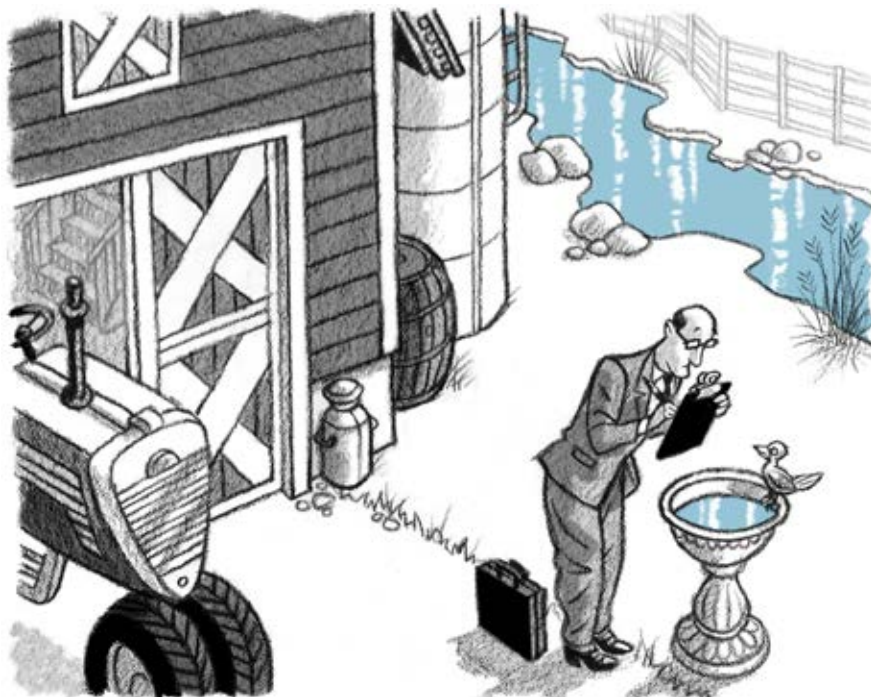
Many critics think that the rule is vague when defining “water,” “dryland” and other terms used in the rule. For example, “ditch” means different things to different people around the country.

While EPA officials tell growers and ranchers normal agricultural practices will be exempt under the rule, many opposed to the regulation claim the exemption isn’t spelled out. They argue the rule seems to say all water bodies—whether in a field or at the edge of a field—that discharge into a waterway navigable downstream must meet all water quality standards as set by the state.

“The EPA knew how to put safeguards in the regulation [to ensure the agricultural exemption], and they didn’t put those words in the rule,” Parrish says. “Words are hollow unless you put the safeguards in the regulation.”

## Site-Specific Regulation

Parrish and others say that without the clarification about agricultural practices, growers or ranchers applying fertilizer or pesticides to their fields or pastures may find themselves afoul of the rule, if they apply those products over or too near a feature determined to be waters of the U.S. Unfortunately,



“This rule upset a lot of people. It’s confused a lot of people. The EPA thought it was providing clarity, but it seems to have raised a lot of questions.”

—LAURA PETERSON



growers won't be able to tell if a ditch or stock pond qualifies as a water of the U.S. with the naked eye.

Determining what qualifies as a water of the U.S. is left up to the EPA's discretion. Regulators can use historical maps and other indicators to determine significant connections to a waterway. But judges may eventually make the final ruling.

Laura Peterson, a federal government relations manager for Syngenta, calls the site-specific analysis detailed in the rule still somewhat ambiguous.

"Clean Water Act jurisdictional determinations are so site-specific, so local," Peterson says. "This rule upset a lot of people. It's confused a lot of people. The EPA thought it was providing clarity, but it seems to have raised a lot of questions."

She recommends that growers and ranchers keep close tabs on the new rule and how it applies to their individual operations while the fight over WOTUS continues in both the courts and Congress. "Make sure you are compliant when implementing practices," Peterson says.

Syngenta works diligently with its grower customers to help ensure they apply crop protection products in a manner that prevents those products from entering water bodies, says Mark White, regulatory stewardship manager for Syngenta. But despite those strong stewardship ethics, it may be difficult—if not impossible—to use those products if a ditch or erosional feature in a field is deemed a water of the U.S.

"Farmers will ask, 'Can I even afford to farm this area or part of the field?'" White adds.

### What's Next?

Even though the rule is "final," growers haven't seen the end of it, Peterson says.

The U.S. House of Representatives overwhelmingly passed a bill to stop the rule's implementation, and the U.S. Senate is considering similar action. However, it is unclear whether there are enough votes in Congress to overturn a likely presidential veto.

That's why it is so important for growers and ranchers to contact their legislators. "Congress needs to know that the EPA has overreached," Parrish explains.

In late August, a U.S. district court judge granted a temporary injunction in favor of 13 states that brought suit in North Dakota against the EPA and the Army Corps of Engineers. As of early September, the EPA was not implementing the rule in those states, and continued enforcement in other states was under review. Court watchers expect the issue to eventually end up before the U.S. Supreme Court. 🍀

STORY BY CINDY SNYDER

**FOR MORE INFORMATION** and perspective on the new rule in the Clean Water Act, visit these websites:

- > Clean Water Rule, [www2.epa.gov/cleanwaterrule](http://www2.epa.gov/cleanwaterrule)
- > Ditch the Rule, [ditchtherule.fb.org](http://ditchtherule.fb.org)

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# Delivering the Goods

Retailers benefit from a bulk program that helps ensure products are available where and when customers need them.

**G**iant ragweed. Just the name of this yield robber is enough to make Alan Boogher cringe. That's why he was interested in trying Acuron® corn herbicide, a new Syngenta weed-management solution that received regulatory approval just days before the hectic 2015 spring agronomy season started.

"There can be three to five flushes of giant ragweeds around here during the growing season, especially in conventional tillage," says Boogher, president of A.G. Boogher & Son Inc. in Wapakoneta, Ohio. "Acuron got our attention because not having to respray for giant ragweed is huge."

**"We're asking the 'what if' questions now so we can work toward making sure our customers get their bulk deliveries when they are going full-speed ahead next year."**

—STEPHANIE NEESE

The only hiccup? Since approval from the Environmental Protection Agency didn't come until late April, Syngenta had only a few weeks to deliver the product before it was out of season. But an efficient supply chain enabled Boogher to receive his bulk supply of Acuron on time. The product's application flexibility was invaluable, especially since 30 inches of rain in 30 days made pre-plant applications tough in Boogher's area.

"Acuron did a good job," says Boogher, who notes that giant ragweed, marehail and lambsquarters are some of the most troublesome weeds in his area. "You don't have to come back and respray. You can get good weed control with one product, rather than three, and it offers crop safety."

In another part of the country, Brandon Koch, a sales agronomist with All Points Cooperative in Cozad, Nebraska, sold about 500 gallons of Acuron within two hours of receiving news of state registration. He then moved another 1,000 gallons the next week. "I liked the long-lasting residual from Acuron. It gave us better control on kochia,



Immediately following product registration in April, bulk tanks of Acuron® herbicide were ready for delivery from the Syngenta manufacturing plant in St. Gabriel, Louisiana, to destinations throughout the Corn Belt.



which is starting to become resistant in our area,” Koch says. “The application flexibility of the product, 28 days pre-plant up to 12-inch corn, was also helpful, since we had a wet spring.”

These accomplishments didn’t happen by accident. Having the right people and systems in place helped Syngenta act quickly to deliver Acuron to the right destinations. “We knew the approval of Acuron would likely come right in the heat of battle for our customers,” says Stephanie Neese, national bulk equipment specialist for Syngenta. “That’s why we analyze every step of the supply chain from point A to point Z with all our products to help make sure our customers can have the right amount of inventory on hand to meet growers’ needs.”

### Hitting a Moving Target

A significant reason why Syngenta is able to meet these inventory crunches is that so many of its corn and soybean crop protection products are available in bulk. That’s important as more retailers consolidate, farms expand and spraying equipment gets larger.

Consider a sprayer with a 100-foot boom that can treat 60 acres per hour for 10 hours a day. “This rig can treat 600 acres a day,” says Randy Ratliff, customer service center head for Syngenta. “If, for example, the use rate of a product is half a gallon per acre, that means 300 gallons of product a day are going through just one sprayer. It’s not uncommon for one retail location to go through 1,500 gallons of Syngenta crop protection products per day. Customers rely on us to get these products where they need to be, when they need to be there.”

Meeting this goal demands a streamlined supply chain. It also requires effective communication, which starts with growers and retailers and extends to Syngenta sales representatives, distributors, key account managers and a variety of other Syngenta specialists.

“Getting our products to market faster is a moving target that never stops,” says David Fisher, manager of logistics excellence for Syngenta.

The Syngenta team analyzes sales forecasts and monitors weather forecasts to provide adequate in-season delivery volumes across the country. In addition, the team tracks the capacity constraints of carriers, from trucks to trains, which can significantly impact the time a delivery takes to reach its destination.



Teamwork helped make the first bulk delivery of Acuron® herbicide in Ohio possible. A.G. Boogher & Son Inc. in Wapakoneta received the shipment on May 7, just days after product registration. Back row, left to right: Eric Anderson, Syngenta; Mark Barnes, Syngenta; Marc George, Syngenta; Mike Erwin, KOVA of Ohio; and Tyler LePage, Syngenta. Front row, left to right: Alan Boogher; Amanda Kohnen, Syngenta; and Matt Cook, KOVA of Ohio.

Take Halex® GT herbicide from Syngenta as an example. After Syngenta manufactures the herbicide in St. Gabriel, Louisiana, its logistics team determines whether the company will ship the product to various bulk terminals located throughout the country or directly to the customer via rail cars or trucks.

“Rail is the most cost-efficient method, but can take five to 30 days in transit,” says Fisher, who notes that trucks can offer same-day delivery in some cases. “We keep an eye on the weather so we know what regions will need product when, and whether we have time to move the product by rail.”

When the need for Halex GT ramped up in the spring of 2015, the process proved itself. “We had a record-setting month in June in terms of total bulk herbicide deliveries,” Fisher says. “The agility of our network helps us stay on track.”

The Syngenta team is already gearing up for 2016 and is ready to meet the challenges the new season may bring. “We’re asking the ‘what if’ questions now so we can work toward making sure our customers get their bulk deliveries when they are going full-speed ahead next year,” Neese says. “We’re always looking ahead to what’s next.” 🍀

STORY BY DARCY MAULSBY



# Ripple Effect

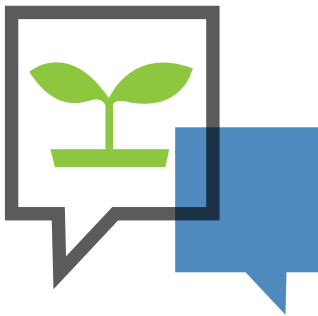
From research and development to support of FFA and industry initiatives, Syngenta is a leader in the ag community. The company also is dedicated to the continual improvement of customer service.

## SURVEY

### > Giving Voice

Earlier this spring, Syngenta asked resellers to take the following challenge: “Tell us how we are performing relative to other manufacturers, and we’ll make a donation to the National FFA Organization on your behalf.” More than 1,000 Syngenta customers from across the country answered this challenge, resulting in a \$10,140 donation to FFA.

Since 2006, the Voice of Customer (VOC) survey has helped Syngenta gauge how satisfied resellers are with its people, products and services. The company then uses participants’ responses to build an even stronger network of support for them.



Analysis of the 2015 survey data is already underway, with recommendations on how to transform resellers’ insights into actionable next steps coming soon. “We are grateful to the men and women who took the time to participate in the 2015 VOC survey,” says Dan Burdett, head of customer marketing at Syngenta. “Their voices will be heard because we are listening.”



Mary-Dell Chilton, Ph.D., of Syngenta celebrates her induction into the National Inventors Hall of Fame for her work with transgenic plants.



## HONORS

### Syngenta Scientist Receives Honor

Mary-Dell Chilton, Ph.D., a distinguished science fellow at Syngenta, was one of 14 honorees recently inducted into the National Inventors Hall of Fame (NIHF). She received this recognition because of her groundbreaking work with transgenic plants.

“My career in biotechnology has been an exciting journey, and I am amazed to see the progress we have made over the years,” says Chilton, who founded the Syngenta biotechnology labs. “My hope is, through discoveries like mine and the discoveries to follow, we will be able to provide a brighter and better future for the generations that follow us.”

Chilton’s work with plant biotechnology led her to produce the first transgenic plant in 1983, which showed that plant genomes could be altered more precisely than previously thought. Her research at Syngenta Biotechnology eventually resulted in improving the ability of plants to resist insects and disease and tolerate extreme environmental conditions. In 2014, Chilton received the World Food Prize, the foremost international award recognizing individuals who positively impact the quality, quantity or availability of food in the world.

“These recent honors belong to all the people who worked with me to produce the first transgenic plants,” she says. “I am truly only a representative of the large number of immensely talented experts who contributed to the work.”

Established in 1973, NIHF honors U.S. patent holders whose technological advancements have changed the world through human, social and/or economic progress.

## EVENTS

### > Woodland Facility Expands

Syngenta recently completed an \$11.2 million expansion of its research and development (R&D) and seed production site in Woodland, California, and hosted a grand reopening celebration to officially mark the achievement. Customers, government officials, members of the media and Syngenta employees gathered at the site for a ribbon-cutting ceremony and first look at the expanded facility, which also serves as the Syngenta Global Cucurbits Center of Excellence.

“This expansion is enabling us to bring together our entire North American cucurbit R&D team under one roof and address farmers’ needs around the world,” says Sean Knapp, head of vegetables seed product marketing at Syngenta. “With the addition of new greenhouses and specialized plant-growth environments, this facility will provide an exciting opportunity for innovation and collaboration across a wide variety of crops, including cereals, corn, cucurbits and tomatoes.

The work that goes on in Woodland to develop the tools that can help growers feed more people using fewer resources is one example of how Syngenta is bringing The Good Growth Plan to life. Go to [www.goodgrowthplan.com](http://www.goodgrowthplan.com) for more information on this Syngenta initiative and its six commitments to address the challenges of achieving global food security by 2020.



Syngenta employees, state and local officials, and civic leaders officially reopen the Woodland, California, R&D and seed production facility.

# thrive

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This document contains forward-looking statements, which can be identified by terminology such as ‘expect,’ ‘would,’ ‘will,’ ‘potential,’ ‘plans,’ ‘prospects,’ ‘estimated,’ ‘aiming,’ ‘on track’ and similar expressions. Such statements may be subject to risks and uncertainties that could cause the actual results to differ materially from these statements. We refer you to Syngenta’s publicly available filings with the U.S. Securities and Exchange Commission for information about these and other risks and uncertainties including the “Risk Factors” in our Annual Report on Form 20-F. Syngenta assumes no obligation to update forward-looking statements to reflect actual results, changed assumptions or other factors. This document does not constitute, or form part of, any offer or invitation to sell or issue, or any solicitation of any offer, to purchase or subscribe for any ordinary shares in Syngenta AG, or Syngenta ADSs, nor shall it form the basis of, or be relied on in connection with, any contract thereof.

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## SPONSORSHIP AND DONATIONS

# Fueling Choice

Syngenta revs up its support of ethanol and local FFA chapters at Iowa NASCAR race.

More than 500 corn growers, seed resellers, ethanol producers and Syngenta personnel from six states came together at the Iowa Speedway in June to celebrate ethanol. Since 2013, sponsorship of the American Ethanol 200 Presented by Enogen has given Syngenta a chance to increase awareness of this superior, higher-octane fuel and show its support of the industry.

The race, which takes place annually in Newton, Iowa, is part of the NASCAR Camping World Truck Series. While 2015 first-place finisher Erik Jones and grand marshal Chris Soules, grower of Enogen® corn and star of the TV show “The Bachelor,” shared the spotlight, ethanol was the true winner. Prior to the race’s start, Syngenta announced its plan to donate approximately \$600,000 to the Prime the Pump Fund. This ethanol industry initiative awards grants

to early retail adopters of high-level ethanol blends to help them reduce their initial investment in infrastructure.

Since 2001, the Environmental Protection Agency (EPA) has allowed the use of gasoline blends containing as much as 15 percent ethanol for cars from that year or newer. Prime the Pump was formed to help the industry advance, following EPA’s initial step. “The Syngenta donation supports our strategy of aiding high-volume, industry-leading fuel retailers who will demonstrate the performance, cost savings and profit opportunity of marketing higher-ethanol blends, such as E15,” says Ray Defenbaugh, chairman, Prime the Pump Fund.

Support of the Prime the Pump Fund is part of a Syngenta commitment initiated in 2013 to contribute \$1 to the ethanol industry for every acre planted with Enogen corn enzyme technology.

“Syngenta is pleased to continue its financial support of the ethanol industry,” says Jack Bernens, head of Enogen at Syngenta. “Clearly, we have the vehicles capable of using blends higher than E10, but consumers need greater

access to stations capable of providing it. Efforts like Prime the Pump will help make that access a reality.”

In conjunction with the race, Syngenta also collaborated with Iowa FFA members to raise money to complement its dollar-per-acre donation. For the past two years, Syngenta has matched funds raised by FFA members for flex-fuel infrastructure, with a portion of the proceeds going to participating FFA chapters.

“Engaging the public about ethanol and renewable fuels is a good opportunity for my students,” says Miranda Johnson, advisor of the Twin Cedars FFA Chapter. “They are the future, and they understand the importance of conservation and preservation of our land and resources—and the vital role farmers play in feeding and fueling our country.”

STORY BY RYAN DIDSBURY

Syngenta presents a check to the Prime the Pump Fund during the American Ethanol 200 Presented by Enogen. From left to right: Chris Soules, Enogen corn grower and grand marshal of the race; Chris Tingle, head of marketing for Enogen; Ray Defenbaugh, chairman of the Prime the Pump Fund; Delayne Johnson, CEO of Quad County Corn Processors; and Kelly Manning, vice president of development for Growth Energy.

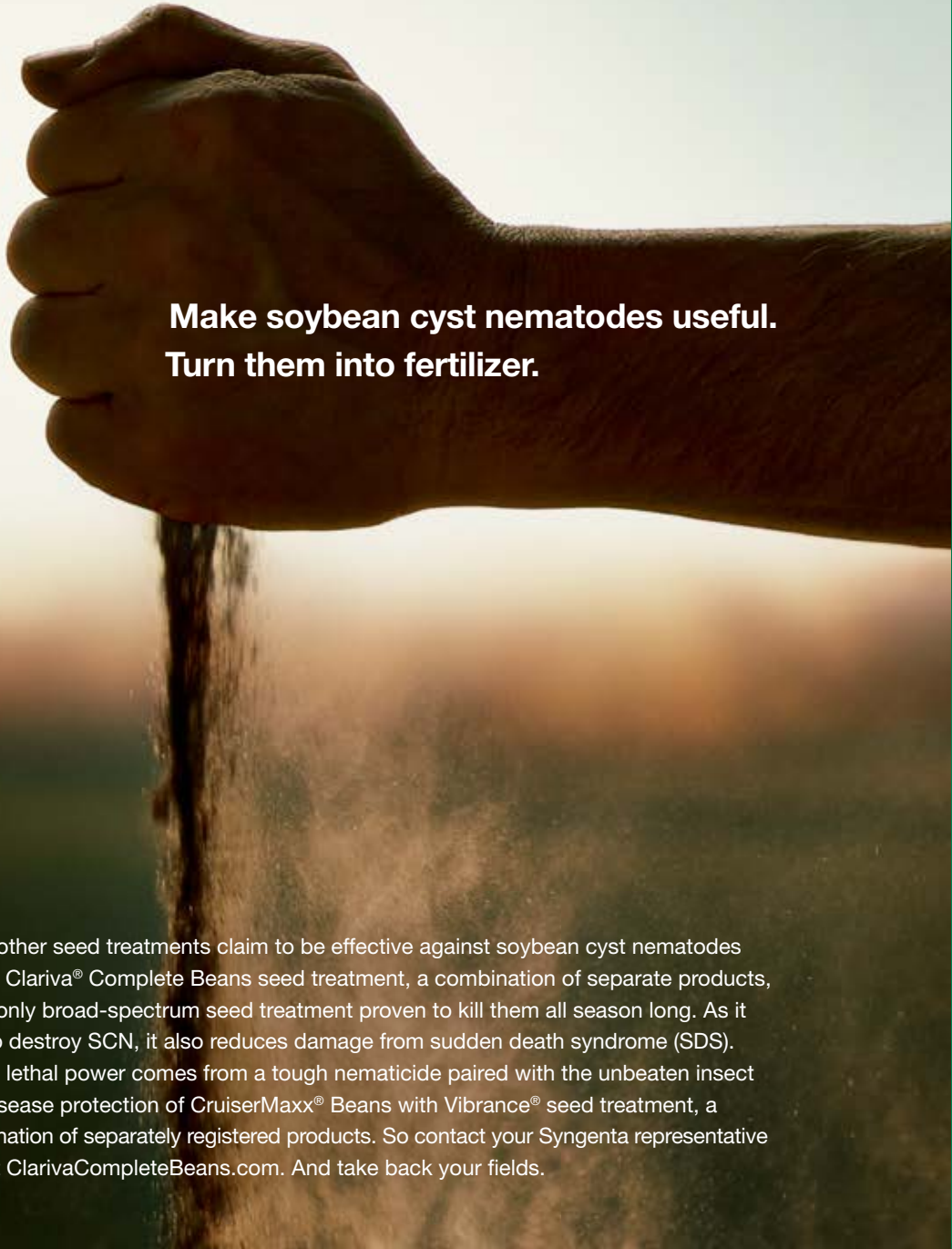






Ponsi Trivisvavet, president of Syngenta Seeds Inc., waves the green flag to start the 2015 American Ethanol 200 Presented by Enogen.





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