

Growing Together

»»» 3Q | 2017

thrive[®]

Seeking Better Yields

Future of Seed Trait
Technology Takes Shape

THE GOOD GROWTH
PLAN GAINS GROUND
ON FOOD INSECURITY

NK[®] SEEDS PAIR
GLOBAL INNOVATION
WITH LOCAL EXPERTISE

syngenta[®]

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thrive   

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.

ON THE COVER

Crop Laboratory Assistant Colin Patrick Keenan inspects corn plants with Agrisure traits at the Advanced Crop Lab in Research Triangle Park, North Carolina. Photo: Alex Maness

THIS PAGE Gary Prescher inspects an early-growth Golden Harvest™ cornfield on his farm in Delavan, Minnesota. Photo: Tim Pearson



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

Please send them to thrive@syngenta.com. For more information, visit the Syngenta U.S. website at 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.



Engine of Innovation

Scientific advances are providing powerful new technologies to help in the quest to feed the world's growing population.

Some of the most important work we do at Syngenta starts in our laboratories. It's in these controlled environments where we oftentimes discover pieces of the puzzle that we're continuously trying to solve: how to grow more from less. Given that farmers will need to feed another 2 billion people by midcentury, the challenge is daunting. But our 5,000 scientists around the globe are working tirelessly to help overcome it.

As a result, the engine of innovation at Syngenta is one of agriculture's most productive. Over the past decade, we've brought new crop-protection chemistries, traits and genetics to market at an unprecedented pace. Equipped with more powerful tools in our toolbox, we're delivering technologies that are helping growers manage many of today's most destructive pests and environmental stresses. At the same time, we're not only anticipating, but also proactively developing solutions for the next wave of threats.

Specifically in the plant biology area, we're implementing complex scientific principles to make the consistent production of high-yielding crops more likely. As Syngenta scientists, we're excited about harnessing critical methodologies—such as advanced molecular breeding, genetically modified traits, genome editing, double haploids and data analytics—to bring growers better seed options with greater efficiency and speed. This issue of *Thrive* explores these processes and shows the positive impact they're already having on farms across the country.

Of course, no success that we achieve in the field is possible without a foundation of enduring partnerships. On the pages that follow, you'll see how Syngenta is bringing together growers, agribusinesses, food companies, industry groups and policymakers to help improve the sustainability of agriculture through our Good Growth Plan. You'll also read how our collaboration with Ag Gateway promises to bridge the language barrier among different data systems on farms, making the collective output more understandable and usable for growers.

As a team, Syngenta scientists have never been more optimistic than we are today. That's because our ability to convert breakthroughs in the lab into products that will benefit growers on their farms has never been stronger—or more possible, thanks to you. Every time you help us put the right seed or chemistry on the right acre, another piece of the puzzle falls into place, and, together, we move one step closer to giving growers the tools they'll need to feed a more populous planet. 🌱



IAN JEPSON, PH.D.

Head, Plant Performance Biology
Site Business Head, Research Triangle Park, North Carolina
Syngenta

“As Syngenta scientists, we're excited about harnessing critical methodologies ... to bring growers better seed options with greater efficiency and speed.”

— IAN JEPSON



WATCH NEW VIDEO For an in-depth interview with Ian Jepson, check out the new video posted to the *Thrive* website (www.syngentathrive.com).



What's in Store

Get the details on new products, upcoming events and how to cast your vote in the #RootedinAg contest.

NEW PRODUCTS

New High-Tech NK Hybrids and Varieties Available for 2018

NK[®] Corn and Soybean technological advancements continue, with Syngenta announcing the release of 31 new NK hybrids and 21 new NK varieties for the 2018 growing season.

Advanced research backs NK Corn hybrids, providing growers with diversified options for their fields. The combination of proprietary genetics and high-performing Agrisure[®] traits enables NK Corn growers to spread their risks. The hybrids will also be the first to feature a new NK naming system, designed to make it easy to identify relative maturity.

Similar to NK Corn, NK Soybeans use advanced research and development to power genetics that protect against a range of diseases and pests, including sudden death syndrome and soybean cyst nematodes.

Syngenta also announced the release of nine new Enogen[®] hybrids for the 2018 growing season.





A soybean plant with four pods like this one is a telltale sign of a healthy crop.

Enogen corn enzyme technology is the industry's first and only biotech corn designed to enhance ethanol production. It also helps livestock producers improve the digestibility and ultimate value of corn as feed for dairy or beef cattle.

Learn more at www.nkcorn.com and www.nksoybeans.com, or contact your local NK retailer.



Golden Harvest Portfolio Expands for 2018 Planting Season

With the release of 46 new corn hybrids and 18 new soybean varieties for 2018, Golden Harvest® is giving farmers more options to get the most yield out of every field. In corn, the 2018 hybrids feature proven genetics protected by high-performing Agrisure® traits and technologies. Nine new Enogen® hybrids in select geographies will also be available. Enogen corn enzyme technology is an in-seed innovation, designed to enhance ethanol production and improve the digestibility and ultimate value of corn as feed for dairy or beef cattle.

The new Golden Harvest Soybean varieties range in relative maturity from 0.08 to 4.5 and protect against many of today's toughest challenges, including soybean cyst nematodes, sudden death syndrome, brown stem rot and *Phytophthora* root



Cellerate™ process technology enhanced by Enogen corn can result in higher-value co-products in the ethanol-production process.

rot. Sixteen of the new varieties also include dicamba-tolerant Roundup Ready 2 Xtend® technology, which provides another line of defense against weed resistance.

Golden Harvest Corn and Soybeans are available from Golden Harvest independent Seed Advisors. For more information and to find your local Seed Advisor, visit the new www.goldenharvestseeds.com.



PRODUCT UPDATES



Plenaris Added to CruiserMaxx Sunflowers

Plenaris® seed treatment fungicide is the latest addition to CruiserMaxx® Sunflowers, a combination of separately registered products. CruiserMaxx Sunflowers with Plenaris provides multiple modes of action, delivering the best-performing sustainable downy mildew management program in the industry. It also provides the broadest disease and insect protection available to maximize sunflower yields. Plenaris provides excellent protection against all downy mildew races and outstanding activity on susceptible and resistant sunflower varieties. For resistance management and additional control, combine Plenaris with Bion® or Dynasty® fungicide seed treatments.

To find out more, visit www.syngenta-us.com/seed-treatment/cruiserm maxx-sunflower.



Orondis Ultra Premix Offers Greater Convenience

Now available in a convenient premix formulation, Orondis® Ultra fungicide combines the active ingredients of two products, Orondis and Revus® fungicides, to help growers manage downy mildew and late blight in potatoes, tobacco, leafy vegetables (lettuce and spinach) and other vegetables. With two different modes of actions, Orondis Ultra provides built-in resistance management for improved yields and crop quality and sets a new standard in foliar oomycete disease control and residual activity.

For more information, go to www.syngenta-us.com/fungicides/orondis.



Fortenza Receives EPA Approval in Corn and Cotton

Fortenza® seed treatment insecticide from Syngenta has received federal registration from the U.S. Environmental Protection Agency for use in corn and cotton to guard against early-season insect damage. Registrations in individual states may be pending.

"We designed Fortenza to complement our brands containing Cruiser® insecticide," says Dale Ireland, Ph.D., Seedcare technical product lead at Syngenta. "Data shows combining these products enhances the spectrum of insect control activity, raising the bar of protection for U.S. growers."

The active ingredient in Fortenza, cyantranilprole, protects against above- and below-ground insects, including black cutworm, fall armyworm, white grub, seedcorn maggot and wireworm. This is especially important to growers who are located in areas with a history of high cutworm activity. Fortenza may also help manage insect resistance, when used in combination with other insecticide chemistries or traits, by providing an additional mode of action against targeted insects. For more information about Fortenza, visit www.syngentaus.com/fortenza.



NEWS AND EVENTS

New NK Retailer E-Newsletter Focuses on Seed

A new e-newsletter is connecting retailers to the latest NK® Corn and Soybeans information and expert insights faster and more conveniently. Launched in July, the quarterly Inside NK: Insights and Information for NK Retailers was specifically created to help retailers better understand the NK portfolio and how it can help growers maximize their return. Each issue will deliver:

- > **Agronomic news:** Get timely insights on agronomic challenges and solutions directly from NK agronomists.
- > **Product updates:** Stay up-to-date on our ever-advancing lineup of offerings.
- > **Latest news:** Keep relevant topics and new information top of mind.

Talk to your NK sales representative to make sure you're on the list to receive the Inside NK e-newsletter.

Potato Blight Hotlines Deliver Insights to Growers

Long-standing partnerships between Syngenta and key researchers on the potato blight hotlines continue in 2017. The hotlines, sponsored by Syngenta, provide growers in Idaho, Michigan, North Dakota, Oregon and Washington access to local information about disease pressures, including weather conditions, control measures and infection confirmations. This year, to make updates available faster than ever, growers can subscribe to receive text messages, alerting them when the hotlines they choose are updated. See below for more information.

To find out what Syngenta brings to the potato industry, visit www.syngenta-us.com/crops/potatoes.



Pathologist/Affiliate	Hotline Number	To subscribe for text alerts, send text to:
Kasia Kinzer, Ph.D. <i>University of Idaho</i>	1-800-791-7195	BLIGHTID to 97063
Rob Schafer, Ph.D. <i>Schafer Agronomy in Michigan</i>	1-888-379-9012	BLIGHTMI to 97063
Neil Gudmestad, Ph.D. <i>North Dakota State University</i>	1-888-482-7286	BLIGHTND to 97063
Ken Frost, Ph.D. <i>Oregon State University</i>	1-800-705-3377	BLIGHTOR to 97063
Dennis Johnson, Ph.D. <i>Washington State University</i>	1-800-984-7400	BLIGHTWA to 97063

Vote for Your Favorite #RootedinAg Finalist

Syngenta is grateful to everyone who entered the 2017 #RootedinAg contest. The stories they told about the people who most nourished their agricultural roots were heartfelt and inspirational. Although it was difficult, a panel of judges has narrowed the field of competitors to five finalists—each of whom has received a mini touch-screen tablet.

We now need your help in deciding who will be the grand prizewinner of a \$500 gift card and a \$1,000 donation to the winner's favorite local charity or civic group.* Just go to www.syngentathrive.com, click on the #RootedinAg link under Special Features, and vote for the entry you think is most deserving. Your votes along with our judges' scores will determine the winner. Online voting ends Sept. 15, 2017, with Syngenta announcing the grand prizewinner in October.

For more information on the #RootedinAg contest and Official Rules, visit www.syngentathrive.com.

*NO PURCHASE NECESSARY. See Official Rules for more details.



TRADE SHOWS AND CONFERENCES

The weather is heating up and so is the summer/fall trade show season. Please stop by the Syngenta booth at either of the shows listed below for more information on what new products and services the company has in store for you.

AUGUST 2017

29–31 **Farm Progress Show**, Decatur, Illinois

SEPTEMBER 2017

12–14 **Husker Harvest Days**, Grand Island, Nebraska

For more information on Syngenta and ChemChina, please read the inserted message from Vern Hawkins, president of Syngenta Crop Protection, LLC, or visit www.syngentathrive.com.

Up and Coming

Syngenta researchers are developing targeted, blockbuster technologies for the crop protection pipeline.

Q. What are some of the most exciting discoveries and production trends in the industry today?

A. David Laird, head of product biology, Syngenta, North America:

One of the most important new chemistry developments over the past 10 years or so has been the commercialization of fungicides from the powerful SDHI [succinate dehydrogenase inhibitor] class of chemistry. All the major R&D companies have been active in this class, but none more so than Syngenta, with five molecules registered or close to registration. For example, Vibrance® seed treatment fungicide offers outstanding protection against major seed and seedling rots, such as *Rhizoctonia* root rot, and provides for exceptional root health. Solatenol® fungicide has revolutionized the control of Asian soybean rust in Brazil and has offered excellent disease control in many crops in the U.S.

We've also seen important production trends in the digital agriculture and stewardship areas. In digital ag, we're seeing improved crop evaluation, GPS applications for farm and field management, and enhanced farm-decision support. At Syngenta, we see this happening through the new Digital Agriculture Solutions group, which focuses on whole-farm management and sustainability. Empowered by its ability to handle big data, digital ag will continue to grow in importance. Programs like AgriEdge Excelsior® demonstrate that the analysis of data and the application of strategies based on data promise many efficiencies and potential game-changing practices for growers.

Stewardship initiatives, like the Syngenta Good Growth Plan, have become and will remain important. Growers are paying more attention to emissions, soil conservation, water use and labor. Overall, we're using more practices that minimize long-term effects on the environment and workers.

Q. How has the Syngenta commitment to innovation shaped its current crop protection portfolio?

A. Syngenta has always been a leader in innovation. Our chemistry portfolio is outstanding, and we're focused on continually delivering the next generation of pesticides. While we strive to develop the next new chemistry or enhancement, we also work to

understand the needs of growers and society. For the past 20 years, we have enhanced and developed our chemistry to be more efficient. Refining our products by transitioning to Dual Magnum® herbicide and Orondis® Ridomil Gold® fungicide has reduced significant pounds of pesticide in the environment. We've met challenges from pest resistance—whether it's in weeds, pathogens or insects—with a deep understanding of the underlying mechanisms. This approach has resulted in the development of robust pesticide premixtures, which have become important tools in pest-resistance management.

Syngenta is also developing new molecules using the concept of innovation by design, which means we're going after specifically needed attributes. Bicyclopyrone is a recent example of a Syngenta innovation of this kind. Our world-class formulation capability enables us to combine this low-use-rate chemistry in premixture products that deliver diversity in weed control and potency against hard-to-control weeds, like giant ragweed and some herbicide-resistant weed species.

Q. What excites you most about the Syngenta Crop Protection pipeline over the next two to five years?

A. The most exciting thing for me is the breadth of grower solutions that Syngenta will deliver. There will truly be something for everyone. Upon registration, Adepidyn® fungicide will be the broadest-spectrum SDHI on the market, with key strengths on difficult-to-control pathogens. This molecule has the potential to provide groundbreaking control of leafspot diseases in peanuts and *Fusarium* head blight in cereals, just to name two of the many crops that it will benefit.

The next blockbuster insecticide is also in our pipeline and looks very exciting. This molecule will complement current insect-management programs with a brand-new mode of action and be available across a broad segment of crops. From the promise of superior wireworm control by seed treatment to longer residual control using foliar applications, this new insecticide is something growers can look forward to.

Using our concept of innovation by design, we have a new foundational herbicide in development as well. This existing mode of action has enhancements in weed-control spectrum with a lower use rate and potential resistance-breaking activity.

Finally within the five-year horizon, we have an exciting Seedcare™ and soil-applied nematicide. This nematicide is superior in control and spectrum to currently available options; and based on the high level of control, its benefits to growers will stand out.

Q. What can the industry look forward to from the Syngenta Crop Protection pipeline longer term?

A. Syngenta has a robust pipeline, and we will commercialize many new products over the next five to six years. There will be an additional wave of chemistry innovation beginning in the middle of the next decade and continuing into the 2030s. Specifically, we're looking for new chemistries that will offer new modes of action, exhibit highly targeted activity, be benign to the environment and fit in precision applications.

In addition, Syngenta is investing significantly in a robust biologicals pipeline. These will be next-generation biologicals and take many forms, but will promise efficacy equal to chemistry standards. The company will also actively enter into significant market segments with RNA-based technology during the next 20 years. This highly specific technology has a great fit for certain problematic pests, such as corn rootworm among others. Enhancing a plant's ability to withstand abiotic stresses, such as heat and drought, is also a future frontier. Syngenta already has an active early-stage research program in this area with promising leads.

Focused on delivery, Syngenta will continue to be a leader in crop protection for years to come. A more positive public perception and acceptance of agricultural technology will be critical to enable the development of new products. We must all do our part to advocate for this technology, which will help meet the needs of future growers and feed the planet. 🌱

INTERVIEW BY MIRIAM PAULSON

“We’re looking for new chemistries that will offer new modes of action, exhibit highly targeted activity, be benign to the environment and fit in precision applications.”



DAVID LAIRD
Head of Product Biology
Syngenta
North America

ADAPT-ing to a New Language

A collaborative project promises to seamlessly integrate farm-management data.

“How can a rainbow cause growers problems?” asks Andres Ferreyra, Ph.D., manager of special projects at Ag Connections, a wholly owned subsidiary of Syngenta. “When they have equipment that’s green, red, yellow and blue, representing different manufacturers, and none of it speaks the same language,” he answers.

Overcoming the Language Barrier

For all the promises on which precision ag can deliver—including reduced input costs, increased yields and greater labor savings—the language barrier among different proprietary data systems has proven to be an obstacle to further efficiencies. If the tractor, combine and sprayers, for instance, are all using different data formats, a grower’s farm-management software can have a hard time understanding the data and using it meaningfully.

“Growers want to grow,” says Tarak Reddy, a product lead for John Deere Intelligence Solutions Group. “They are not trying to get a Ph.D. in farm-management software.”

That’s why Ag Gateway, a nonprofit consortium of more than 230 ag businesses, is leading an industry-wide project, known as the Agricultural Data Application Programming Toolkit (ADAPT). Syngenta and Ag Connections are members, as are a host of software companies, equipment builders, chemical manufacturers and ag retailers.

With ADAPT, manufacturers can still use their proprietary software, but they can also build plug-ins that allow their systems to translate between their own format and a common data model. In other words, “ADAPT is a translator that allows growers to speak with the rest of the world,” says Tyler McGee, systems architect with Syngenta.

Leveraging Efficiencies

Syngenta and Ag Connections have played important roles in the yearslong process of bringing ADAPT to life. Ferreyra has worked as one of the key data architects, and McGee is the project manager. Additionally, Shannon Haringx, marketing technology lead at Syngenta, is spearheading communication efforts for the project; and Stuart Rhea, a software developer at Ag Connections, chairs the ADAPT Technical Team.

Growers have so much data flowing in and out of their farm-management systems today that it can be hard to know what to do with it all, says Ferreyra. Using ADAPT-compatible farm-management software, such as Land.db® from Ag Connections, growers will not only be able to find efficiencies on their own land, but export complete



“Growers want to grow. They are not trying to get a Ph.D. in farm-management software.”

—TARAK REDDY

regulatory reports and share their information with retailers and advisers.

Today, this exchange of information is not seamless and can lead a busy grower to much frustration and stress. There also aren't a lot of do-overs when it comes to farming.

“You can't harvest a field again if the data was wrong the first time,” says Mark Stelford, general manager of Premier Crop Systems and chair of the ADAPT Oversight Committee. “People can get upset very quickly—and rightly so—if their systems aren't working well together.”

ADAPT is moving closer to deployment. In 2017, companies are building plug-ins and implementing trial runs to see how the data flows through the system. Some farm-management systems may be ready to put ADAPT into production mode in 2018, Reddy says.

Cooperative Brain Power

Although many of the companies that participate in Ag Gateway compete head-to-head in the marketplace, when it comes to ADAPT, they all work together. Syngenta, Ag Connections and their competitors all believe in the power of ADAPT to revolutionize precision agriculture. What is good for one company is good for all.

“We collectively defined a precompetitive space,” Ferreyra says. “If we collaborate, it will be better for everyone. Then each company can focus on making its products better, instead of competing with one another on the basic infrastructure we all need.”

Ferreyra has become an ADAPT evangelist of sorts, encouraging companies to participate by building plug-ins for their software. Over a couple of months earlier this year, he visited Japan, the Netherlands, Spain, Germany and the United Kingdom, spreading the message of ADAPT.

“We've reached a critical mass,” he says. After years of cooperative development work, now it's time for individual companies to step up and join the project with their own technology. “We're encouraging participation all over the world.”

End of the Journey

In the not-too-distant future, when ADAPT is fully up and running, and companies—big and small—have contributed their pieces to the puzzle, growers won't even realize the system is working. The different pieces of software will seamlessly co-exist, doing the complicated number-crunching work that before had been impossible. Growers will just see the results.

The people behind ADAPT are excited those days are drawing nearer. It has been a long and sometimes difficult journey to get to this point. McGee likens the ADAPT-building process to a county work crew installing a water line.

“There's very little glory in the installation process,” he says with a laugh. “But it's something we all need in order to thrive.”

For more information on ADAPT, visit www.adaptframework.org. 🌱

STORY BY MATT EHLERS



A Breed Apart

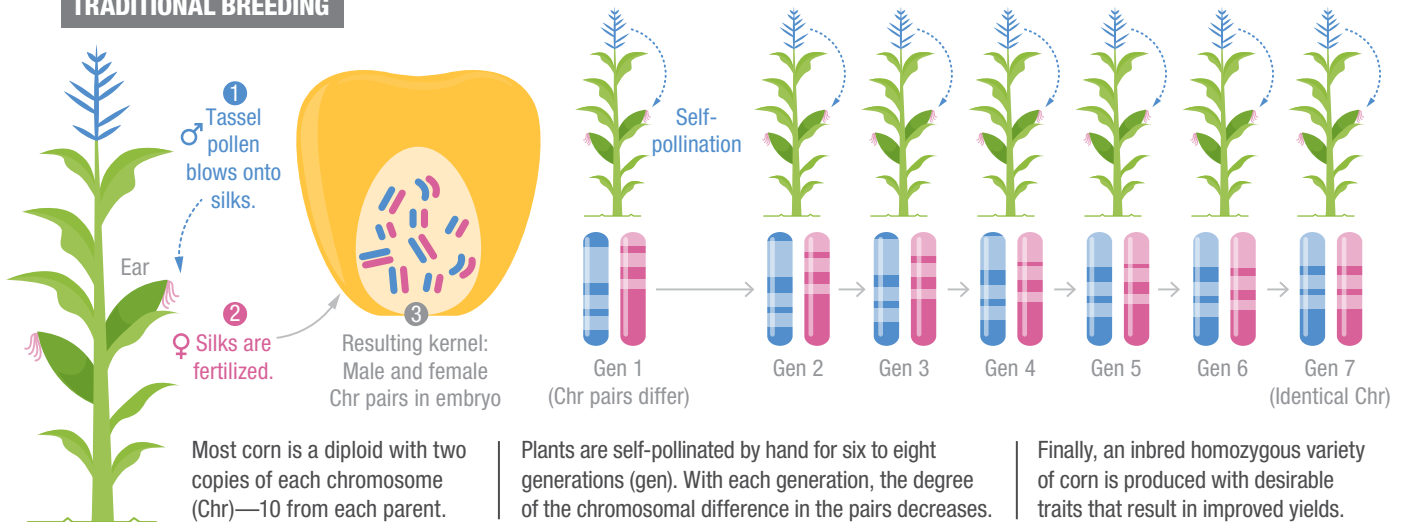
Syngenta scientists have identified the genetic source of haploid induction, a process that greatly speeds up plant breeding.

Syngenta scientists have solved the mystery behind an abnormal corn line responsible for revolutionizing corn breeding. Discovered in 1959 by University of Missouri Professor Edward H. Coe, Ph.D., the line produces haploid plants that contain just half the DNA of normal corn.

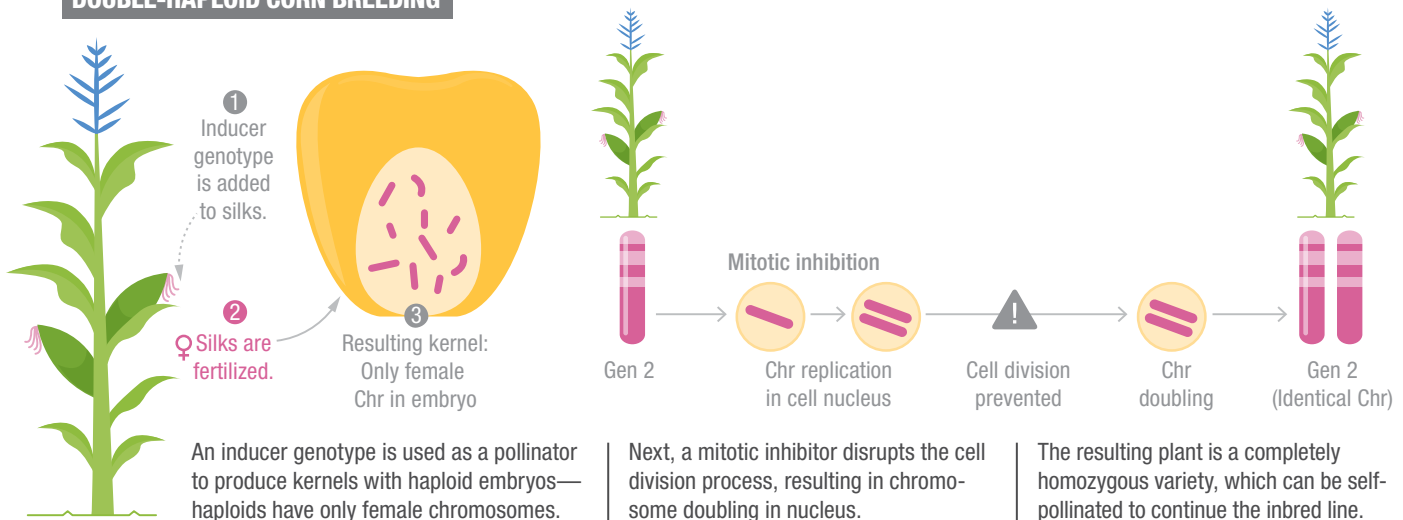
The ability to use this line to speed up breeding caught the attention of the corn-breeding industry. Today, all corn-breeding companies use haploids to shorten the time required to produce parent lines by several years. Reduced time and increased efficiencies for scientists to develop new hybrids have the

The Benefits of Double-Haploid Corn Breeding

TRADITIONAL BREEDING



DOUBLE-HAPLOID CORN BREEDING



potential to bring about higher-yielding, better-adapted seed options for growers at a faster pace.

But the reason why this odd and naturally evolved line produces haploids was never understood until recently. In 2007, Syngenta scientists began a quest to locate the genes responsible for haploid production. They found their answer by 2013 and followed up with gene editing to verify the discovery in 2015.

Solving this mystery will help Syngenta improve how scientists use haploids in current breeding systems and may lead to applying the technology in other crops. It also shows how new biotechnology can find solutions located deep in genetic coding.

Doubling Haploids

Some basic corn biology helps explain why haploids are so important to corn breeding. Corn is a diploid, meaning it has two copies of every chromosome in every cell. That's 10 chromosomes that come from the female parent and 10 from the male parent. A haploid occurs when there is only one copy of every chromosome coming from one of the parents, while the copies from the other parent are gone.

Haploids become valuable when scientists double them and use them to produce homozygous breeding lines. In homozygous

lines, all genes on each pair of chromosomes in every cell of the plant are identical. These homozygous lines are 100 percent inbred lines, which otherwise would have to be produced by repeated forced self-pollinations. The haploid method lets

“We had this one huge-effect gene, the big gun. It was exciting that it was a major gene contributing so much of the trait.”

—BRENT DELZER

breeders produce inbred lines within just two generations, while traditional breeding takes 10 generations.

“It speeds up parent line development for hybrid crops by several years,” says Michiel van Lookeren Campagne, Ph.D., head of Syngenta Seeds Research. “The way we do this is by regenerating new plants out of pollen or egg cells, which each have only one set of chromosomes, and then doubling the chromosomes of these plants through a chemical treatment. The end result of this process is a doubled-haploid plant.”

The most efficient way to produce doubled haploids in corn is through haploid induction, he adds. “It can be done cheaply in the field and is broadly applicable across all genetic starting material.”

Haploid induction requires taking pollen from a haploid-inducer plant and putting it on any female ear of corn. The result will be an odd-looking ear that's populated with about 13 percent haploid kernels.

Continued on page 12



Your MVP this season.

Orondis® fungicide, with its unique, best-in-class active ingredient for controlling oomycete fungi, is on its way to achieving Most Valuable Product status. With a remarkably low use-rate, longer-lasting systemic activity and no cross-resistance, Orondis can help make your disease-management program an out-of-the-park home run. To learn more about how Orondis can be a real game changer when it comes to your vegetable, potato or tobacco crop, visit SyngentaUS.com/Orondis

 **Orondis®**

syngenta®

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The Search for Answers

The discovery of corn haploids has been around since 1959, but its use really took off in the 1990s, as scientists learned how to effectively double the haploids and breeders efficiently used them in their breeding programs, says Brent Delzer, Ph.D., Syngenta corn breeder. Delzer was part of the team that searched for the gene source of the haploid induction.

“As scientists, we have inquiring minds and want to know what the genetic basis is that is contributing to haploid induction,” he says. In 2007, Syngenta made the first crosses of haploid inducers with non-inducers, while also developing a mapping population to search for the chromosome position of the genetic trait.

“We initiated that work in our nursery in Hawaii,” Delzer says. “We were able to get several generations a year and set up the breeding population so we could map the gene.”

In the summer of 2008, Delzer planted some of the first crosses at his location near Janesville, Wisconsin. The next winter, his colleagues in Hawaii grew fields with crosses for evaluation. The team was looking for the chromosome region containing genes contributing to the haploid-induction trait.

“Chromosomes are rather big with a lot of genes on each one,” Delzer says. “So after we mapped a spot on the chromosome, we had to do fine mapping.” Syngenta geneticist Satya Chintamanani, Ph.D., became involved with the search and during 2009 and 2010 helped hone in on a small region of a chromosome.

The team was able to identify six different genes in the region. Using gene sequencing, they found one of the genes had a mutation that produced haploids. They baptized it as the *MATRLINEAL (MATL)* gene.

The Big Gun

The results surprised the team. The *MATL* gene was responsible for nearly 70 percent of the haploid-induction trait. “Corn has as many genes as people do—about 30,000—and almost all traits are controlled by many, many genes,” Delzer says. “But we had

this one huge-effect gene, the big gun. It was exciting that it was a major gene contributing so much of the trait.”

There was another surprise ahead, which came during the verification process. Tim Kelliher, Ph.D., principal scientist for reproduction biology at Syngenta, led the verification to prove the gene was the correct one. The team used gene editing to recreate the small mutation in a normal inbred. By doing the minor edit, the plant produced a working haploid inducer, just like the one found decades ago in Missouri.

During the process, the team discovered the gene’s unusual type. “The gene produces a protein that modifies pollen fats or lipids,” Kelliher says. “Lipids are an important but poorly understood part of cellular biology. Now we are looking at the lipid composition of pollen grains and how they change to figure out ways to make haploids without editing genes.”

Future Work

The team’s work on the haploid mystery is not done, Kelliher says. Syngenta will continue to study the *MATL* gene and also identify the other minor genes involved in haploid production.

The value of this long-term research for Syngenta is two-fold, according to van Lookeren Campagne. The first comes with “making existing haploid-induction systems more efficient and thereby saving costs.”

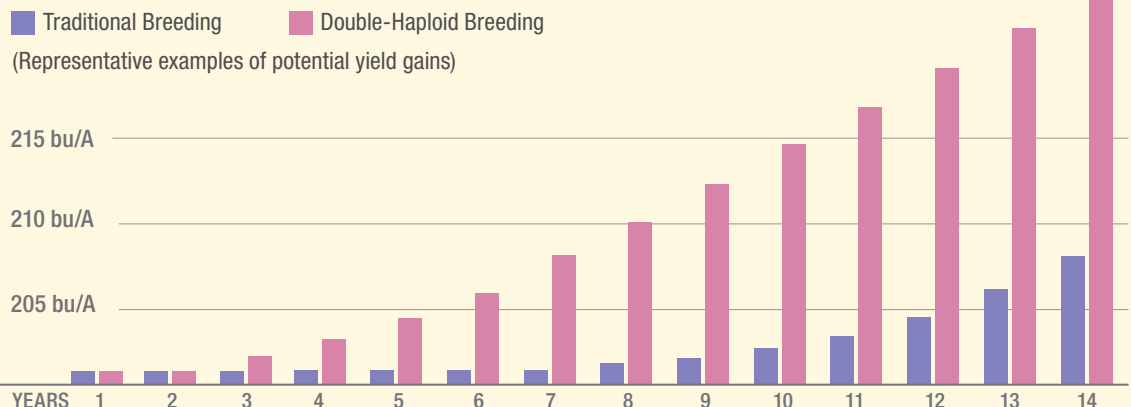
The second is “deploying the technology to other crops that do not have any doubled-haploid production system,” he says. “That is where the real value would be, as it could really make a breakthrough in the breeding of these crops.”

Corn is a prime example of what can happen when scientists use the doubled haploid. “The line that Professor Coe found, the haploid inducer, has really underpinned the success of corn as a crop in the marketplace,” Kelliher says. “Corn is king, and a lot of it is due to this line.”

For Syngenta scientists, helping another crop achieve similar success and sustainably feeding the world are high on their list of priorities. 🌱 STORY BY KAREN MCMAHON

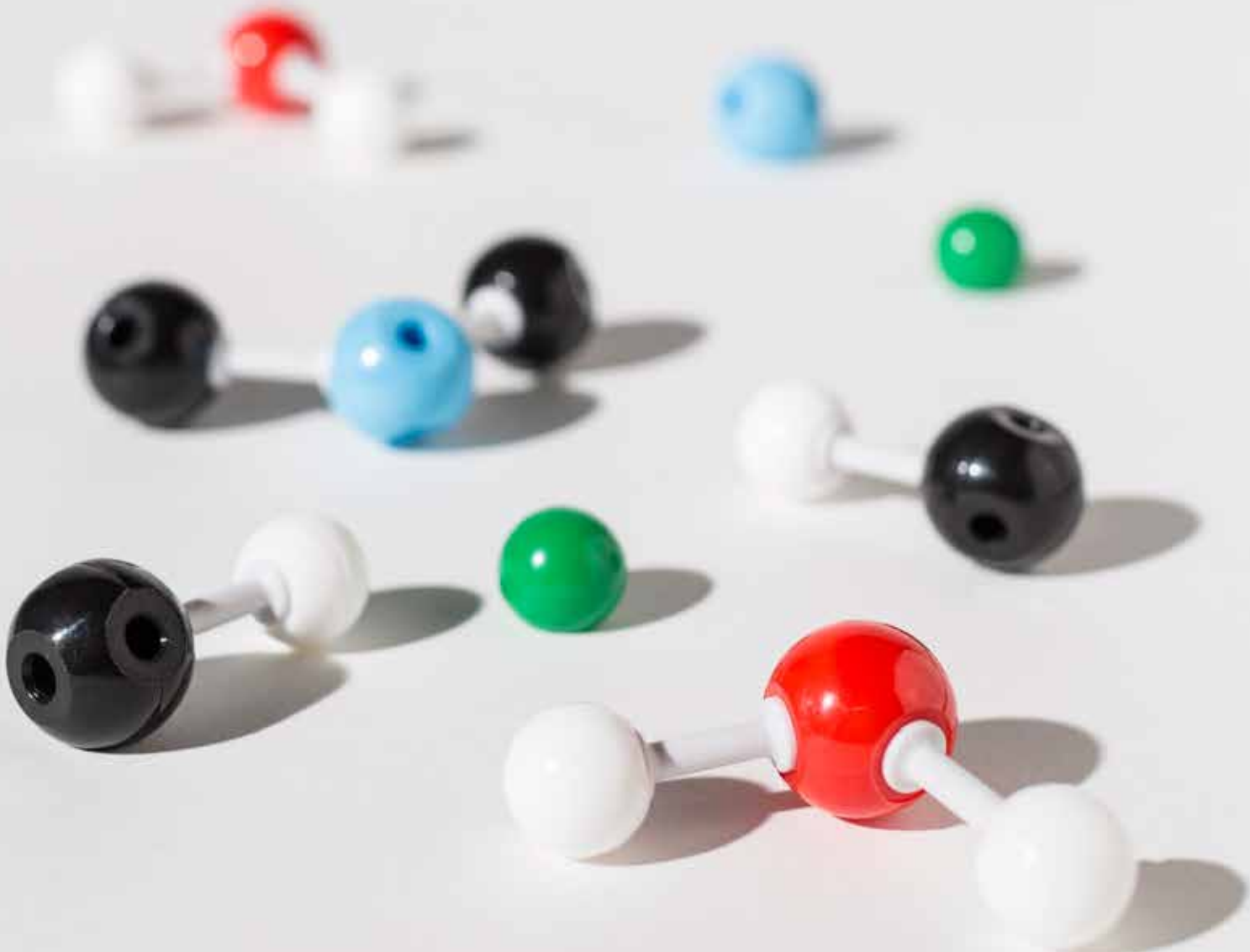
SHORTER TIME, INCREASED YIELDS

Double-haploid breeding allows for pure inbreds to be created in two generations (two years), versus six to eight with traditional breeding, making for large potential bushel per acre (bu/A) gains over a 14-year cycle.



BUILDING BLOCKS

Innovative research and new technologies
are expanding the Agrisure portfolio, providing potent solutions
to many production challenges. | By Darcy Maulsby



CAN A CARTON OF SOUR MILK HOLD THE KEY TO HIGHER CORN YIELDS?

It can when it's in the hands of researchers who never quit looking for ways to take corn traits to the next level.

"One of our researchers went on vacation for a week and accidentally left a carton of milk in his refrigerator in North Carolina," says Eric Boudreau, Ph.D., head of trait projects for corn at Syngenta. "When he returned, he decided to study the bacterial strains in the sour milk instead of dumping it."

The sour milk yielded a new strain of *Bacillus* called AB88 that secretes an insecticidal protein. The new insecticidal protein was named Vegetative Insecticidal Protein 3 (Vip3). Discovered in 1996, Vip3 led to the creation of the Agrisure Viptera® corn trait, which set a new standard in insect control.

"Before Agrisure Viptera, yield losses from lepidopteran [above-ground pests] were devastating," says Boudreau, who notes that Agrisure Viptera controls above-ground insects, including corn borer, corn earworm, and many cutworm and armyworm species. "Agrisure Viptera marked a major step change in insect control in corn."

This was just one of several important breakthroughs that have helped form the robust Agrisure® traits pipeline at Syngenta. Between 2005 and 2014, Syngenta launched six Agrisure traits. In addition to Agrisure Viptera, these traits included Agrisure Artesian® water-optimization technology for corn and Agrisure Duracade®, which offers a different mode of action for corn rootworm control. By early 2017, Syngenta had launched 11 new Agrisure trait stacks in 12 years.

"Curiosity is the driver of innovation," says Boudreau, who notes that Syngenta is committed to delivering new trait technologies. "The sour milk example shows that solutions can come from the most unlikely places."

"By stacking individual traits on top of each other, you could have three to five traits in one hybrid. Molecular stacking will allow Syngenta to develop new technologies more quickly and shorten the commercialization process."

—DUANE MARTIN





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www.syngentathrive.com/research.



In the quest for higher yield potential, Syngenta invests \$1.3 billion globally on crop protection and seeds research and development every year. That translates into almost \$3.5 million per day. All this effort is directed toward one key question: How can Syngenta sustainably increase the yield and profit potential of crops to advance agriculture around the world?

“It’s such a simple question with such a complex answer,” Boudreau says. “What we’re doing is more complicated than rocket science.”

Simplifying the Complex

While growers are already reaping the rewards of the diverse Agrisure portfolio, Syngenta will seek to expand the product offerings in the next five years with:

> **Improved Artesian™ hybrids.** Consider Agrisure Artesian the A-list of high-performing corn hybrids. Containing multiple genes for season-long drought protection, Artesian hybrids offer a practical option to meet the water challenges of the 21st century. “The main benefit of Artesian hybrids is the consistency of performance,” says Duane Martin, Ph.D., commercial traits lead for Syngenta. “Their ability to help manage variability across microclimates and soil types far exceeds what we envisioned for the Artesian technology 10 years ago.”

Continuous improvement defines Artesian hybrids, thanks to research into alleles (variant forms of a gene) that builds on existing knowledge. In 2016, newly identified Wave II alleles helped give each new Artesian hybrid an even greater set of genes that help them manage water more efficiently. In the near future, Wave III alleles are expected to provide even more advanced Artesian hybrids; they’re expected to be available for planting in the 2019 growing season.

“No other company has continued to develop water-optimization technology like Syngenta,” says Martin, who adds that Artesian hybrids are available in combination with exceptional insect control and herbicide-tolerant traits. “Syngenta continues to identify new Artesian genes that can help growers manage water use more efficiently.”

> **Advanced insect control.** An eye on providing even better protection has led to the creation of Agrisure Viptera 3330 E-Z Refuge® and Agrisure Duracade 5332 E-Z Refuge, which, upon receipt of all necessary regulatory approvals, are anticipated to be available for the 2019 planting season. “These trait stacks are expected to provide at least two, if not three, different modes of action against above- and below-ground insects,” says Dirk Benson, Ph.D., head, seed product development, product selection for Syngenta.

With three modes of action against many ear- and leaf-feeding insects, Agrisure Viptera 3330 E-Z Refuge will offer control on a broad range of above-ground pests. If below-ground insect control is needed, Agrisure Duracade 5332 E-Z Refuge will offer three modes of action against most above-ground insects, plus dual modes of action against yield-robbing corn rootworms.

Providing more modes of action is smart management, Boudreau says. “We want Agrisure technologies to last a long time. Providing multiple modes of action helps delay insect resistance issues and preserve the durability of the traits.”

> **New molecular stacks.** While developing more traits offers more options for growers, it creates a unique set of challenges. “With so many traits available, you can ‘clog’ the product development system,” Boudreau says. “But molecular stacking physically links the traits together, which allows them to go through the breeding process more easily.”

Syngenta scientists’ work with molecular stack technology will pave the way for the next wave of products in the Agrisure traits portfolio post-2020. “By stacking individual traits on top of each other, you could have three to five traits in one hybrid,” Martin says. “Molecular stacking will allow Syngenta to develop new technologies more quickly and shorten the commercialization process.”

The resulting trait stacks will offer increased convenience and more opportunities to protect the hybrids from damage that can occur throughout the season.

With all the existing and upcoming technologies in the Agrisure portfolio, expect there to be even more trait stacks,

giving growers increased choice when selecting the technologies they truly need. “The Agrisure traits portfolio offers the best choice of trait packages in the industry, and there are ample options to select hybrids specific for each field,” Martin says. “By offering a variety of insect control options, growers can select what they need and put their trait dollars where they count the most.”

Endless Possibilities

Innovation never rests at Syngenta, as researchers continue to develop traits that help to manage growers’ most problematic insects and diseases, optimize water usage, and reduce destructive weeds by offering tolerance to herbicides. The end result is an increase in the potential to boost yields.

“Our future offerings are so promising, in part, because we’re connecting a broader range of scientific disciplines—biotechnology, molecular biology, mathematics, statistics, analytics and more,” Benson says. “It’s fascinating to be at the forefront of innovation in agriculture.”

Keeping the focus on the grower is essential. “Molecular biologists, for example, are experts in their area, but they may not be as well-versed in crop production,” Martin says. “In many cases, my role is to help our researchers understand the needs of growers, so they can pursue the science that effectively tackles the agronomic challenges of the future.”

The possibilities are endless as technology continues to evolve rapidly, Boudreau says. “It’s an exciting time to help growers deploy new technologies to feed a growing world. We know we can do it right.”

WHAT’S IN A NAME?

Syngenta has developed a grower-friendly naming system for Agrisure® trait stacks that creates consistency and helps you better understand the technology in the trait stacks. Here is an example of how it works:

Agrisure	Duracade	5	2 2 2	A	E-Z Refuge
Master Brand	Brand Suffix: changes as new technologies are introduced	Technology Series: 3 technology series: herbicide tolerance 5 technology series: next-generation corn rootworm control	Last three numerical identifiers: number of modes of action in each hybrid for broad lepidopteran, corn borer and rootworm control	Letter A: available in an Agrisure Artesian corn hybrid	E-Z Refuge: hybrids are available as integrated, single-bag refuge products

Note: The naming system does not apply to Agrisure® 3000GT.

The Evolution of Agrisure Trait Technology

A robust research and development (R&D) program at Syngenta has resulted in the Agrisure® traits portfolio, which offers exceptional insect control, water optimization and herbicide tolerance to help protect genetic yield potential. Learn more about the Agrisure portfolio and the Syngenta commitment to R&D through key statistics that showcase past, present and future highlights.

AGRISURE MILESTONES

POST-2020: Molecular stack technology will pave the way for the next wave of Agrisure products, adding new brands and multiple trait stacks to the portfolio.

2019: Two new Agrisure trait stacks are slated to be introduced (upon receipt of all necessary regulatory approvals), featuring three modes of action against above-ground insects for the first time in the portfolio.

2005–2017: Eleven Agrisure trait stacks were introduced in a 12-year period.

2005–2014: Six Agrisure traits were launched commercially, including Agrisure Viptera® for control of lepidopteran insects, Agrisure Artesian® water optimization technology and Agrisure Duracade® for rootworm control.

1996: A Syngenta researcher discovered Vip3, a new insecticidal protein, leading to the creation of Agrisure Viptera, which set a new standard in above-ground insect control.

1995: The first genetically modified corn product (Bt176) to ever be planted by U.S. corn growers was deregulated by U.S. regulatory agencies. Ciba-Geigy (a legacy Syngenta company) scientists developed the Cry1Ab gene used in Bt176, which confers resistance to the European corn borer.



\$1.3 BILLION

is the investment Syngenta makes in global R&D every year. That's the equivalent of \$3.5 million per day.

\$166 MILLION

is the amount invested since 2011 on new and expanded R&D facilities in Research Triangle Park, North Carolina, the hub of Agrisure traits research in North America.

5,000

is the number of Syngenta scientists around the globe who are dedicated to developing innovative technologies for growers.

13

is the number of years it takes to develop a new trait and move it through the regulatory process.



NK Seeds Sales Representative
Nicole McConnell and grower
Tom Franke inspect field
conditions prior to planting
NK Soybeans on his family's
farm in Hayfield, Minnesota.



BEST OF BOTH WORLDS

Global innovation and local expertise combine to maximize yields in NK Corn and Soybeans.

By Raven Carpenter

Each year, the world becomes more interconnected, greatly impacting global industries like agriculture. International trends dictate commodity markets, growers are under increasing pressure to feed the planet's burgeoning population, and agribusinesses are looking across all seven continents for innovative solutions.

But even in this globalized environment, the American farmer needs services and solutions that are close to home. So while Syngenta taps into genetics and research expertise from around the world to create new hybrids and varieties, it also offers growers local expertise from NK® retailers and agronomists. This collaboration between Syngenta scientists, retailers and growers creates opportunities for customized production strategies and increased return on investment (ROI).

Combining Agronomy and Technology

Tom Franke, a grower from Hayfield, Minnesota, has grown NK hybrids and varieties for more than a decade. He has his seed selection process down to a science to determine what works best for his operation.

"You need to match up the agronomy and technology," Franke says. "You can find varieties for every soil, and Syngenta matches it up the right way."





Grower Mike Franke checks out NK Soybeans in his planter on his family's farm in Hayfield, Minnesota.



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www.syngentathrive.com/farmproduction.

Franke credits his NK retailer with keeping him informed on what works best for the agronomic challenges in his area. Following a season with excessive wind and rainfall, many growers in Hayfield struggled with stalk and root issues in 2016. Not Franke.

Despite the environmental obstacles, Franke's NK hybrids stood tall, with NK Corn N45P-3122A brand yielding more than 200 bushels per acre (bu/A). This Agrisure Artesian[®] hybrid maximizes yield when it rains and increases yield when it doesn't, for a good crop regardless of the weather.

Syngenta develops all NK Corn hybrids using a complex system of intelligent analytics, testing and technology geared to improve a grower's bottom line. Joe Bollman, corn seed product manager at Syngenta, notes that the NK portfolio enables growers to diversify their portfolio and find what works for them.

"At the end of the day, you're going to want something that adds value to your farm," Bollman says. "NK hybrids have greater genetic choice and competitive performance. They are the seeds of change that can make a real difference at harvest."

Disease Protection From the Start

Similar to NK Corn, modern science has paved the way for NK Soybeans. (See "Going Outside the Lines," page 21.) With outstanding genetics, NK Soybean varieties include built-in resistance to pests and diseases, such as soybean cyst nematode, sudden death syndrome, brown stem rot and *Phytophthora* root rot.

"Our research and development team is continuously expanding scientific techniques for plant breeding and genetic placement," says Scott Erickson, soybean seed product marketing manager at Syngenta. "We continue optimizing NK varieties for the grower, so they can get the most out of their seed decisions."

According to Erickson, the most effective way for growers to select soybean varieties from the broad NK portfolio is to work with their local NK retailer to determine the best varieties for their fields.

Harold Ellenbacher from Greenville, Wisconsin, is one of those growers whose strong relationship with his NK retailer is helping him make the most of his soybean yields. Last season, many growers throughout Wisconsin struggled with heavy rain and white mold pressure. Ellenbacher was

an exception. His retailer helped him select NK Soybean varieties with advanced genetics to maximize his ROI.

Ellenbacher's NK Soybeans S20-T6 brand, which includes built-in protection against diseases common to the region, such as *Scletorinia* white mold, showed strong plant health throughout the season.

"We keep growing NK because we're sold on the varieties and the company that stands behind them," he says. "The service and the technologies help keep us around."

Translating Technology Into Results

Many growers note their NK retailers' wisdom is one of the biggest driving factors in their seed decisions. Providing regional expertise to decipher some of the complex seed technology, NK retailers know what seed and management practices work best for a given area to optimize results.

Win Noem, an NK retailer from De Smet, South Dakota, maintains strong relationships with his growers, so he knows what they need for their fields. In 2016, for example, he recommended that Greg Albrecht, one of his customers, plant NK variety S21-M7 brand in a field that saw dry spells throughout the season. Because Albrecht listened to Noem's advice, that field produced yields 10 percent to 20 percent higher than in 2015.

"I've been planting NK Corn and Soybeans for almost 20 years now, and I work mostly with Win," Albrecht says. "And to tell you the truth, he handles the reins on our whole corn and soybean program. We have so much going on between crops and livestock, that it's good to work with him and have his expertise."

Having sold NK seeds for much of his life, Noem understands all that the brand has to offer. "NK Soybeans are top tier with exceptional genetics and a great breeding program," he says. "NK varieties have proprietary genetics that are unique—the total disease package."

Keeping Up With the Market

Syngenta remains nimble in the ever-changing agricultural environment, bringing the latest NK seed genetics to the market faster than ever before. For the 2018 growing season, the company released 31 new NK Corn hybrids and 21 new NK Soybean varieties. With a geographically tailored portfolio, along with local expertise from NK retailers, growers can find a hybrid or variety for each field's individual requirements.

"Through our network of NK retailers, we know the local fields, and we know the local management needs," Bollman says. "We also have the advanced genetics to meet those needs all season long. That's a winning combination for growers and their yields." 🌱

GOING OUTSIDE THE LINES

What does it take for researchers to develop genetics with an average annual yield gain three times the historic average? Syngenta researchers who are developing new NK[®] Soybean varieties are discovering that it sometimes requires going outside their comfort zones.

"Central to our strategy has been the innovative use of data analytics to maximize genetic gain," says Joseph Byrum, Ph.D., senior R&D strategic marketing executive at Syngenta. "We've learned from other industries that analytics can enhance what they do, such as delivering packages more efficiently, enhancing medical research and scheduling airline flights to minimize delays. Syngenta is the first in agriculture to apply the same techniques to the breeding of plants, and the results have been tremendous."

From the millions of new lines that Syngenta soybean breeders develop each year, the data-rich selection process allows them to hone in on those lines that have tolerance to specific pests and diseases and targeted genes. "What we're doing is making better breeding choices, which means we're better able to spot winning varieties right from the start," Byrum says.

Syngenta is also seeking partnerships inside—and outside—ag that can help push soybean yields to new highs. The Syngenta Crop Challenge, an annual initiative sponsored by the Institute for Operations Research and the Management Sciences in coordination with Syngenta, invites people with expertise in data analytics to apply their skills in devising a data-backed method of increasing yield.

"Some participants may not have ever stepped foot on a farm before, but that doesn't matter," Byrum says. "If a mathematician, computer scientist, engineering student or even a business owner with a sound scientific mind has ideas, the Crop Challenge provides a platform to share them."

Syngenta will continue to advance its research and development toolkit by adding sophisticated new analytical tools in 2018. "Our suite of data analytics tools has achieved impressive results, but there is more to be done," Byrum says. "The tools undergo constant revision and improvement. We never assume the job is finished, because we know there will always be a better way of doing things."

"Central to our strategy has been the innovative use of data analytics to maximize genetic gain."

—JOSEPH BYRUM



Xiujuan (Jenny) Su, a research scientist in new breeding technologies, works on a project at the Syngenta Innovation Center's Advanced Crop Lab in Research Triangle Park, North Carolina.

Facing *the* Future

A progress report from Syngenta shows significant advances toward reaching the goals of The Good Growth Plan.

By Karyn Ostrom

The world needs to grow more food during the next five decades than it has over the past 10,000 years. It's a staggering reality that represents a significant motivator for Syngenta and underscores the continued importance of The Good Growth Plan, the company's framework of six global sustainability commitments that it plans to achieve by 2020.

"It's incumbent upon the ag industry to cultivate a more sustainable future for agriculture," says Jill Wheeler, head of sustainable productivity for Syngenta in North America. "The measurable goals that comprise The Good Growth Plan are helping us get there. And the metrics we're collecting to demonstrate our progress are helping us further validate our efforts and highlight the ongoing work that is making a difference."

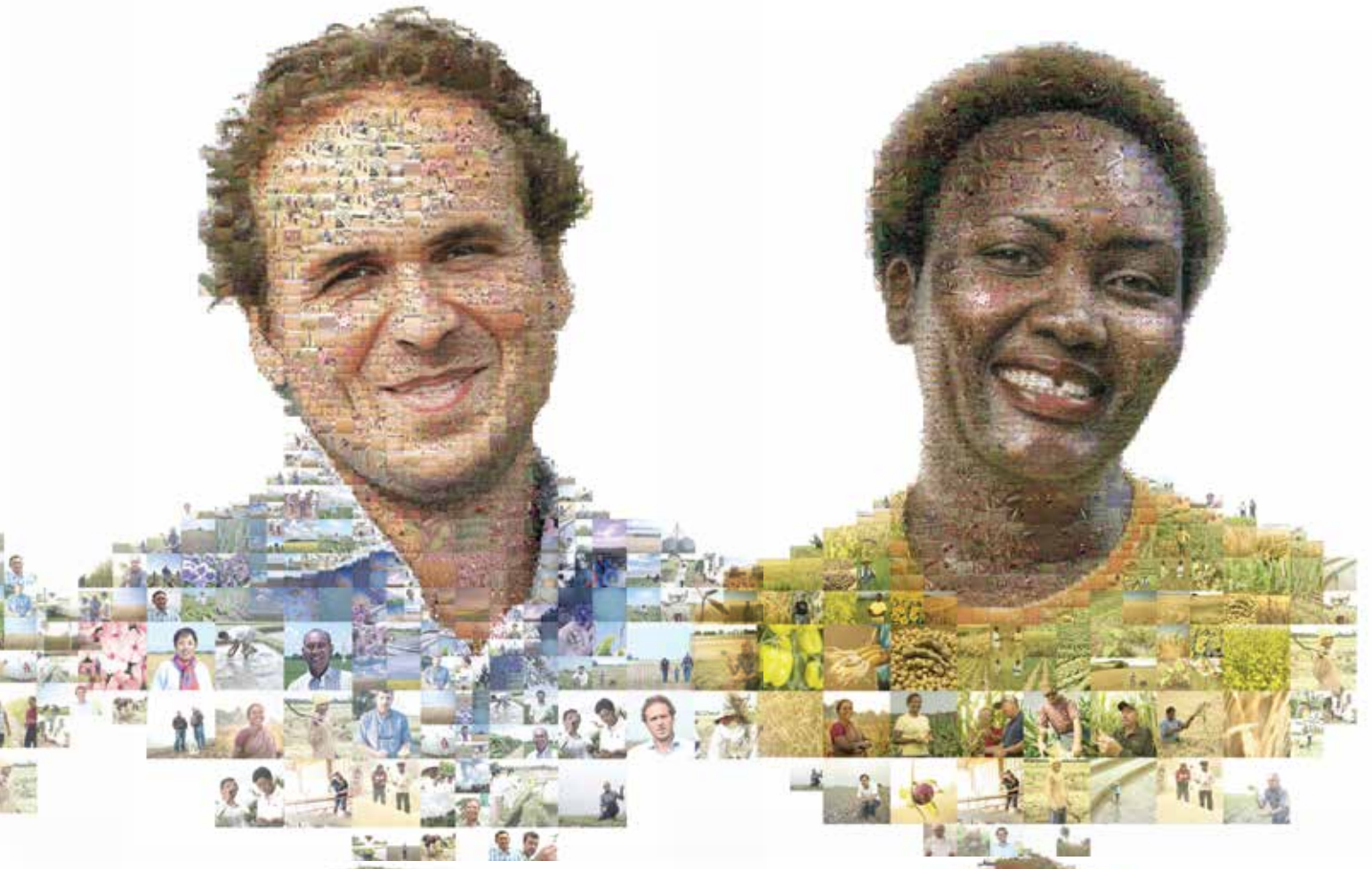
Measuring the extent of its reach—and the value the commitments have on people, communities and the environment—is what differentiates The Good Growth Plan from a well-intentioned set of ideals that has little or no practical impact. Providing annual progress reports helps promote accountability and transparency; since the plan's inception, Syngenta has publicly shared how the company is realizing each commitment.

The 2016 progress report for The Good Growth Plan, released in March 2017, brings to life the key projects and initiatives that are helping Syngenta deliver on its ambitious sustainability goals.



WATCH THE VIDEOS. The Good Growth Plan is positively impacting thousands of lives around the world, including the people represented in these images. Go to www.goodgrowthplan.com to watch their videos.





Here's a look at where each commitment stands:

Rescue more farmland



Measurable goal: Improve the fertility of more than 24 million acres of farmland on the brink of degradation.

Progress to date: In 2016, Syngenta programs benefited an additional 4.6 million acres of land, bringing the cumulative total to 10.6 million acres.

Notable 2016 learnings/achievements: Syngenta substantially increased the amount of farmland acreage benefiting from this goal by better integrating soil management practices into its commercial offers.

North America: In North America, efforts to better quantify the soil health and nutritive benefits of cover crops will continue to be a priority in 2017, says Macie O'Shaughnessy, sustainable solutions specialist for Syngenta. "As we are able to increasingly correlate the benefits of specific management practices with measurable results—for example, demonstrating the impact that certain practices have on indicators like water and nutrient-use efficiency—we help farmers bring more credibility and purpose to these types of decisions," she says.

To promote a better understanding of soil-conservation techniques among growers, retailers and channel partners, Syngenta is establishing cover-crop demonstrations at selected Grow More™ Experience sites this year.

Look after every worker



Measurable goal: Strive for fair labor conditions throughout the entire supply chain network.

Progress to date: In 2016, Syngenta completed implementation of its Fair Labor program in China, Colombia, Mexico and Paraguay. At year-end, the number of suppliers reached was more than 24,000, representing 82 percent of the Syngenta seed supply chain.

Notable 2016 learnings/achievements: Syngenta continues its efforts to obtain certification to GLOBALG.A.P. Risk Assessment on Social Practice (GRASP) for all Syngenta and third-party commercial flower farms. By the end of the year, 73 percent of farms had GLOBALG.A.P. certification and 24 percent had undergone the GRASP assessment.

North America: Also in 2016, the Syngenta Supplier Sustainability Program covered nearly 50 percent of its chemical suppliers in North America. This program aims to raise awareness among suppliers on the proper, sustainable use of Syngenta crop protection products.

Empower smallholders



Measurable goal: Reach 20 million smallholders and enable them to increase productivity by 50 percent.

Progress to date: In 2016, the calculated number of smallholders reached via sales totalled 16.6 million.

Notable 2016 learnings/achievements: In 2016, Syngenta received the findings from three social impact assessments, conducted in 2015 in China, India and Mexico. This output is helping the company achieve a better understanding of its interactions with smallholders in these countries, which will help Syngenta augment the benefits it brings to growers and communities.

Help people stay safe



Measurable goal: Train 20 million farm workers on labor safety, especially in developing countries.

Progress to date: In 2016, Syngenta reached 6.8 million people, with dedicated safety training programs and initiatives aligned with commercial activities. This brought the cumulative total farm workers reached to 17.2 million.

Notable 2016 learnings/achievements: Syngenta entered into a joint working group with international network organization Solidaridad to seek a deeper understanding of farmers' behaviors, in an effort to improve the transfer of knowledge and the adoption of training messages.

North America: In North America, as part of its safe-use outreach efforts, Syngenta has trained more than 900 pest control professionals in the application of an insect-control technology from its Lawn and Garden portfolio to help fight the spread of the Zika virus.

Help biodiversity flourish



Measurable goal: Enhance biodiversity on more than 12 million acres of farmland.

Progress to date: Syngenta has engaged in programs in 34 countries, benefiting a total area of 12.1 million acres.

Notable 2016 learnings/achievements: A large-scale rainforest restoration project helped bring Syngenta within 200,000 acres of meeting its 2020 biodiversity commitment target of 12.3 million acres.

Make crops more efficient



Measurable goal: Increase the average productivity of the world's major crops by 20 percent without using more land, water or inputs.

Progress to date: Across all Syngenta reference farms, the average land productivity increase in 2016 was 1.2 percent. Meanwhile, smallholders achieved an 8 percent increase in productivity.

Notable 2016 learnings/achievements: Without an efficient global infrastructure for agricultural data, the value of openness and transparency is limited. To contribute to a more robust infrastructure, Syngenta joined the Global Open Data for Agriculture and Nutrition (GODAN) initiative. The company's work with GODAN is helping Syngenta create a more effective data ecosystem for the industry.

While these goals—and the programs and partnerships that have been integral to their success—are quantifiable, the dialogues about The Good Growth Plan and sustainability aren't. But that doesn't mean conversation, education and industry solidarity aren't shaping the landscape for sustainable agriculture. "With The Good Growth Plan, Syngenta has a global platform to provide a face and voice to the farmers who are making a difference and ensuring a viable future for agriculture," says Wheeler.

For Liz Hunt, sustainable solutions lead for Syngenta in North America, these dialogues are crucial to engaging and bringing together the growers, agribusinesses, food companies, industry groups, policymakers and consumers that collectively influence the future of agriculture—starting with the very definition of sustainability.

"Sustainability is a word that can be interpreted many different ways, depending on the audience," Hunt says. "Not only does this word have numerous meanings, it's also emotionally charged."

Hunt and O'Shaughnessy stress the importance of articulating the three equally important aspects of sustainability. "We describe sustainability as a three-legged stool," says O'Shaughnessy. "It's a balance between environmental, economic and social practices and benefits."

A more pronounced nexus between environmental sustainability and economic sustainability is one that has emerged in connection with the ongoing challenging commodity climate. "If farmers aren't profitable, then they can't be sustainable," says O'Shaughnessy. "In this era of low commodity prices and tight margins, adopting sustainability measures must be economically viable for farmers—and we need to have the data to communicate the benefits of adopting sustainability measures. With The Good Growth Plan and the work Syngenta is doing in Sustainable Solutions, we're able to do just that." ■

SUSTAINABLE SOLUTIONS:

The Good Growth Plan in Practice



In North America, Syngenta has launched a series of Sustainable Solutions projects that are helping growers produce more food using fewer resources, while improving the economic and environmental sustainability of their operations. The data that these projects generate are also helping farmers meet the requirements of the food companies that purchase their crops.

The Syngenta Sustainable Solutions team has specialists who provide support to a network of more than 130 farmers across 11 crops, all in an effort to help growers deliver crops—and information regarding how they grow their crops—to the food companies to which they are contracted.

"The benefits of capturing crop data are two-fold," says Liz Hunt, sustainable solutions lead for Syngenta in North America. "In addition to supporting a comprehensive crop profile for the food company, farmers can use the

data to develop better crop-management protocols that can more efficiently use inputs and resources. That's good news for farmers—today and tomorrow."

"Farmers can use the data to develop better crop-management protocols that can more efficiently use inputs and resources."

—LIZ HUNT

Putting It All Together

The right Golden Harvest hybrid and agronomic practices can help farmers achieve a more bountiful harvest.

Success is no accident—at least not for Gary Prescher. The National Corn Growers Association recently recognized this Minnesota farmer and Golden Harvest® agronomist as a 2016 state yield champion.

“It’s taken me years of experimental farming to find just the right formula,” Prescher says. “This honor is a result of many years of daily dedication to my work with Syngenta and applying what I have learned to my fields.”

According to a U.S. Department of Agriculture crop report, the 2016 Minnesota corn yield was projected to average 184 bushels per acre (bu/A). This was the state’s second-highest yield prediction ever, and yet Prescher surpassed it by more than 100 bu/A with Golden Harvest hybrid G10S30-3220 brand, hitting 288.6 bu/A.

A Yield Champ’s Strategy

A lot of hard work, careful calculations and field consulting led to Prescher taking home top honors in the 2016 National Corn Yield Contest’s Minnesota AA Non-Irrigated category. It

actually started back in 2009, when he enhanced his fields by installing drainage tile lines.

“We wanted to bring our yields up, so we started grid soil sampling and variable-rate fertilizer applications,” he says. “Those were the foundational practices.”

That was only the beginning. In preparation for the 2016 planting season, Prescher analyzed yield studies and chose a Golden

Harvest hybrid with the Agrisure Viptera® trait for comprehensive insect control. He also made sure he planted his corn at the proper depth and applied a broad-spectrum herbicide, along with early-season and at-tassel fungicides. In addition to these crop-protection inputs, his spray regime included prescribed nitrogen and sulfur applications.

Getting the timing right was also critical, Prescher says. Fields planted a week earlier than his winning field didn’t do as well because of the cold soil conditions. Planting when the soil was ready and tilling the ground during the right window were important early decisions that helped him break yield barriers at the end of the season.

Success Starts From the Ground Up

Like Prescher, Doug Kirkbride preaches the importance of agronomic considerations every day. As a Golden Harvest agronomist based in Pana, Illinois, Kirkbride is on the front lines when it comes to helping farmers place hybrids and varieties in the right fields.

Given commodity prices for corn, he recognizes that some farmers want to “cut, cut and cut” inputs. But he advises taking a more moderate approach that takes field history into consideration. “For example, if planting continuous corn acres, the chances for corn rootworm will be higher,” he says. According to Iowa State University Extension, farmers can expect a 15 percent yield loss on average for every node of roots pruned by corn rootworm larvae. A hybrid featuring a trait, such as Agrisure Duracade®, may cost more upfront, but it can end up delivering a larger return.

“Rather than completely reducing the quality of your inputs by choosing all conventional hybrids and foregoing fungicides, try another alternative,” Kirkbride says. “For example, take a small portion of the farm and try different trait, chemical and fertility input programs on fields that are easy to access for in-season scouting. This will provide an on-the-farm testing ground, so you can see for yourself and set yourself up for the greatest chance of high yields and, ultimately, higher profits.”

John Flynn, a Golden Harvest agronomist in Nebraska, builds on Kirkbride’s advice. “Traits are very nice to have, but you also need to have the right seed in the right place,” he says. “If it seems like you always pick the right hybrid or variety a year or two too late, I recommend choosing three to five options to help diversify and spread risk.”

When possible, Flynn says he advises farmers to choose ear-flex hybrids to maximize yield. Unlike determinant and semi-flex offerings, ear-flex hybrids have the potential to increase the number of kernels down and around, which can translate to more corn in farmers’ hoppers at harvest.

After farmers select and place hybrids and varieties, Kirkbride says their attention should turn to fertility. Proper soil fertility is critical to maximizing yield potential of a crop. It first starts with the proper soil pH level to optimize soil fertility available for uptake by the plant’s root mass.

“As the hub for plant nutrient intake, the larger a root system, the greater chance a crop has of reaching its full yield potential,” Kirkbride says. “I’ve seen young corn and

“If it seems like you always pick the right hybrid or variety a year or two too late, I recommend choosing three to five options to help diversify and spread risk.”

—JOHN FLYNN

Gary Prescher (center), a Golden Harvest agronomist, holds his trophy for being named a 2016 state yield champion, while Golden Harvest independent Seed Advisors Angela Gurntzel and Andy Cramblit visit with him on his farm in Delavan, Minnesota.



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soybean plants that start off looking good above ground, but soon turn into a mess because of what's going on below ground. Oftentimes, that's because the soil pH wasn't properly maintained and nutrients were limited."

Keep Learning

While agronomics are critical to success, staying open-minded is also key, Flynn says.

"These days, agriculture is becoming so technologically advanced that having a willingness to try a new management approach can lead to a big field win," he explains. "I encourage farmers to attend trade shows, visit field events and read magazines, so at the very least you have a chance at being exposed to the latest and greatest products."

Another way farmers can stay in the know is reaching out to experts in their area, Kirkbride says. "The most

rewarding part of my role is developing relationships with farmers and helping them solve crop problems. So I always encourage them to call or email—whether that's me, another agronomist or their Golden Harvest independent Seed Advisor, who is trained to be a local field expert," he says.

Prescher agrees and credits teamwork for his recognition in the National Corn Yield Contest. "I'm thankful for the family, friends and colleagues who have helped me along the way," he says. "The yield win was a collaborative effort. Now it's time for us to break last season's record and reach 350 bu/A." ■ STORY BY KRISTIN DE SUTTER

288.6 bu/A
average, using Golden Harvest hybrid G10S30-3220, made Gary Prescher the winner of a 2016 NCGA yield contest in Minnesota.

Defending Funding

The political and economic environment is unsettled, as work begins on the 2018 Farm Bill.

With the 2018 U.S. Farm Bill on the horizon, ag policy experts and leaders are turning their attention to creating legislation that benefits agriculture as a whole.

It comes at a time of uncertainty. “We don’t think we have a crisis yet, but it could be not too far down the road, depending on weather and yields this year,” says Mary Kay Thatcher, American Farm Bureau’s senior director of congressional relations. “We always say you write farm bills for the bad times, not the good, and here we are.”

Although farm bills are created every five years, they use a 10-year baseline. For example, when the 2014 U.S. Farm Bill passed, it was projected to cost \$956 billion over the decade. In January, the Congressional Budget Office estimated it will cost \$80 billion less than projected, primarily as a result from lower-than-projected costs in the nutrition and crop insurance programs. Many say that as members of Congress consider a new farm bill, they should recognize the substantial savings already achieved.

“Advocates in agriculture will fight to keep the most funding they can, no matter what the score is,” says Laura Peterson, head of federal government relations for Syngenta. “That ties to the reason for keeping SNAP [Supplemental Nutrition Assistance Program] in the farm bill. Nutrition accounts for a large percentage of the farm bill budget, resulting in benefits to constituencies across the country, from families putting food on the table to retail supplying food and farmers supplying retail. The whole food chain is arguably involved in the large cost, but also the big benefit. Without SNAP, the farm bill wouldn’t get as much attention. Every state has people using it.”

Thatcher agrees on the importance of not splitting farm and nutrition programs. “If that happened, we don’t believe we would ever get a farm bill through the House of Representatives, so that’s a very high priority.”

A full 77 percent of the current farm bill’s funding goes to those nutrition programs, leaving 23 percent for issues that directly affect ag programs.

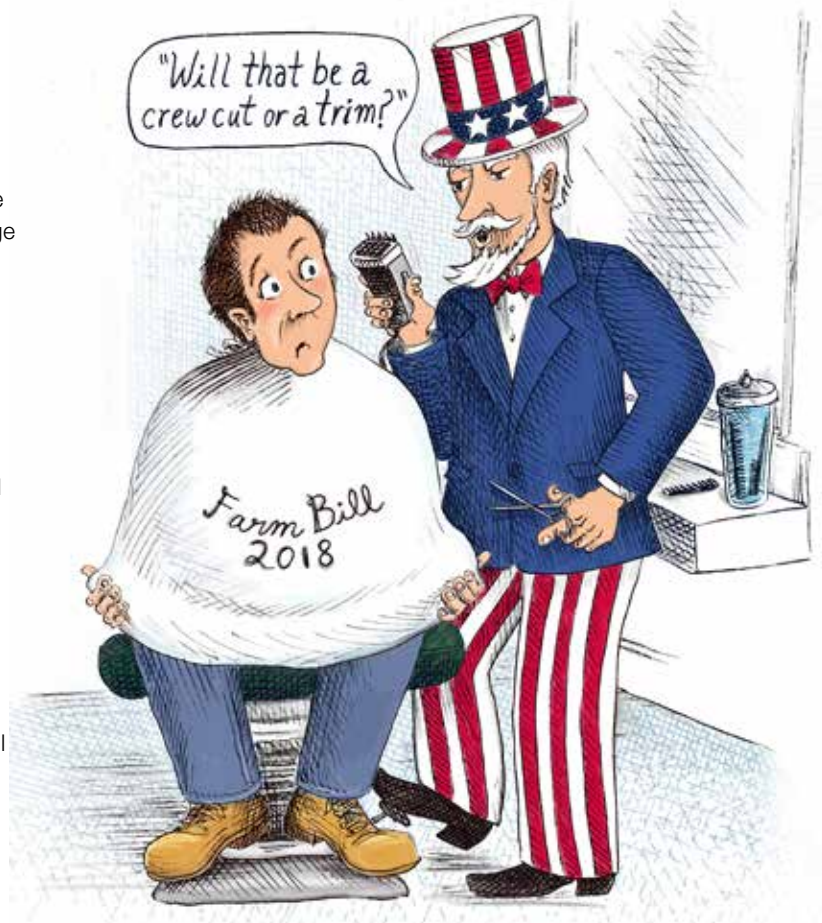
Crop Insurance

Crop insurance, accounting for about 8.5 percent of the farm bill and covering 90 percent of U.S. cropland, is especially crucial now. The Department of Agriculture estimates net farm income for 2016 was \$54.8 billion, compared to \$123.3 billion in 2013—a 46 percent reduction.

But ag policy experts expect crop insurance to be a major target for legislators looking for cuts. “Our opposition wants

to cut the discount that farmers get on their premiums and make cuts to the private sector delivery,” says Tara Smith, vice president of federal affairs at Michael Torrey Associates, LLC. “A lot of folks want to add means testing to crop insurance. We know how to get the facts out there to defend against those changes.”

Those same kinds of amendments have been floating around for a long time, Thatcher says. While working to defeat them, Farm Bureau is working on other strategies, too, including a private policy for dairy revenue insurance. They also hope to take the \$20 million cap off the Livestock Gross Margin Insurance Plan. “It includes Whole-Farm Revenue Protection under that cap,” Thatcher says. “We’re trying to remove the cap so more people can be covered by it.”



Conservation Programs

Conservation programs—now about 6 percent of the farm bill budget—will also have to compete to maintain funding levels; disparate farm interests are joining that debate. “You see some unusual partnerships coming together, such as conservation interests and crop insurance interests, realizing it’s in all of our interest to work together to preserve these baselines,” Peterson says.

Meanwhile, there’s concern about the new administration’s emphasis on budget cuts. “I see the need for the priorities this administration is talking about,” says John Larson, senior vice president of policies and programs at American Farmland Trust. “Fiscal responsibility is important, but not at the expense of our natural environment and the long-term ability for us to produce food, feed, fiber and fuel.” He hopes to see a balance of those needs.

“Part of the new administration’s platform was a regulatory reform approach, which I agree with, but with a caveat: If we don’t have a regulatory push toward protecting the natural resource-based building blocks of life, then we need to do something,” Larson says. “That’s where Title II of the farm bill, the conservation title, comes in. We’re really hoping that Congress will keep conservation a focal point and fund programs at a level that can accomplish a voluntary incentive-based approach to natural resource conservation.”

“We have a very difficult budget scenario right now, where folks are looking at cuts more than anything. That’s a difficult environment in which to write a bill.”

—TARA SMITH

Commodities and Other Programs

Commodity program provisions make up about 6 percent of the farm bill; specialty crops and other programs are the last 1 percent. “Defending the societal investment in these programs remains a critical priority for our sector,” Peterson says.

Similarly, the ag industry supports programs related to ag research, such as the Ag and Food Research Initiative, and crucial trade programs. “Two programs in the farm bill help grow our exports: Foreign Market Development and Market Access Program,” she says. “We’re looking to bolster these, even in this tight budget, because international export markets are critical for our American ag economy.”

Given the politicized atmosphere in Washington now, none of this will be easy. “We have a very difficult budget scenario right now, where folks are looking at cuts more than anything,” Smith says. “That’s a difficult environment in which to write a bill.”

Visit www.fb.org/issues/farm-policy for more information on the progress of the farm bill. 🌱 STORY BY SUZANNE BOPP

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Ripple Effect

Syngenta celebrates the contributions of women to agriculture through its sponsorship of “FarmHer on RFD-TV” and works to ensure a bright future for ag by promoting advanced analytics and stewardship.

SPONSORSHIP

Get Ready for FarmHer, Season Two

Syngenta has announced that it will be the presenting sponsor of “FarmHer on RFD-TV” for a second consecutive season, which starts this fall. During the show’s inaugural season, viewers had the opportunity to meet women from across the country who contribute to agriculture in their daily lives. Marji Guyler-Alaniz, the show’s host and founder of the FarmHer movement, visited more than 43 farms, ranches and agricultural labs during season one, to give viewers a glimpse into the lives of some of the women who make up 30 percent of the farming workforce. The original TV series also won the Cynopsis TV award for the Best Reality Series: Family-Focused category during its first season.

“At Syngenta, we’re proud to be a part of this groundbreaking series,” says Wendell Calhoun, communications manager at Syngenta. “We look forward to hearing more inspiring stories about the remarkable women of agriculture.”

Guyler-Alaniz and her team have already begun traveling the country to visit FarmHers to feature in season two. The Syngenta #RootedInAg Spotlights will also be returning for a second



Marji Guyler-Alaniz (right) visits Stacy Whitener (left) at Pecan Grove Farms in Bastrop, Texas.



season, with a focus on the women who have inspired others to follow their dreams.

FarmHer returns to RFD-TV on September 8, with episodes airing Fridays at 9:30 p.m. Eastern time. You can visit www.syngentathrive.com/community each week to view the latest #RootedinAg Spotlight.

2017 Syngenta Crop Challenge in Analytics Winner Announced

The Analytics Society of INFORMS has recognized a team from the BioSense Institute in Serbia as the winner of the second annual Syngenta Crop Challenge in Analytics. The institute is a multidisciplinary research organization dedicated to using technology to help ensure the food supply for the world's growing population.

The team, which included Oskar Marko, Sanja Brdar, Marko Pani, Isidora Šašć, Milivoje Knežević, Danica Despotović, Vladmir Crnojević and Zorana Djindjica, received a \$5,000 prize for its entry, "Portfolio Optimization for Seed Selection in Diverse Weather Scenarios." The submission set forth a mathematical strategy for predicting farmers' soybean seed-variety demand.

"The Syngenta Crop Challenge in Analytics exemplifies how individuals with expertise in industries beyond agriculture—in this case, data analytics—can contribute to solving the complex challenges inherent in agriculture," says Joseph Byrum, Ph.D., MBA, PMP, senior R&D strategic marketing executive with Syngenta and Syngenta lead for the Crop Challenge committee.

For more details about the Syngenta Crop Challenge, please visit www.ideaconnection.com/syngenta-crop-challenge.



Two members from the BioSense Institute in Serbia, Marko Pani (second from left) and Oskar Marko (third from left), receive a plaque for winning the second annual Syngenta Crop Challenge in Analytics. Also pictured are Joseph Byrum (far left) with Syngenta, Crop Challenge Committee Chair Robin Lougee (second from right) and INFORMS representative Stefan Karisch (far right).



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For the Common Good

A unique collaboration sets its sights on improving agricultural production and stewardship.

Nine public- and private-sector organizations, including Syngenta, have established a collaborative framework that will promote agricultural production and natural resource stewardship. Under the auspices of the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS), the partnership will spread the word about innovative technologies and best production practices.

PARTNERS FOR PROGRESS

Below, representatives of the collaborating organizations celebrate the signing of the memorandum of understanding that created the partnership to help promote agricultural production and natural-resource stewardship. The Natural Resources Conservation Service is working closely with the following organizations:

- > Syngenta
- > Agricultural Retailers Association
- > American Society of Agronomy
- > CropLife America
- > Crop Science Society of America
- > National Association of Conservation Districts
- > National Association of State Departments of Agriculture
- > Soil Science Society of America
- > The Fertilizer Institute



From left to right: Lee McDaniel, National Association of Conservation Districts; Jeff Sands, Syngenta; Jay Vroom, CropLife America; Hunter Carpenter, Agricultural Retailers Association; Jason Weller, USDA-Natural Resources Conservation Service; Ellen Bergfeld, American Society of Agronomy, Soil Science Society of America, Weed Science Society of America; Clark Mica, The Fertilizer Institute; and Nathan Bowen, National Association of State Departments of Agriculture

The partnership is developing case studies focused on soil health and the four Rs of nutrient management—right source, right rate, right time, right place—which it plans to publish this summer.

“NRCS has a keen interest in working with private and public sectors,” says Marty Adkins, assistant state conservationist, partnerships, for NRCS in Iowa. “Companies like Syngenta that provide service and support for ag retailers and farmers help us achieve our mission.”

Agricultural retailers have long-standing relationships with growers, and growers value their retailers’ technical knowledge, Adkins adds. Retailers will gain additional knowledge through case studies co-developed by the partners and by attending training sessions.

“Everyone is pitching in to develop the case studies—documenting successes, failures and what’s possible,” Adkins says.

The case studies share practical approaches to improving soil health and nutrient management, such as incorporating cover crops into farming operations. “These studies reflect a diversity of cropping systems across the United States,” notes Jeffrey Sands, manager of government relations for Syngenta.

Syngenta, the only chemical agribusiness in the partnership, contributed case studies that feature the stewardship efforts of agricultural retailers and their customers from five regions of the United States: the Northeast, the Southeast, the central Midwest, the Pacific Northwest and California. Syngenta hopes these examples of what’s possible will inspire creativity and encourage best-management practices, Sands says.

The nine partners are planning an orientation-and-training program next winter, held in conjunction with a national event. They’re also discussing other activities, such as hosting field days.

As the partnership’s activities expand, there will be a recognition program for stewardship achievements at the local level.

In the long-term, the public-private partnership will help growers and other agricultural professionals improve farm production, preserve natural resources and stimulate agricultural innovation, Sands says.

Visit www.croplifeamerica.org for updates on the partnership’s efforts. ■ STORY BY LYNN GROOMS

A corn seedling emerges
in the early morning light
in an Iowa field.



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