NORTH DAKOTA AGRICULTURE

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ON THE MARK

New technologies allow farmers to improve crops through precision agriculture

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New generations of North Dakota farmers are carrying on their families' legacies

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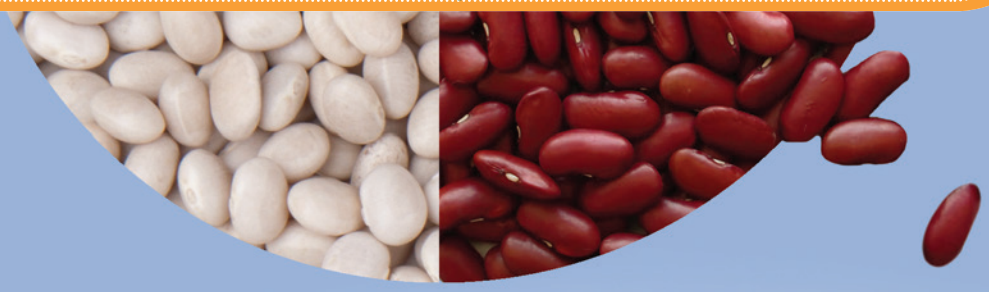

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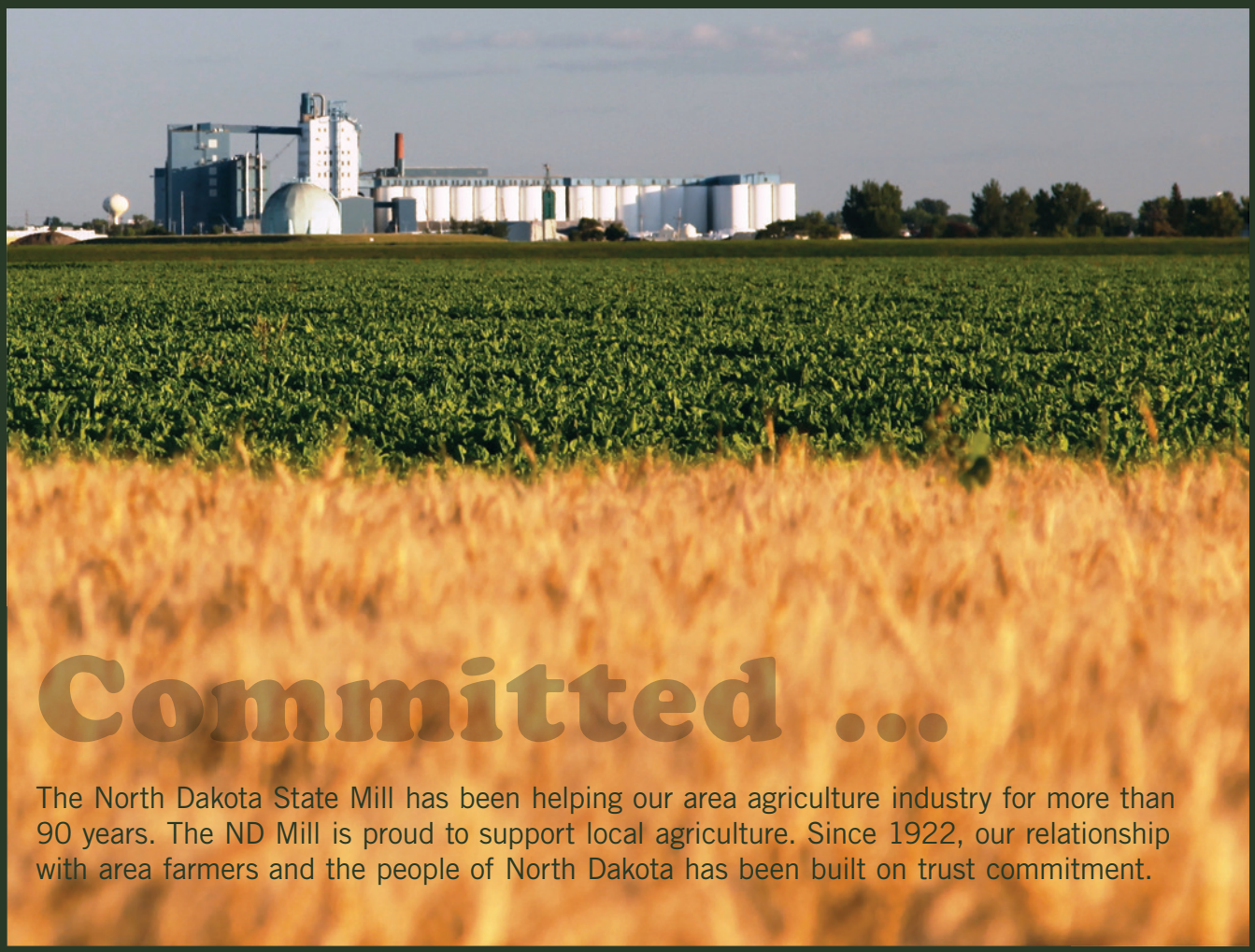

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CONTENTS

28 Modernization

SUCCESSFUL SUCCESSION

New generations of North Dakota farmers are carrying on their families' legacies

7 Ag Profile

NORTH DAKOTA AGRICULTURE

An overview of the state's food, farming and agribusiness sectors

10 Top Ag Products

WHAT'S GROWING IN NORTH DAKOTA

A glimpse at the state's leading ag products based on cash receipts

12 Dairy

MILKING MASTERY

North Dakota dairies of all sizes produce top-shelf milk

16 Value-Added Products

VALUE: ADDED HERE

Companies increase economic impact of farm products

COVER STORY (page 28)

The Kuhn family on their multigenerational farm in Dickinson, North Dakota

Photo by Michael D. Tedesco

19 Wheat

THE GROWTH OF GRAIN

North Dakota sees diverse opportunities for wheat crops

20 Ag Careers

FIELD OF OPPORTUNITY

Ag degrees open doors for North Dakota graduates

26 Youth in Agriculture

LEADING THE WAY

4-H and FFA prepare young people for success

27 Agricultural Education

HEAD OF THE CLASS

Ag in the Classroom cultivates learning

32 Auctions

MAKING THE SALE

Livestock auction markets update to meet demands

36 Precision Agriculture

PRECISE PRACTICES

New technologies improve crops through precision agriculture

39 Farm Size

INFLUENTIAL SHIFT

Adjustment in farm numbers and size point to changing industry

40 Hemp

HEMP FOR HARVEST

Emergence of industrial hemp holds promise for growing ag industry

44 Genotyping

CRACKING THE CODE

Genetic testing reveals clues for managing diseases

46 Weeds

NOXIOUS KNOCKOUT

Agencies, plant businesses educate consumers and farmers about invasive plants

HEMP SEED: ©ISTOCKPHOTO.COM/ALASDAIRJAMES

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NORTH DAKOTA AGRICULTURE

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Commissioner Goehring is a third-generation farmer who operates his 2,000-acre no-till farm with his son, Dustin.

North Dakota Agriculture. A few words encompass a generations-long story of North Dakota's heritage, people and culture.

We've captured just a few of those stories for you in this second edition about our state's leading industry.

We invite you to take some time to get to know a few of our 29,800 farmers and ranchers, and explore this diverse industry where one in four jobs in the state are connected to agriculture. As you'll read, agriculture is ripe with job opportunities in fields as diverse as management, business, STEM, education, communications and more.

While respecting the past, we look toward the future of agriculture with cutting-edge developments in the production of food, feed, fiber and fuel. In this magazine, you'll learn that precision ag practices and genotyping are two of the tools used to help producers become more efficient.

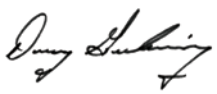
We'll talk about adding value, from a local dairy processing its own milk, cheese and yogurt to the state's ethanol plants that purchase up to 60 percent of North Dakota's corn production.

North Dakota has been blessed with abundant resources and a varied landscape that enable our farmers and ranchers to produce over 50 different commodities. It is my hope that by sharing an in-depth look at North Dakota agriculture, you will come away with a greater understanding and appreciation for the men and women who produce the wide array of products that are used here and around the world.

While it's my honor to serve as Agriculture Commissioner, I am also a third-generation farmer. My son and I operate a 2,000-acre, no-till farm near Menoken in south central North Dakota, where we raise corn, soybeans, spring wheat, winter wheat, sunflowers, and barley. As farmers and ranchers, we want to show you how agriculture touches all of our lives.

Thank you for your interest in North Dakota Agriculture!

Sincerely,



Doug Goehring
North Dakota Agriculture Commissioner

North Dakota Agriculture

An overview of the state's food, farming and agribusiness sectors

In North Dakota, agriculture is vital. So vital, in fact, that the motto "Strength from the Soil" appears on the state's coat of arms.

Each year, North Dakota agriculture contributes approximately $10.9 billion to the state's economy. The state is home to nearly 30,000 farms and ranches spread across 39.1 million acres, ringing in at an average size of 1,312 acres each. In fact, 90 percent of North Dakota's land is used for agriculture, and if that's not impressive enough, the industry employs 24 percent of the state's population.

North Dakota is the No. 1 producer in the nation for dry edible beans, dry edible peas, canola, flaxseed, honey, sunflowers, and spring and durum wheat.

The state raises many different agricultural commodities, including beef, soybeans, corn, sugarbeets and potatoes. North Dakota is one of the only places where potatoes are grown for all of the industry's four main uses: fresh, processed, chips and seed. North Dakota farmers produce enough potatoes annually for about 2.6 billion servings of French fries.

More than just crops and livestock, North Dakota agriculture is constantly changing with farmers embracing new technologies and innovations, including practices in precision agriculture, experimenting with emerging crops, and constantly continuing education. The state also has many agribusinesses, which include processing and value-added food companies, ethanol and fuel plants, and other companies that support the industry.

These components work together to strengthen and grow North Dakota agriculture.

29,800
Total Farms

61
Farmers Markets

$10.9B
Economic Impact

Many commodities are produced across North Dakota. This map shows the highest concentrations throughout the state.

Source: USDA National Agricultural Statistics Service

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- Largest distribution hub between Chicago and Seattle
- Convenient access to three U.S. highways

North Dakota exports agricultural products to
83 COUNTRIES ACROSS THE GLOBE

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North Dakota Ag NEWS & NOTES

To North Dakota and Beyond

North Dakota farmers are feeding people across the United States and the world. Exports are extremely important to the state's agriculture industry and economy.

North Dakota is the top state in the country for wheat exports, and in 2015, the value of wheat exports reached $988.4 million. The state ranks No. 2 nationally for soybean exports, with 92 percent of the crop going to other states and countries. Other important agricultural exports include dry beans, dry peas, lentils and barley.

North Dakota is the ninth-largest agricultural exporting state in the United States, according to the most recent Census of Agriculture.

Pride of Dakota

When searching for local products, look no further than Pride of Dakota.

Launched in 1985 with just 20 companies, the program promotes brands and products created, produced, manufactured or processed in North Dakota. Today, more than 500 member companies participate, from foods and beverage businesses to artisans and service providers.

Members can use the Pride of Dakota logo on their products, plus enjoy other benefits, such as help with networking, advertising and exports.

Learn more about Pride of Dakota and the program's members at **prideofdakota.nd.gov**.

SUNBUTTER IS JUST ONE OF HUNDREDS OF PRODUCTS PARTICIPATING IN THE PRIDE OF DAKOTA PROGRAM.

Going Local

In North Dakota and across the nation, the local food movement has grown rapidly in the past decade.

What exactly is local food? Local food is grown, processed or produced right here in North Dakota and its communities.

Consumers are more interested than ever in where their foods come from, and buying local allows them to meet the farmers and ranchers who grow it. Consumers can ask questions and better understand agriculture's impact on the economy, and make more educated choices on what they choose to eat.

There are many ways to eat local, whether visiting a nearby farmers market, joining a Community Supported Agriculture program or growing food in a backyard garden. The North Dakota Department of Agriculture also provides a local food directory, divided by region.

Learn more at **nd.gov/ndda**.

Granting Help

The North Dakota Department of Agriculture (NDDA) is committed to helping farmers in any way possible, including providing financial reimbursement assistance through U.S. Department of Agriculture (USDA) grant programs. The department has several, including the Specialty Crop Block Grant Program and the Organic Cost Share Program.

The Specialty Crop Block Grant is meant for producers of fruits and vegetables, tree nuts, dried fruits, horticulture and nursery crops (also known as specialty crops) that need funds for projects that will enhance the competitiveness of North Dakota-grown specialty crops in domestic or foreign markets. This could include projects promoting education, research, food safety, production, marketing, or pest and plant health.

The Organic Cost Share Program is designed to help farmers who are transitioning their operations to an organic system, who have not already been certified by the USDA. The NDDA reimburses crop and livestock farmers for 75 percent, up to $750, of the costs associated with organic transitioning.

Discover more about these grant programs, and how to apply, at **nd.gov/ndda**.

What's Growing in NORTH DAKOTA

The state's leading ag products based on cash receipts

CANOLA

North Dakota produces 87 percent of the nation's canola. The crop's seeds are prized for their high oil content. In 2015, North Dakota's canola earned annual cash receipts of $355 million.

$355M
CASH RECEIPTS

FARM FACT Canola is in the same family as mustard, broccoli and cauliflower.

BEEF CATTLE

A single steer typically yields about 450 pounds of edible meat. North Dakota is home to more than 950,000 beef cows. Total cattle and calves brought in a whopping $1 billion in annual cash receipts in 2015.

$1B
CASH RECEIPTS

CORN

Field corn, which is different from the corn we eat, is used to feed livestock and make ethanol fuel. In 2015, North Dakota's corn crop generated annual cash receipts totaling $882 million.

$882M
CASH RECEIPTS

WHAT ARE CASH RECEIPTS?

Defined by the U.S. Department of Agriculture's Economic Research Service, cash receipts refer to the total amount of crops or livestock sold in a calendar year.

WHEAT – SPRING AND DURUM

North Dakota is a leader in wheat production, both hard red spring (used for baking bread) and durum (used to make pasta). In 2015, the state's crop brought in $1.6 billion in annual cash receipts.

$1.6B
CASH RECEIPTS

SUNFLOWERS

Light in taste and noted for its health benefits, sunflower oil supplies more vitamin E than any other vegetable oil. Sunflowers are one of North Dakota's leading ag exports. In 2015, they brought in $222 million in annual cash receipts.

$222M
CASH RECEIPTS

POTATOES

Loaded with potassium, a medium potato with skin provides 18 percent of the recommended daily value per serving. In 2015, North Dakota's potato crop earned $198.9 million in annual cash receipts.

$198.9M
CASH RECEIPTS

BARLEY

Barley contains the highest percentage of fiber of all the whole grains. North Dakota provides about 30 percent of the nation's barley supply, earning the state $267 million in annual cash receipts in 2015.

$267M
CASH RECEIPTS

FARM FACT

Some barley varieties contain a whopping 30 percent fiber.

SUGARBEETS

$233.4M
CASH RECEIPTS

Sugarbeets were first recognized as a valuable sweetening plant source in the 1700s. North Dakota's sugarbeet crop brought annual cash receipts totaling $233.4 million in 2015.

DRY EDIBLE BEANS

Americans eat about 8 pounds of beans per person each year. North Dakota ranks first in the nation of all dry edible bean production. Beans earned the state $219 million in annual cash receipts in 2015.

$219M
CASH RECEIPTS

SOYBEANS

Soybeans provide a whopping 54 percent of edible vegetable oils for the United States. North Dakota ranks in the top 10 states for soybean production and earned $1.35 billion in annual cash receipts in 2015.

$1.35B
CASH RECEIPTS

MILKING MASTERY

North Dakota dairies of all sizes produce top-shelf milk

Dairy operations of all sizes are producing high-quality, safe and nutritious milk across North Dakota.

One such dairy is Bessy's Best, a third-generation farm in Sterling. The company bottles plain and chocolate milk, makes fresh and aged cheeses, as well as plain, vanilla, and strawberry yogurt. Despite its small size, Bessy's has made a name for itself and sells its products statewide.

"We deliver our products to the stores in Bismarck and Mandan, and Dan's (Supermarket) takes it to Dickinson, though we sell to other stores that pick up their milk," says Kathy Goetz, who owns and runs Bessy's Best with her husband, Blaine. "We are a small dairy, only 350 acres. We try to keep 100 cows in the milking herd, sometimes more or less."

Bessy's Beginnings

Blaine's parents first started the dairy in Sterling in 1945 after World War II, and each subsequent generation has made its mark.

"Blaine took over the farm in 1980," Goetz says. "Our son, Travis, is now in charge of running the dairy farm."

90

Number of licensed dairy herds in North Dakota

In 2007, milk prices were low enough to prompt the Goetzes into looking for ways to optimize their profitability. A year later, they began processing their own milk instead of sending it out.

The dairy's philosophy is to have milk "be natural the way cows make it." To ensure the milk is safe for consumers, they use low-heat pasteurization to kill any bad bacteria while preserving the good enzymes.

"If we skimmed our milk, we would have to add vitamins," Goetz says. "Even if we used a natural vitamin, it still would not be as natural as what is found in our milk."

This wholesome approach makes Bessy's Best a favorite among consumers with food sensitivities.

"There are people who can't drink milk but can drink ours," Goetz says. "Our cheeses and yogurts are the same – milk and culture, that's it. Our yogurt has a great five strains of probiotics."

Another top priority for Bessy's Best is animal care.

"We do not push our cows; they are fed a total mixed ration, but they are also free to roam the pasture," Goetz says. "By not pushing these cows to get high productions of milk, our cows are healthier and live longer."

STAFF PHOTOS BY MICHAEL D. TEDESCO


322

The third generation of Goetzes has excelled in managing the nutrition and health of the cows.

"Travis does a great job with the cows. He is even better then we were," Goetz says. "We are very proud of him."

In the end, Bessy's Best strives to provide the best-quality product they can for their loyal fan base.

"Our customers are great," Goetz says. "They always make us glad for our service."

Small-Town Pride

Just a few hours away in Bottineau, local favorite Pride Dairy is touted as the state's last small-town creamery, with customers flocking to its ice cream parlor for a sweet treat. The business dates back to 1930, and finds continued success today, providing its products to grocery stores, restaurants, schools and more, all within 50 miles.

In addition to producing and selling milk and butter, Pride Dairy offers ice cream in a variety of flavors, as well as caramels, cheeses, syrups and toppings.

Whether a dairy operation reaches national or international markets, sells across the state or focuses on a local market, one thing is certain – North Dakota's dairy operations are milking success.

– Brittany Stovall

Bessy's Best dairy produces quality cheeses, milk and yogurt in Sterling.

IN 2015, N.D. DAIRY FARMS PRODUCED APPROXIMATELY

39M

GALLONS OF MILK.

It only takes about **48 hours** for milk to travel from the farm to the dairy case.

$57M

NORTH DAKOTA DAIRY FARMS GENERATE ABOUT $57 MILLION PER YEAR IN MILK SALES.

The average dairy cow in North Dakota produces about **6.6 gallons** of milk per day. That's more than **2,412 gallons** of milk per year.

Source: Midwest Dairy Association

VALUE: ADDED HERE

Companies increase economic impact of farm products

North Dakota is like the world's superstore, exporting agricultural commodities and products to nearly 90 different countries. Adding value to farm products before they leave the state creates more jobs and delivers a broad range of positive economic impact.

Value-Added Agriculture

Value-added agriculture refers to any activity adding economic value to farm-raised products by changing their state or form.

"You can add value by a wide range of processes, services and technologies," says John Schneider, former director of Agricultural Products Utilization Commission and current economic development and finance division director at the North Dakota Department of Commerce. "Value-added agriculture is one of the pillars for economic development strategy in North Dakota."

Wheat mills have long added value to the state's largest crop. The North Dakota Mill, in Grand Forks, is the country's largest flour mill. North Dakota businesses also add value to high percentages of soybeans and other oilseeds grown here (like canola and sunflower), potatoes, corn, and sugarbeets.

"A very large percentage of our sugarbeet crop is processed right here," Schneider says. "That not only provides value to farmers, but it supports jobs for the state."

Food and Fuel

Making ready-to-eat foods from farm products helps a farm or ranch capture a larger share of the consumer's food dollar. North Prairie Signature in Leeds creates summer sausage, meat sticks and jerky from farm-raised bison.

Specialty foods, like North Prairie Signature's bison products, have been a profitable value-added niche for some producers.

"Adding value can be as simple as cleaning pulses and packaging them in 5-pound or 50-pound bags for export," Schneider says. "We are looking for new companies that complement our existing pulse companies."

Ethanol is a remarkable value-added agriculture success story in North Dakota. The state's five ethanol plants now purchase 40 to 60 percent of North Dakota's corn production, annually contributing nearly $625 million to the state's economy. Each ethanol plant has an average payroll of $3.3 million,

Approximately 60 percent of North Dakota's corn crop is used to make ethanol.

at 47 jobs per plant. And the impact does not end there.

"Studies indicate that we create up to 4,000 indirect jobs between our two sites," says Jeff Zueger, CEO of Midwest AgEnergy Group. The company operates Blue Flint Ethanol near Underwood and Dakota Spirit AgEnergy near Jamestown.

Corn and Soybeans

Zueger says corn farmers have benefited big from the five plants.

"Ethanol plants offer an opportunity for North Dakota farmers to have a steady, year-round processing facility market, with an offer to buy product to process on a much more consistent level," he says. "This naturally creates opportunities for farmers to market their products into delivery periods that work best for their individual business model."

North Dakota farmers often alternate corn with soybeans from year to year. Many soybeans are shipped to out-of-state crushing plants, which separate soy oil from soybean meal.

"We have always been looking for another opportunity to add value to soybeans before they leave the state," says Schneider.

A new soybean crushing facility planned for Jamestown will benefit area farmers. That means another value-added enterprise for North Dakota – along with more jobs and more economic impact from a crop already growing here.

– Matt Ernst

$3.3M

AVERAGE PAYROLL OF EACH OF NORTH DAKOTA'S ETHANOL PLANTS

80%

North Dakota ethanol plants purchase 80 percent of the 160 million acres of corn they use annually from local farmers.

North Dakota's five ethanol plants purchase between **40 and 60 percent** of the state's corn production.

Source: North Dakota Ethanol Council

The Growth of **GRAIN**

North Dakota sees diverse opportunities for wheat crops

North Dakota's wheat industry continues to flourish, though the drought of 2017 has affected production for the year. Still, wheat farmers have more diverse crop choices and opportunities than just a few years ago.

"Wheat is still king for many North Dakota producers, but crop choices continue to expand," says David Clough, chair of the North Dakota Wheat Commission (NDWC).

The state ranks No. 1 in the United States in the production of both hard red spring (HRS) wheat and durum, with an annual output of approximately 250 million bushels of HRS and 50 million bushels of durum, which is nearly half of the nation's HRS and two-thirds of U.S. durum production.

"U.S. millers, bakers and pasta processors, and quality-conscious markets worldwide pay premiums for these two unique wheats," Clough says. They are highly sought after to augment the quality of less-robust wheat crops.

The Wheat Commission reports nearly 70 nations import HRS and durum wheat from North Dakota on a regular basis, at prices often exceeding other classes and origins by $1 to $2 per bushel.

North Dakota's prized durum wheat is a key ingredient in your favorite authentic Italian pasta dish.

"Hard red spring wheat is the largest wheat class produced in North Dakota, but durum is the world's premier pasta ingredient," says Neal Fisher, North Dakota Wheat Commission administrator. "You might be able to make pasta from other wheats or perhaps a blend, but in Italy, if it's not 100 percent durum, it's not pasta – that's actually a law in Italy. U.S. durum, mostly grown in North Dakota, has a distinct advantage in Italy because of its very high-quality processing traits and great color scores."

In addition, HRS is recognized worldwide for its high protein content and high-performance milling and processing traits.

"Quality reputations do not happen by accident," Clough says. "Our varieties are developed with time-tested agronomic and end-use characteristics sought as dual priorities."

Clough and Fisher note that both yield and quality must be addressed, or producers will not grow the variety. Most are developed at North Dakota State University (NDSU) through leveraged arrangements of producer dollars via their wheat commission checkoff, supplementing important state and federal general fund appropriations and grants.

Private sector companies have also ramped up variety development efforts, further broadening overall choices, genetics and much-needed wheat industry investment.

North Dakota wheat farmers have a strong support system, thanks to organizations such as the NDWC, North Dakota Grain Growers Association (NDGGA) and North Dakota-based U.S. Durum Growers Association (USDGA). All three grassroots organizations have specific missions and programs, but regularly work together, drawing on industry partners and bolstering North Dakota's wheat industry through research, promotion, education and advocacy.

Dan Wogsland, executive director of the NDGGA, says the state's wheat commission contracts with NDGGA and USDGA for the development of domestic policy positions benefit wheat and durum farmers on the local, state and federal levels, such as crop insurance, water management, disaster programs and other critical Farm Bill issues.

The groups also work together on producer education endeavors with the NDSU Extension Service.

"We have a wonderful working relationship with the North Dakota Wheat Commission and the North Dakota Grain Growers Association," Wogsland says. "The Wheat Commission does an excellent job in researching and promoting North Dakota wheat, while the U.S. Durum Growers Association does a wonderful job promoting durum and durum production in the state. We continue to focus on doing the best job possible for our farmers."

As a result, it's no surprise Clough predicts continued success for North Dakota's wheat growers and the industry as a whole.

"The state's signature wheat classes have been produced in North Dakota for more than 150 years," Clough says. "We have a bright future as the world's premier wheat source, as long as we continue to work with all of our partners to deliver on our high-quality, high-performance reputation."

– Jessica Walker Boehm

Radio director Sarah Heinrich at home on the farm with her husband, Richie, and their son, Luke.

FIELD OF OPPORTUNITY

Ag degrees open doors for North Dakota graduates

Sarah Heinrich was a farm kid. She grew up in Mandan, following her dad around their cattle operation and working on 4-H projects with her mom. Her parents nurtured her interest in agriculture, as did her uncle, Al Gustin, a longtime farm news broadcaster.

Today, Heinrich is the farm and ranch director for KFGO radio and other stations across the state, and an active partner in her own family-farm operation near Medina with her husband, Richie.

Ashley Bruner grew up on a farm in Drake, but her parents weren't involved in agriculture. Her dad worked construction and her mom was a postal employee. Though she was active in the North Dakota Farmers Union growing up, it was Ashley's marriage to Travis that furthered her interest in agriculture.

Together, the couple serves as secretary/

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Red River Valley Fair Association

CASS COUNTY FARM BUREAU
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BIG IRON FARM SHOW
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bigironfarmshow.com

treasurer for the North Dakota Angus Association and works on the Bruner family Angus ranch, with Ashley responsible for the operation's catalog and advertising.

Both women have found careers in agriculture, a field that the U.S. Department of Agriculture reports has more jobs available than graduates to fill them.

Heinrich took a traditional route, growing up on the farm and then majoring in agricultural communications and public relations, and minoring in animal science at North Dakota State University (NDSU). Bruner earned an associate's degree at Bismarck State College,

Ashley Bruner (left) and Sarah Heinrich (right) took very different paths to their agricultural careers, showing the diverse opportunities the industry offers.

a bachelor's in mass communications and business from Jamestown College, and a master's of business administration from the University of North Dakota.

These different paths don't surprise David Buchanan, associate dean for academic programs at the NDSU College of Agriculture, Food Systems, and Natural Resources.

"There are a variety of employment opportunities in agriculture and a variety of academic paths to get there," he says. "If you are committed to preparing yourself and if you have some flexibility in terms of where you're willing to live, there are plenty of opportunities in the field."

Jobs Galore

What are those opportunities? A recent study by the U.S. Department of Agriculture indicates that there will be an average of nearly 58,000 job openings across the country each year for the next three years for graduates with bachelor's degrees or higher. Nearly half of those opportunities will be in management and business; a quarter will be in STEM (science, technology, engineering and math) fields, and the rest will be in sustainable food and biomaterials production, as well as education, communications and governmental services.

Each year, nearly 35,000 students will graduate from agriculture programs in the United States. They will fill about 60 percent of the job openings, which leaves plenty of opportunities for graduates in biology, business administration, engineering, education, communications and consumer services.

Jobs include traditional work in farm operations, production, commodity trading, and agricultural loans and finance, plus opportunities in emerging fields like seed genetics, plant science and sustainability. And then there are jobs like Heinrich's and Bruner's that support all those efforts via communications and public relations.

Buchanan says over the course of his 40-year agricultural career, the diversity of job opportunities has increased tremendously.

"When I was in college, most people were coming from a ranch or farm to go to school and then returning to the farm after completing their education," he says. "Now, many agriculture jobs are not on the farm, and increasingly, many students who are getting agriculture degrees haven't spent time on the farm. With the growing number of jobs in the sector and in our state, we need students from both inside and outside the traditional agricultural community to share their talents, to rigorously prepare themselves, and to take advantage of the many exciting opportunities in the field."

– Cathy Lockman

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LEADING the Way

4-H and FFA prepare young people for success

What's the best way to prepare young people for success? Youth advocates say it begins with positive relationships, experiences and environments. The agriculture community has long provided all three for hundreds of thousands of North Dakota young people through 4-H and FFA programs.

"We work with students ages 5 through high school," says Brad Cogdill, the state 4-H program leader and chair of the Center for 4-H Development. "And when we train our staff and adult volunteers, we focus on the essential elements of positive youth development and develop the program around a life-skills model."

He explains that the 4-H model includes providing a sense of belonging, creating opportunities to practice independence and develop mastery of a subject, and then offering opportunities to practice generosity by giving back.

"When young people have the chance to build these strong, foundational skills, there is a high level of transferability across their lives as citizens and leaders," Cogdill says.

Aaron Anderson agrees. As the state's FFA advisor and agriculture education supervisor for the North Dakota Department of Career and Technical Education, he has seen the positive impact the program has on high school students. And with an estimated 1,800 new North Dakota FFA members last year, lots of others see it, too.

"Students appreciate the opportunities FFA provides," Anderson says. "We're teaching them to be active learners and to challenge themselves to move beyond their comfort zones, all of which develops leadership. And because our members are all enrolled in an agriculture class in high school, they can directly apply the skills they learn in the classroom in a practical way with the support of an FFA advisor and classroom teacher to mentor them."

North Dakota FFA members learn leadership skills, communication skills and more while forming lifelong friendships.

Not only have Cogdill and Anderson seen how the program changes the lives of young people, they've both experienced it personally. Anderson was a Rugby FFA member in high school and taught high school agriculture for five years before joining the state FFA staff. Cogdill was a 10-year 4-H member growing up in Ward County and has been involved with the organization professionally for nearly four decades.

"Historically, 4-H served rural youth across the country," Cogdill explains. "Certainly, we continue to do that, but today our intent is to reach young people no matter where they live, to promote positive youth development for students who live in an agricultural community and those who are in urban areas."

So while there are still traditional 4-H projects that focus on animal science, gardening and nature, students are also exploring robotics, GPS and other STEM-based disciplines.

"The future of agriculture depends on our young people being exposed to the industry, being able to visualize a place for themselves in it and being willing to give back," says Cogdill.

Programs like 4-H and FFA are ensuring North Dakota young people are ready for that future.

– Cathy Lockman

PHOTO COURTESY OF NORTH DAKOTA FFA

Head of the Class

Ag in the Classroom cultivates learning

What do elementary students across North Dakota know about crops, livestock or conservation? Thanks to Ag in the Classroom's *Ag Mag*, they have access to a wealth of such information.

Every fall, winter and spring, the magazine is published and distributed free to teachers registered with the Ag in the Classroom program. The *Ag Mag* explores a new agriculture topic through activities, games and lessons.

This initiative provides students with an opportunity to learn about North Dakota's largest industry.

"Many students are generations removed from agriculture and are uninformed about the time and effort that is put forth by farmers and ranchers to produce wholesome foods," says Ashley Stegeman, Ag in the Classroom specialist. "We want this program to cultivate an understanding and appreciation for agriculture."

The *Ag Mag* is one way the program does just that. Teacher education is another.

"We need to equip teachers with information about agriculture, so they are comfortable incorporating it within their classrooms," Stegeman explains.

It's about making the information engaging and accessible for both teachers and students.

For instance, the program is exploring online delivery of *Ag Mag* materials in the future and "farm chats" where students can go on a virtual tour of a farm. And as educators focus on building STEM curriculum, Ag in the Classroom can play a crucial role.

"Agriculture actually ties science, technology, engineering and math concepts together in a way that nothing else does," Stegeman says.

Ag in the Classroom continues to teach the value of agriculture to the next generation in order to preserve North Dakota's strong agricultural foundation.

To receive the educational *Ag Mag* for teaching purposes, contact the North Dakota Department of Agriculture at (701) 328-1974.

– Cathy Lockman

Successful Succession

New generations of North Dakota growers and producers are carrying on their families' legacies

Across North Dakota, family farms and ranches are passing from one generation to the next, with younger members building upon foundations established by their forefathers many years ago.

Kjelgaard Simmentals Prepares for Succession

Located in McHenry, Kjelgaard Simmentals is a 5,000-acre grain farm and beef cattle ranch currently operated by father-and-son team Bruce and Michael Kjelgaard. Bruce Kjelgaard, whose parents began the operation in 1961, plans to hand over the reins to Michael once he is ready to retire in about six years.

However, he has already started relinquishing responsibilities, giving Michael control of the ranch's 350 beef cow-calf pairs. The elder Kjelgaard still manages most of the grain farming, but he says Michael will eventually handle that aspect of the operation as well.

The duo is working with an AgCountry Farm Credit Services representative to plan their financial future, and Kjelgaard says he will continue to give Michael more responsibility and ownership so that he is fully prepared to manage Kjelgaard Simmentals when the time comes.

"You have to build confidence in these young people," he explains. "It's important to let them

Father-and-son team Jeff and Ben Kuhn run a family farm south of Dickinson, North Dakota.

STAFF PHOTOS BY MICHAEL D. TEDESCO

make decisions and do some things on their own so they can develop the skills and confidence they'll need once they're the boss. If you turn over everything all at once and they don't know what they're doing, you're doing them a disservice."

Kuhn Family Farm and Ranch Plans for Future

Another father-and-son operation preparing to transition ownership from one generation to the next is Jeff and Ben Kuhn, who operate a grain farm and beef cattle ranch together south of Dickinson.

While Jeff Kuhn handles most of the operation's ranching responsibilities, his son, a fifth-generation farmer, manages the crops. Since getting heavily involved after graduating from North Dakota State University in 2007, Ben Kuhn says he has helped expand the variety of crops grown on the farm to include winter wheat, spring wheat, durum, sunflowers, corn, canola, flax, peas, lentils, alfalfa and more.

In addition, Ben Kuhn has helped his father implement several precision agriculture techniques to increase yield, such as zone mapping, and he's worked to improve the quality of the farm's soil by practicing residue management and strip-tillage.

Ben's younger brother, Jaden, may eventually take on an ownership role with the farm and ranch and become Ben's business partner, but for now,

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Ben Kuhn inspects his spring wheat crop.

Ben is slowly preparing to take over the operation.

"I'm buying land from my dad gradually, and we're working out the finances between us," he says. "So far, it's going really well and working out flawlessly. We are fortunate that our situation is pretty simple and my father and I work so well together, so we have not had to reach out for help at this point."

Although the transition can be challenging, resources are available to help families like the Kjelgaards and Kuhns navigate the process with ease.

Russ Tweiten, vice president of agribusiness consulting and succession and retirement planning at AgCountry Farm Credit Services in Fargo, recommends families begin laying the groundwork for succession five to 10 years in advance.

He also says it is important for families to have defined goals, communicate clearly, determine the stakeholders, and ensure the farm or ranch can support an additional family member.

"There's no 'one-size-fits-all' approach to succession, because every farm is different," Tweiten says. "Family dynamics, debt and many other elements come into play. We [at AgCountry Farm Credit Services] basically serve as quarterbacks, helping to manage the transition process and advising families on the best approach for their farm. We also keep in mind that even though farms and ranches are businesses, working in agriculture is a way of life. We help families manage the emotions associated with succession, too."

– Jessica Walker Boehm

FIND MORE ONLINE

Explore the state's family farms at **NDagriculture.com**.

Now & Then

North Dakota's ag landscape

North Dakota's farming and ranching landscape has vastly changed in the last century, developing into one of innovation and diverse crops.

According to Mark Halvorson, curator of collections research at the North Dakota State Historical Society, you can thank state, federal, and private industry research and development for helping push these changes. This includes the North Dakota Agricultural Experiment Station (NDAES), which was established in 1890 to support ag research and marketing. Today, NDAES has seven research extension centers with its main station on the North Dakota State University campus.

Leading into the next few decades, the state's ag community focused on diversifying its crops. One such crop that rose through the ranks was soybeans, which is now one of the state's top ag commodities.

"If you would have asked someone here in the 1920s about soybeans, they wouldn't have known what a soybean was," Halvorson says. "Their idea of diversified agriculture back then was wheat, flax, oats and cows. All the beans and oilseeds came later in the century when farmers were looking for new crops."

Ag practices changed over time, too, such as the adoption of no-till methods, planting trees in fields to act as windbreaks and cut down on soil erosion, and planting grasses that will survive in drought conditions.

The adoption of mechanized tractors from horse-drawn plows through the 1950s "totally changed the agricultural picture of North Dakota," Halvorson says. Not only was using machinery more efficient, farmers were able to use large portions of their pasture once dedicated to feeding horses to instead plant crops. "That was a game changer on the farmer's financial bottom line," Halvorson adds.

North Dakotans' eating habits greatly changed as well. Consumers once ate whatever was in season, but today seek out-of-season, fresh produce year round.

"A lot of people now expect fresh fruit in the grocery store year round, not realizing the fruit is seasonal," Halvorson says.

In addition, specialty food purchases are on the rise. This has affected the demand for bison. The native animal once widely roamed the range, but by the late 19th century, they were hunted to a point that few remained. However, bison are making a comeback as a niche specialty food, providing yet another growing market for North Dakota farmers. *– Brittany Stovall*

SOYBEANS: ©FOTOLIA/TPZIJ

PHOTO COURTESY OF NAPOLEON LIVESTOCK AUCTIONS

Making the SALE

Livestock auction markets update to meet market demands

The booming voice of the auctioneer guides the bidding at North Dakota's livestock auction markets, which have provided competitive sales for generations. Today, auctions are using new tools that help sellers receive the highest prices buyers are willing to pay.

Real-Time in the Ring

Real-time weighing, installed at many auction markets a generation ago, has already helped improve auctions.

"Ring scales came in the early 1980s. That lets the buyers see the actual weight of the cattle when they are in the ring, rather than a weight taken before or after," says Jerry Kist of Kist Livestock in Mandan. Ring scales also created less stress on the animals, because of less movement needed for weighing.

Auction sellers are aiming to attract higher bids by providing as much information as possible to as many buyers as possible.

"People can see the auctions on TV, and now bid online," says Ray Erbele of Napoleon Livestock Auction. "They can watch from their home or office and see the cattle that are selling and the prices. They have that information sooner, and they can start deciding whether they might bring more or less cattle to the next sale."

Auction markets more recently

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have adopted internet technology, allowing for cattle video sales. Large groups of livestock are filmed, at the ranch or farm, and then sold by an auctioneer to bidders that agree to arrange future delivery of the animals.

"I call video sales the best of both worlds," says Larry Schnell of Stockmen's Livestock Exchange in Dickinson. "You still have an auctioneer involved, so it's competitive, but at the same time it's for future delivery, which some people like. It's just another option."

Better Genetics, Better Sales

Through sophisticated breeding programs, North Dakota farmers and ranchers today raise higher-quality, more uniform cattle, and that helps sales run smoother.

"We do sell more cattle per hour, because the cattle are more uniform and can be grouped into fewer lots," Schnell says. "Ranchers have really improved their genetics."

Livestock auction markets have played their own role in enhancing genetics by holding special sales focused on breeding stock. Buyers now digest detailed genetic and performance information that sales barns list for breeding stock.

"We have a lot of people who might be sitting at home, watching the sale and bidding by computer, because they are watching the numbers so much more," Kist says. He says that helps the best animals bring higher prices at Kist Livestock, which holds about 30 bull sales per year. "People aren't afraid to invest in the bulls with better genetics."

The Computer Age

Technology also keeps information moving much faster during sales.

"Everything is instant now," says Kist. "When the sale is made in the ring, the office has the numbers. It saves us so much time in keeping the books than before the computer age."

The information age also placed new tools in the hands of livestock buyers and sellers. Electronic trading of livestock futures contracts can benefit producers who use futures markets to hedge against price swings.

With those benefits also come challenges, according to Schnell, whose grandfather started the Dickinson auction market in 1937.

"Today's cattle markets seem so much more volatile than in the past, which I think is often a detriment for our cow-calf producers," he says.

Napoleon Livestock Auction

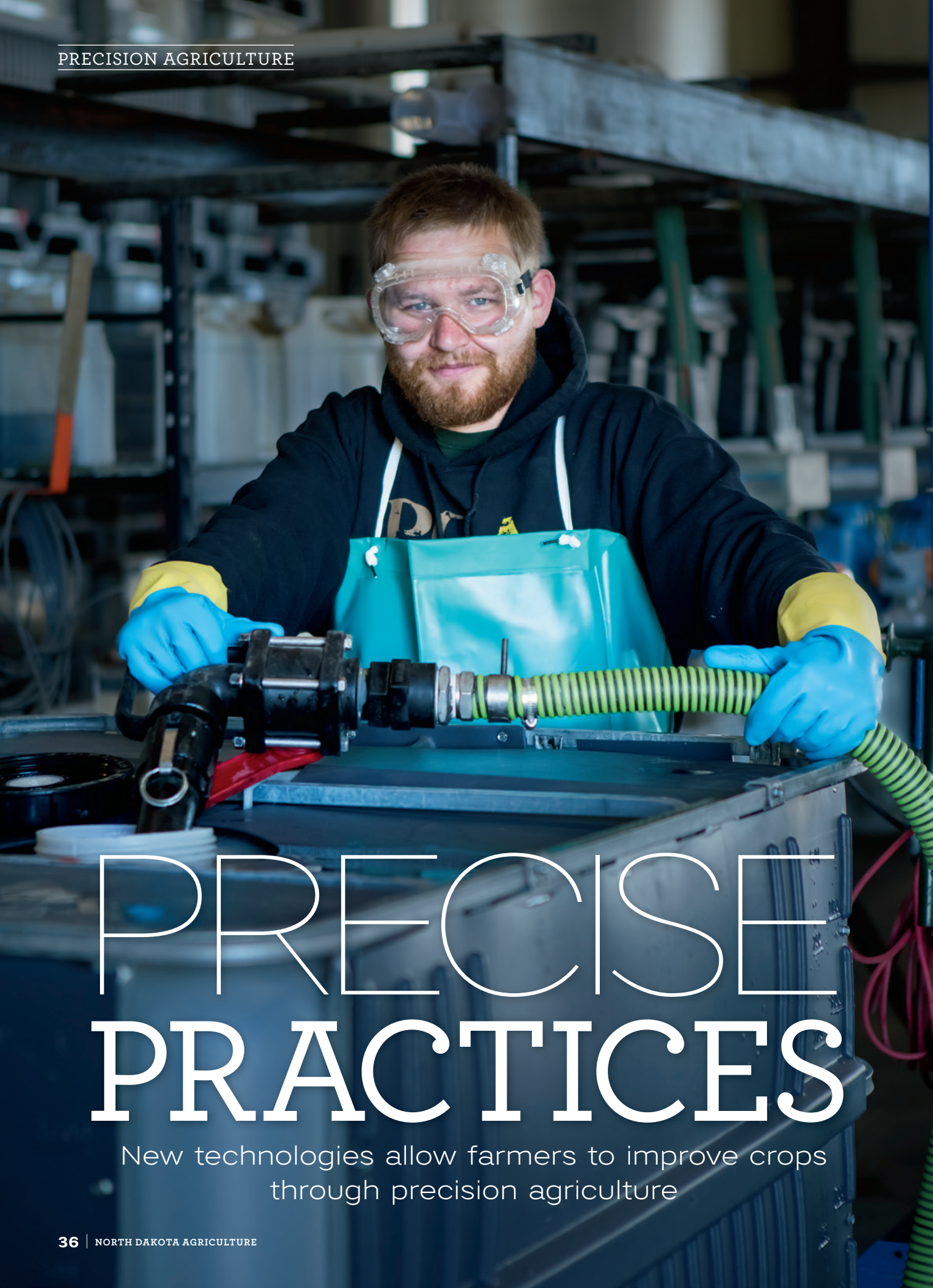
Erbele says despite all the technology now used by livestock auctions, the sales ring is no less important.

"It seems the most popular way to buy is to still buy them through the ring, with a bidder that has eyes on the cattle," he says.

Auctions will keep using all the tools they can to make that sale, helping producers obtain the highest price possible when the auctioneer's gavel falls.

– Matt Ernst

PHOTO COURTESY OF NAPOLEON LIVESTOCK AUCTIONS



PRECISE PRACTICES

New technologies allow farmers to improve crops through precision agriculture

The last decade has seen a rapid evolution in technology. We can access the world with the swipe of a cellphone screen, and we can video chat with family or business associates on the other side of the world. In agriculture, producers can use global positioning systems to determine how much to water specific acres of cropland.

In some ways, technology advancements are best seen in the agriculture industry. Precision agriculture helps farmers break their fields into smaller portions and areas to manage each section of the field individually, so plant life receives specific care, instead of treating entire fields the same way.

Farmers are utilizing new advancements like variable rate technology, unmanned aerial vehicles, GPS and mapping technology to give them a better sense of their fields.

"These technologies are allowing producers to more accurately understand variation in their fields while being able to adjust 'on the go' for that variation," says Preston Sundeen, director of the Dakota Precision Agriculture Center at Lake Region State College. "The quality of the finished product improves as well as the efficiency of fuel, pesticides and fertilizers, all while improving soil health."

Teaching Technology

As new technologies are developed, North Dakota wants to ensure its farmers know how to take advantage of them. Lake Region State College received a U.S. Department of Labor workforce grant to train and educate farmers in precision agriculture practices, offering an associate of applied sciences degree in precision ag. The Precision Agriculture Center, along with offering traditional for-credit classes, also hosts producer seminars, noncredit classes, and industry presentations geared around agronomy and technology.

"Most of our classes utilize traditional textbooks, but all of these ag classes either have a hands-on component or experience components built in to provide students with the real-world type of work they will be performing," Sundeen says.

Major Advancements that Improve Crops

Sundeen says the major technical advancements that he's seen in the past decade are higher adaptation of auto steer, which has led to decreased overlap and greater ability to monitor the equipment, and section control that aids in decreased expenses and better soil management by not overapplying chemicals or fertilizer.

"We're also seeing major advancements in acquiring data," he says. Today's equipment can monitor the smallest details regarding planting, fertilizing, spraying and harvesting applications. This data can then be stored in various agriculture software to provide analytics that help increase yield or improve return on investment.

Data layers can be laid on top of each other to compare yield with variety, soil characteristics, topography and fertilizer treatment. Weather data can be more field-specific through in-field weather stations that allow producers to compare yields of fields, knowing, for example, which got an extra inch of rain during a crucial time.

Variable Rate Technology and the Future

Variable rate technology is a form of seeder, spreader, sprayer and planter technology that has developed over the last 10 years. This mechanization helps reduce overseeding, overspraying and overspreading on farms by tracking the equipment with GPS location and preventing redundant use of product.

This technology can include assisting farmers with what they've already done, or it can connect with different maps and use GPS to determine areas that need more seed or pesticides and herbicides. The major benefit to farmers is reducing their product usage, which will save overhead costs.

"With new technology, we can do more with less," says Shane Sharpe, precision ag manager of Plains Grain and Agronomy, a full-service agronomy center and premium dealer for precision planting located in Enderlin. "We can plant less because we're doing a better job of monitoring nutrient levels and applying those nutrients where and when they are needed."

Sharpe says these technologies are only going to continue to improve and to enhance agriculture production in the United States.

"We're going to see improvements in planter performance. Seeding at the right time in the spring is crucial, and we're going to see faster seeding equipment and improved knowledge of chemical fertilizers."

– Blair Thomas

> "With new technology we can do more with less."
>
> **Shane Sharpe,** *precision ag manager of Plains Grain and Agronomy*

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Farmers are using innovative technologies, such as variable rate technology, to help them be more efficient on their operations.

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Influential **Shift**

Adjustment in farm numbers and size point to changing industry

North Dakota's fertile land has nurtured the state's diverse agriculture industry for centuries, serving as the foundation for thousands of farms.

In 2012, North Dakota was home to about 31,000 farms. According to the most recent statistics in 2016, the number of farms dropped to 29,800, almost 4 percent. However, despite the decrease in numbers, the average size of North Dakota farms increased 3.5 percent, from 1,268 acres in 2012 to 1,312 acres in 2016, according to Darin Jantzi, state statistician for the National Agricultural Statistics Service in the North Dakota Field Office.

As for the reasoning behind this phenomenon – it's not cut and dry, says Dr. Frayne Olson, crop economist/marketing specialist.

"We've seen this trend happening for a long time," Olson says. "A large portion of farm consolidation is driven by technology. New technologies come at a cost, and in order to spread that cost over enough bushels or acres or head to make it viable, farms have to be relatively large."

Olson explains that as farmers continue to adapt and become more efficient thanks to these new technologies, one person can do more work in the same amount of time. As a result, there's a competitive pressure to stay on top of the game and maintain margins to generate enough revenue. For smaller farms or those who may not be as financially successful due to size, it's often harder to keep up.

Olson says that since they've been tracking the rate of change, farm numbers have continued to decrease while size increased, but there was a slowing in the 2000s.

"Starting in 2007, we saw a slowing of this rate of change because lots of younger people were entering into production agriculture careers," he says. "A lot of them were coming back to the family farm, so it was easier to find people who wanted to farm," which helped curb consolidation. "We still saw more people retiring and leaving than entering, though," he adds.

As far as the impact of the phenomenon, Olson says it's tough to say whether it's positive or negative, since you can't revisit the past to measure alternate change. The shift comes with pros and cons, but North Dakota agriculture remains strong regardless.

– Rachel Bertone

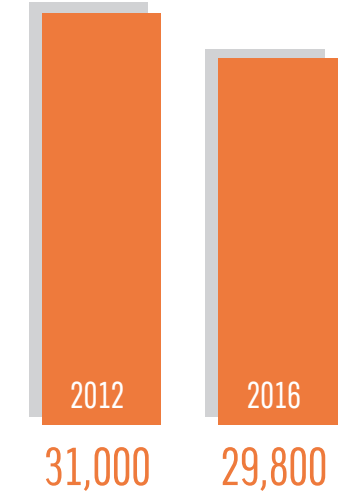

PHOTO BY J. PATRICK PHELAN

Roger Gussiaas of Healthy Oilseeds in Carrington processes hempseed into protein powder and ships it across the globe.

HEMP *for* HARVEST

Emergence of industrial hemp holds promise for growing ag industry

North Dakota's hemp farmers are looking into the past for the cash crop of the future. Hemp played a large part in U.S. agricultural history, including its important role as a fiber used from colonial times through World War II.

But for modern farmers, the crop is relatively new, not to mention oftentimes taboo. In 2015, North Dakota became one of 30 states to pass industrial hemp legislation and one of seven to start planting industrial hemp research crops. With its reputation as a hub for agricultural research and ingenuity, the state has become the perfect location for hemp to regain popularity, uniting its past utility with present-day worth.

U.S. Hemp Sales on the Rise

Demand for U.S. hemp products has increased in recent years for a variety of reasons. Because hemp grows so fast and competes so well against weeds, it's attractive to organic enthusiasts. Hemp is also widely used by vegetarians and vegans as a meat replacement, and health-conscious consumers are turning to hempseed and hemp oil as a great source for omega-3 fatty acids.

But for local growers, its numerous agricultural benefits from weed suppression to use in crop rotation have many reconsidering the value of this once obsolete crop; a first step in opening the doors to hemp's resurgence in American agriculture.

Hemp as a Viable Alternative Crop

To further research the growth, cultivation and marketing of industrial hemp statewide, the North Dakota Department of Agriculture (NDDA) developed the Industrial Hemp Pilot Program. In 2016, a select group of five North Dakota farmers grew a combined 70 acres of the state's first recorded commercial industrial hemp crop. Now in its second year, 34 producers will plant more than 3,100 acres in 2017.

"Industrial hemp may only be grown in North Dakota through the NDDA's pilot program or by institutions of higher education," says North Dakota Agriculture Commissioner Doug Goehring. "A provision

STAFF PHOTOS BY MICHAEL D. TEDESCO

in the 2014 U.S. Farm Bill gives authority to state departments of agriculture to create a pilot program that allows producers to grow industrial hemp for the purposes of agricultural or academic research. The program's primary goal is to increase our knowledge of how industrial hemp fits into the existing agricultural landscape and economy."

Based upon feedback from the pilot program's growers thus far, Rachel Seifert-Spilde, NDDA plant protection specialist and industrial hemp program coordinator, says that "hemp is well suited to North Dakota's climate, soils and farming techniques. Field trials had low-weed pressures, good plant stands, and lacked significant diseases and other pests."

Seifert-Spilde found that the "pilot program growers felt comfortable growing the new crop and were able to plant, maintain, and harvest hemp without significant modifications to their current farming equipment and practices." The end result was impressive seed yields and economic returns.

Looking to the future, North Dakota's location near established Canadian hemp growers, seed suppliers and processors will prove instrumental as the international trade partner can share years of reliable research data.

Hempseed Harvest to Storefront

Healthy Oilseeds in Carrington started buying hempseed in September 2016 after the first crop was harvested. They began processing, cold press expelling and milling it into protein powder before finally marketing and shipping to businesses, both nationally and overseas.

Roger Gussiaas, president of Healthy Oilseeds,

finds hemp still has a young, growing market, as many countries cannot legally grow hempseed, but can purchase it from other countries. All hempseed grown in the state must be devitalized or processed before leaving North Dakota.

"I think hemp will be a niche crop in North Dakota with more and more acres every year," Gussiaas says. "North Dakota is well suited to be the largest producer of hempseed in America in the near future. We have a great climate for hempseed and our production costs are lower than most states."

The company is already working to contract with about 31 growers in North Dakota and is the only permitted processor in the state, although some growers may process their own product.

– Keri Ann Beazell

A New Type of Crop

North Dakota is a hotbed for emerging crops like hops

North Dakota is fertile ground for producers foraying into emerging crops and livestock – from hops and industrial hemp to faba beans and carinata.

Ostlie's Sunnyside Acres is one such operation in Carrington. The farm grows a variety of products, primarily focusing on hops, as well as garlic and berries.

"Hops is the emerging crop we are growing," says Lindsay Ostlie, who runs the farm with her husband, Mike. "There is a lot to growing, harvesting and processing it, and we are still learning, but trying to stay focused on doing things right and growing it well. We chose hops because we enjoy the challenge, saw a lot of market opportunity and because we really like beer."

For the 2017 season, the Ostlies are looking forward to having their hops processing facility and visitor center up and running.

"In addition to pelleting and packaging our own hops, we plan to provide custom hops pelleting, and also broker hops from other farms," Ostlie says.

North Dakotans continue experimenting with other crops. Farmers in the western part of the state are planting carinata, an oilseed crop primarily grown for bio and jet fuels, while the North Dakota State University Agricultural Experiment Station is exploring faba beans as a possible cash crop that's adaptable to the state's growing conditions.

– Brittany Stovall

HOPS: ISTOCK.COM/OSOZNANIEJIZNI | INDUSTRIAL HEMP: NORTH DAKOTA DEPARTMENT OF AGRICULTURE

CRACKING

Genetic testing reveals clues for managing diseases

At the core of every organism is a secret code containing information about its very being. The National Agricultural Genotyping Center (NAGC) in Fargo is developing genetic tests that help beekeepers, farmers and wildlife biologists manage challenging diseases.

Genomics is the study of all the genes in an organism. This genetic blueprint can reveal markers for specific traits, including natural tolerance or susceptibility to disease.

"In genotyping, we take the traits, or genetic markers, discovered in genomics research and use them to develop a test," says Megan O'Neil, NAGC lab manager.

The NAGC began in 2014 as a joint project of the National Corn Growers Association and Los Alamos National Laboratory.

"Los Alamos had developed a high-throughput genotyping test which was so much more rapid, and they were looking for ways to apply the test, to speed up detection even more," says Larry Hoffmann, a Wheatland farmer who served on the committee of corn growers that developed the NAGC.

The work at NAGC reaches beyond conventional agriculture.

"Agriculture is plants, animals, insects – you name it. Agriculture touches all parts of our lives, whether we realize it or not," O'Neil says.

Multiplex Testing for Bees and Wildlife

The far reach of agriculture shows in the first test panel NAGC offered: Bee Care.

"The North Dakota Department of Agriculture provided a list of 11 bacteria and viruses known to affect honeybees and asked us if we could come up with a single test to test for all 11 of them," O'Neil says.

NAGC lab staff developed a multiplex test that identifies the 11 pathogens.

"Multiplex is a really important strategy that we use to be a high-throughput, low-cost, nonprofit lab," O'Neil says.

The NAGC is also using

THE CODE

a multiple testing strategy for Chronic Wasting Disease (CWD), a neurological disease devastating wild deer populations. CWD testing presently involves examination of deer brain tissue under a microscope.

"We're developing an assay to test live deer, using blood or saliva samples," O'Neil explains.

And the final CWD test will go beyond disease identification.

"There are genetic markers associated with the natural resistance or susceptibility to contracting CWD," O'Neil says. "Along with the test to identify whether CWD is present, we're also developing a molecular genetic test that allows us to say, 'This animal has the susceptible trait,' or 'They have the resistant marker.'"

Private deer farms could start using the dual-pronged test when it is available, and the test could benefit future CWD management in wild deer populations.

Unveiling Imposter Corn Diseases

In 2017, the NAGC began offering an assay that detects the presence of an untreatable corn disease. "Xanthomonas is a bacteria that infects the soil and cornstalk," Hoffmann says. "It cannot be treated with fungicides, but its symptoms closely resemble other diseases that can be treated."

If the assay indicates Xanthomonas is responsible for a cornfield's symptoms, "it saves the farmer a lot of money, and the time, by not applying fungicide," Hoffmann says.

The NAGC also offers tests for Goss's Wilt, another corn disease, and two soybean assays.

"NAGC is farmer-led, which gives agriculture more influence in research," North Dakota Agriculture Commissioner Doug Goehring says. "It is a great way to help increase production, lower costs and address issues plaguing our industry."

From honeybees to deer, corn and soybeans, the work at NAGC shows the wide benefits to agriculture of genotyping – and the benefit of scientists working closely with those in the field.

"We're here to build the assays. We're scientists, not farmers and producers," O'Neil says. "It's been really great to have guidance from the North Dakota Department of Agriculture and the growers saying, 'These are the problems in our field. What can you do in the lab?'"

– Matt Ernst

NAGC PHOTOS COURTESY OF BETSY ARMOUR OF NCI (NORTHERN CROPS INSTITUTE)

Noxious KNOCKOUT

Agencies, plant businesses educate consumers, farmers about invasive plants

Noxious weeds are a farmer's nemesis, easily spread by unknowing gardeners and landowners, and potentially devastating to other plants. North Dakota plant businesses and state agencies are using education as a tool to help prevent these invasive plants from getting a greater foothold.

Public Plant Enemies

More than nuisances, "noxious weeds are plants most likely to spread and cause economic damage, health concerns, and habitat degradation," says Rod Lym, North Dakota State University (NDSU) weed scientist. The state maintains a list of 11 noxious weeds, with additional species added by some counties and cities.

It is especially important to raise awareness about noxious weeds with attractive foliage or flowers, like purple loosestrife, that are visually appealing but environmentally devastating.

"It overtakes the native vegetation, and a lot of the wildlife that live along creeks and the banks of streams and rivers lose their food source," Lym says. Tiny purple loosestrife seeds – up to 2.7 million per plant – are easily spread by wind and water.

NDSU and the North Dakota Department of Agriculture (NDDA) distribute educational materials at garden shows and other events to help homeowners identify and control invasive weeds.

"Proper plant identification is the first step in weed control," says Chelsey Penuel, NDDA noxious weeds specialist.

Protecting the Farm

Farmers and crop consultants also learn about invasive weed control from NDDA and NDSU publications, educational seminars, and field days. Producers can also be confident they are not unknowingly sowing contaminated seed, by purchasing seed inspected and certified by the North Dakota State Seed Department (NDSSD).

"While certification standards permit a minimal number of common weed seeds in a sample, there is no tolerance for the presence of prohibited noxious weed seed," says Steve Sebesta, the seed department's deputy commissioner.

State agencies also work to keep potentially devastating weeds from even entering North Dakota. One current concern is Palmer amaranth, a tiny-seeded weed not confirmed in the state at the start of 2017.

"Palmer amaranth spreads so fast, is very difficult to control and has become resistant to many of the herbicides," Lym says.

The NDDA, NDSU and the state seed department have coordinated extensive preventative measures to keep Palmer amaranth at bay. The state seed department, whose inspectors are in fields all season, is an important first line of defense.

Homeowners and Horticulture

North Dakotans may rely on numerous strategies to avoid unintentionally spreading contaminated seeds for home landscapes, pollinator gardens and wildlife habitats. "Home gardeners and landowners should always purchase seeds from reputable sources," says Esther McGinnis, NDSU horticulture specialist.

Buying properly identified plants, instead of planting from seed, is a recommended weed control approach.

The biocontrol process of releasing non-native insects takes at least **10 years**, involving multiple federal and state agency approvals.

PHOTOS COURTESY OF NORTH DAKOTA DEPARTMENT OF AGRICULTURE

"Planting plugs, instead of sowing from seed, is now standard practice in the state's 18 Master Gardener pollinator gardens," McGinnis says.

Excavation for new homes can stir up dormant weed seeds and create more favorable germination conditions.

"We recommend applying an appropriate rate of glyphosate herbicide to eradicate weeds, before laying sod or seeding grass. Always use chemicals approved for residential use," McGinnis says.

Leafy Spurge Biocontrol

Biocontrol is another successful prevention strategy.

"Biocontrol involves going back to the native habitat of the plant and screening for pathogens or insects that could control the weed here," Lym explains.

These efforts have proven effective in the past, particularly in controlling leafy spurge, an invasive weed with root systems that can reach up to 30 feet deep.

"We gained approval to release some insects in the late 1980s," Lym explains. "We monitored those insects in areas called insectaries, redistributing the insects as populations grew."

The most impactful insect was a type of flea beetle, first released in the early 1990s. "Adult insects feed on leafy spurge leaves. However, it is the larvae that cause the most damage when feeding on the plant roots," Penuel says.

The proliferation of the flea beetle is credited with helping cut the area infested with leafy spurge in half, and that area continues decreasing.

"We're never going to eradicate a weed like leafy spurge, but we can control it," Penuel says. "The goal of biocontrol is to create a balance."

– Matt Ernst

RIGHT: Farmers in North Dakota should be aware of invasive weeds including thistle white flowers, saltcedar, purple loosestrife, and more.

Keep up with NORTH DAKOTA AGRICULTURE

Want to stay in touch with North Dakota food and farmers? Here are a few ways to get started:

Shop at a Farmers Market

With dozens of farmers markets across the state, it's easy to buy fresh, local produce, meats and other foods in North Dakota. Find a farmers market near you at **ndfarmersmarkets.org**.

Keep Learning

Ag in the Classroom provides agricultural education to students across the state. For more information, visit **nd.gov/aitc**.

Buy Local Products

Want to support producers in your state? Discover products made in North Dakota at **prideofdakota.nd.gov**.

Stay in Touch

Keep up with the wide-ranging efforts of the North Dakota Department of Agriculture at **nd.gov/ndda**.

Visit a Farm

Picking berries, exploring a corn maze, selecting the perfect Christmas tree – these are just some of the fun things to do on farms. To learn more about North Dakota agritourism, visit **ndtourism.com/agritourism**.

Share Infographics

Download shareable graphics featuring the state's top 10 ag products, seasonal produce calendars and more at **NDagriculture.com**.

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