grain news

U.S. GRAINS COUNCIL

June 2015

Precision Agriculture Improves Efficiency For U.S. Producers

When U.S. farmers replaced their horse-drawn equipment with tractors in the early 1900s, their crop productivity took a mighty leap forward. Technology on the farm has continually evolved to increase efficiency, improve yields and drive production and profitability. In the 21st century, this is due in part to the development of precision agriculture tools.

The U.S. Department of Agriculture (USDA) defines precision agriculture as an "information- and technology-based agricultural management system used to identify, analyze and manage variability within fields for optimum profitability, sustainability and environmental protection." Essentially, precision agriculture allows producers to specify input needs including nutrient and pesticide application, tillage and irrigation throughout individual fields. In addition to cutting production costs and saving energy, precision agriculture reduces soil erosion and environmental pollution and improves water quality by reducing nutrient runoff.

A farmer demonstrates the precision agriculture system used in a tractor on his farm.

The latest precision agricultural tools include technologies made possible by GPS, which support mapping programs to capture detailed information; automatic steering that allows for hands-free operation and guidance of tractors, sprayers and other equipment; and variable rate technology (VRT) in both seeding and chemical application equipment. Farmers choose among these new tools to meet production goals by evaluating what is best for their individual farms.

North Dakota farmer and businessman Neil Bernhoft believes there are many benefits to automatic steering.

"It has changed the game tremendously," he said. "Auto steer reduces operator fatigue, increases accuracy and allows for more focus in other important areas. Farmers can actually put more hours in with the help of this technology."

Continued on page 2

U.S. Grains Council
Email: grains@grains.org
www.grains.org

@usgc
/usgrainscouncil
/usgrainscouncil

U.S. Headquarters
20 F Street NW
Suite 600
Washington, DC 20001
202.789.0789 TEL
202.898.0522 FAX

Your Local Office
Address
Address
TEL
FAX
EMAIL

Developing **Markets.**

Enabling **Trade.**

Improving **Lives.**

The most recent USDA data indicates automatic steering was used on 52 percent of planted U.S. sorghum acres in 2011, 45 percent of planted U.S. corn acres in 2010 and 43 percent of planted U.S. barley acres in 2011.

Fields typically vary in soil type and chemistry, elevation, fertility and productivity. By using VRT available for equipment such as planters and chemical applicators, grain producers can pinpoint input needs throughout an individual field and optimize the application of seed, fertilizers and crop protection products. The use of this technology reduces input usage, lessens environmental impacts and increases overall efficiency.

Timely and accurate information is one of U.S. farmers' most valuable resources. Yield monitors and the mapping applications that interpret the data collected by them show farmers both the strong and weak locations within a field. The combination of yield maps, aerial imagery and VRT strategies provide information for farmers to develop field management plans.

"Data is a huge player in the industry," Bernhoft said. "Accurate data collection is the key to making informed decisions."

Bernhoft believes precision technology will help farmers become even more customized in their work in the future.

"Farmers will continue to utilize these tools to capture and review information about their fields, and develop strategies acre-by-acre, rather than by the field," he said.

Drones Elevate The Perspective On U.S. Farms

Unmanned aerial vehicles (UAVs), commonly known as drones, are making their way into precision agriculture as a valuable tool for monitoring crop health. While this technology is heavily used for agriculture in some areas of the world, such as Japan, drones in agriculture are relatively new in the United States.

An unmanned aerial vehicle (UAV), or drone, captures crop data and images for analysis.

Drones can be used by farmers to efficiently scout fields, collecting imagery and delivering data back to the farmer for analysis and follow-up. Agronomists traditionally scout fields by walking the length of the acreage and looking for problems – a time consuming process that may miss some areas. Drones, however, take a more comprehensive look and gather more accurate information in less time.

Chad Colby, a pilot, UAV advocate and owner of AgTechTalk.com, said drones are revolutionizing the way farmers manage their inputs, which results in improved yields.

Continued on page 3

Technology Use On U.S. Farms

Multiple forms of technology are available to improve production on the United States' 2 million farms of all sizes. Beyond computer and Internet access, which is available on about 71 percent of U.S. crop farms (2013 report), various methods of technology are used in coordination with one another to increase efficiency, minimize labor and enhance sustainability.

Technology has led to production practices such as conservation tillage or no-tillage, which has reduced labor, conserved capital and energy, improved water quality and provided wildlife habitat. The U.S. Department of Agriculture (USDA) 2012 Ag Census estimates 474,000 farms use no-till or conservation tillage methods on approximately 173 million acres.

USDA reports precision agriculture practices such as variable-rate technologies, yield monitors, and GPS were used for 72 percent of corn in 2010; 62 percent of sorghum and 60 percent of barley acreage utilized the technology in 2011.

Furthermore, USDA Economic Research Service (USDA-ERS) reports show farms using herbicide-tolerant crops are able to substantially reduce labor hours per acre of land. Additional figures are available at http://www.ers.usda.gov/data-products/arms-farm-financial-and-crop-production-practices/

"Drones are able to provide information in real time – a significant benefit to growers who use this technology," he said. "The earlier the farmer gets the information, the quicker he can make important management decisions for his crop."

Once airborne, a drone captures videos and/or still images of a field as it searches for any signs of plant stress, disease, nutrient deficiency, weeds or insect infestation. The imagery collected can be viewed on the controller's tablet computer while the craft is flying over the field. Drones allow farmers to collect better and more complete data, cut input and labor costs and more closely monitor crop health.

As drone technology continues to evolve, more farmers will be able to afford them. Currently, the base price of a drone is about $1,200 and increases depending on the model and capabilities included. Additional costs include advanced imagery software and data analysis tools.

The future of drone usage in agriculture looks promising. "This technology is really advancing by the week," Colby said. "It's exciting to see what the future holds with the development and implementation of drones on U.S. farms."

Technology for Today's Grain Farmer

U.S. grain farmers have many technology options to conserve resources and grow quality crops.

Advancements in technology allow U.S. farmers to produce 262% more food with fewer inputs than they did in 1950[1].

Mapping Technology
The keystone for precision agriculture, mapping technology combines imagery and data for specific analysis.

Variable Rate Technology (VRT)
Conserves resources through targeted application of seed, fertilizers and pesticides.

GPS[2] provides a method to determine precise locations. Used on:
- 22% of corn acreage
- 9% of barley acreage
- 7% of sorghum acreage

Auto steering[2] coordinates with mapping systems to guide machinery. Used on:
- 52% of sorghum acreage
- 45% of corn acreage
- 43% of barley acreage

Yield monitors[2] identify variability and moisture levels within a field. Used on:
- 61% of corn acreage
- 40% of barley acreage
- 34% of sorghum acreage

Drones
Provide overhead imagery paired with mapping technology to evaluate crop and soil health.

Software
Enables data management for precise decision-making.

Plant Improvements
Developments in traditional breeding programs result in crops with desirable traits such as higher yields, better quality, drought tolerance and herbicide resistance. For corn and other genetically modified crops, biotechnology provides additional enhancements.

- Improved varieties for drought and cold tolerance
- New products protect seed from undesirable germination conditions
- 907 million metric tons decrease in soil erosion because of herbicide-tolerant crops[3]
- 14 billion pounds (6 million metric tons) of additional U.S. crop yields as a result of agriculture biotechnology
- 37% reduction in pesticide use by U.S. farmers as the result of biotechnology[1]

[1] American Farm Bureau Federation
[2] U.S. Department of Agriculture - Economic Research Service (USDA-ERS), 2010 corn, 2011 sorghum and barley
[3] National Corn Growers Association

U.S. GRAINS COUNCIL

Continued on page 4

Sorghum Seed Technology Targets Tolerance

Sorghum grows throughout the world in wide-ranging environments and growing conditions. This high level of variety provides a broad genetic base from which researchers can develop desirable traits quickly and effectively.

“We can look for DNA markers for specific traits within the sorghum species then apply those to breeding and seed development programs without having to borrow them from other plant species,” said Chad Hayes, a sorghum geneticist with the U.S. Department of Agriculture - Agricultural Research Service (USDA-ARS) in Lubbock, Texas.

This ability to use genetics from within the species results in targeted genetic improvements while offering a crop that can enter the marketplace without issues associated with genetically modified organisms (GMOs).

“The unified effort within the sorghum industry is moving forward with technology for U.S. farmers to grow a hardy and high-yielding crop that produces a quality grain demanded by international buyers.” – Chad Hayes, sorghum geneticist

For USDA sorghum research, the emphasis is currently focused on drought- and cold- tolerant varieties. Demand for sorghum this marketing year has led to increased plantings, including in areas of the United States that traditionally haven’t produced much of the crop.

“We are looking into indentifying the DNA markers that contribute to drought tolerance in dry areas and researching the ability of sorghum seed to germinate in cooler conditons for the northern regions,” Hayes said.

The process for developing new drought- and cold-tolerant sorghum is the same that has been applied to other crops.

“We’ve not seen the emphasis to apply the knowledge to sorghum seed programs until recently because seed companies – and to some extent, farmers – did not see the potential for a return on the investment of such technology,” Hayes said.

However, a robust and energized effort by the U.S. sorghum industry, paired with rising demand for sorghum, has shifted the focus and provided support for sorghum improvements to USDA and university researchers.

Disease tolerance is another important consideration for genetic trait selection. The emphasis is toward seed varieties that are tolerant to disease-inducing situations throughout the growing and harvest seasons without impacting the end quality and quantity of the grain.

Farmers inspect a test plot of sorghum plants developed for specific genetic traits. *Photo courtesy United Sorghum Checkoff Program.*

“We know there is a strong demand for sorghum,” Hayes said. “The unified effort within the sorghum industry is moving forward with technology for U.S. farmers to grow a hardy and high-yielding crop that produces a quality grain demanded by international buyers.”

Tailored Traits Improve Corn Crop

Continued on page 5

Biotechnology is a critical tool used by U.S. corn farmers to produce a safe, high-yielding, quality crop in varying growing conditions while reducing the use of pesticides and fertilizers. Still, the genetic quality, diversity and specificity in a bag of corn seed begins with a conventional breeding program that develops germplasm that is specific for the soil and environment where it is intended to grow.

According to National Corn Growers Association (NCGA), conventional breeding is still part of corn improvement efforts with advancements in biotechnology applied in tandem to provide an exceptional advantage for crop yields.

"A bag of corn seed today is highly specific in regards to potential yield for a given region, and more efficient than it was just 10 or 15 years ago," said Nathan Fields, director of biotechnology and economic analysis at NCGA.

"As biotechnology evolves, U.S. farmers will continue incorporating it on their farms to enhance sustainability and lower production costs. The resulting crops are wholesome and safe for domestic and international markets."

Germplasm is living tissue from which new plants can be grown. It can be a seed or another part of the plant such as a leaf, stem or pollen.

Biotechnology is the process of transfering one or a few genes from one plant species to the germplasm of another to introduce new characteristics like, in the case of corn, pest tolerance.

Today, farmers have the option of selecting a corn variety that combines the benefits of hybrid genetics with biotech traits that provide crop protection to safeguard plants from insects. This protection carries over into grain quality by reducing a main path – insect damage – by which aflatoxins and mycotoxins enter the grain during storage.

Herbicide protection traits are also available for farmers to combat weed pressure, which results in cleaner fields and a crop with less foreign material when harvested. U.S. Department of Agriculture (USDA) reports show that seeds with these traits allow farmers to apply herbicide once rather than multiple times.

"Research is ongoing in this area to provide a wide range of protection against multiple weeds and the herbicides necessary to combat them," Fields said.

Another way for farmers to help seeds perform optimally in local growing conditions is by using seed treatments. These treatments are a coating sprayed onto the seed prior to planting. They allow for specific placement of nutrients and insecticides to protect corn seedlings so germination can occur.

"These treatments allow for corn to be planted in sub-optimal weather conditions, yet protect the seed from becoming too cold or too wet so germination can occur when conditions become optimal," Fields said.

Through use of seed treatments, farmers can have more flexibility with their planting timeframe. The treatments are usually purchased by U.S. farmers based upon the environment of the growing region.

The next generation of corn technology incorporates soil health, environment and nutrient uptake. One type is growth regulators, which are organic compounds other than nutrients that modify the plant's growth rate from germination through harvest. Another form is soil innoculants containing microorganisims such as bacteria or fungi that promote plant growth by increasing the supply or availabiltiy of nutrients. Understanding of this technology is increasing and validation is improving.

"We are at the point where investment and energy toward these biologics and systems to enhance plant health are moving forward," Fields said.

For more information visit www.grains.org/key-issues/biotechnology or www.ncga.com/topics/biotechnology.