Nebraska CornBoard

‘Water’ we know about water?

CAN YOU GROW MORE CORN WITH LESS WATER? MULTIPLE, IN-FIELD RESEARCH PROJECTS SAY YES. AND YOU’LL SAVE MONEY WHILE BEING A GOOD STEWARD.

Some tremendous research into water use is going on across Nebraska – and the results are dramatic and demonstrate that it’s possible to reduce water use while maintaining yields.

What researchers are learning is how to quantify changes already adopted by many farmers across Nebraska – and discovering what farmers can do to be even more efficient. For example, expanding conservation tillage, better irrigation timing and converting the few gravity irrigated acres to pivots would reduce water use by 107,000 acre-feet in one Natural Resources District. That’s a 37 percent reduction without any impact on yields.

All of the research highlighted in this issue of CornsTALK is already in practice on some fields throughout Nebraska – and can be easily adopted by those looking to become more efficient, reduce their impact on the environment and save a significant amount of money in energy and related costs.

CornsTALK

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www.NebraskaCorn.org

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Know-how

Irrigation know-how can cut water use 25%

Ever get rainfall that wasn't forecast? Cutting irrigation levels to 75 percent of evapotranspiration allows you to take advantage of that unexpected rain and reduce overall water use while maintaining high yields.

Over the last four years, the University of Nebraska's Dr. Suat Irmak has spent a lot of time in fields and on the telephone with farmers offering words of encouragement and assurance that the test field on their farm would be just fine if the pivot was turned off for another few days.

Based on earlier research in Clay Center, Irmak was confident farmers could maintain corn yields even though irrigation levels were reduced by 25 percent for much of the growing season. That early research examined what would happen if irrigation only replaced water that corn used based off evapotranspiration (ET) readings.

If over a week the ET gauge said corn used 1 inch of water, Irmak's trials would allow the pivot to replenish that 1 inch of water but do so at different levels: 100 percent (1 inch of water), 75 percent (75 hundredths), 60 percent (60 hundredths) 50 percent (50 hundredths) or dry land (no irrigation).

"At some point the 'diminishing return' begins, the point at which corn does not respond much to supplemental water in the form of irrigation. In other words, corn yield response to water starts to decline even if you apply more water than what you'll get an economical return from," Irmak explained. "We were trying to find that point and quantify its variability from one year to another."

Four years of research indicate that while there may be some yield reduction, replenishing 75 percent of the crop water use can produce very similar yields as compared to replenishing the soil profile to meet 100 percent of the crop water use in the central and south central part of Nebraska.

Technology pays. *Evapotranspiration (ET) gauges, like the one shown here, let you know how much water corn plants have taken up from the soil and evaporated into the air around them. Watermark sensors keep track of how much water is available in the soil. Combining these two technologies provides an accurate picture of water use and can help reduce irrigation amounts, saving both water and the energy dollars to pump it.*

That early research led to a larger study on farm fields in Edgar, York, Mead (two sites), Ord, Geneva, West Point and the South Central Lab in Clay Center (two sites) for a total of more than 2,000 acres. This research was funded by the USDA-Natural Resources Conservation Service, which was matched by the Nebraska Corn Board and the University of Nebraska. It focused on irrigating at 100 and 75 percent ET, with a slightly different application.

It involved two fields on each farm site that had similar soil types and other factors and were planted on the same day and in the same direction. The farmer managed the irrigation on one field and Irmak and his research team managed the other, which they monitored through soil moisture sensors. That's where the phone calls and farm visits came in.

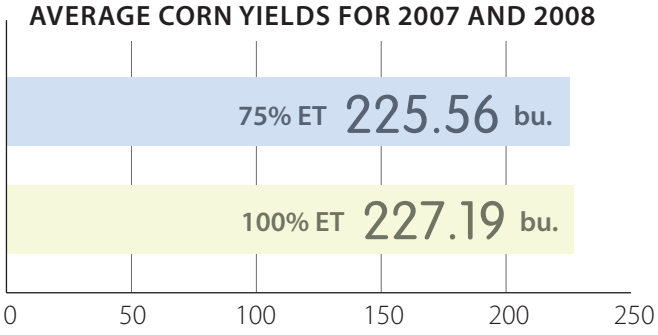
"Understandably, the farmers would get nervous because they are not used to waiting to irrigate," Irmak said.

In Irmak's early work, the irrigation rates remained constant through the growing season. However, in this trial, the corn was not allowed to be stressed for two weeks before and one week after the silking stage. "We didn't want to stress the corn during that critical period of time," he said.

"Cutting back on our irrigation applications by utilizing soil moisture measurements and practicing good irrigation management strategies, we were not lowering yields," Irmak said. "We were still producing crops with yields of 240 or more bushels per acre with the 75 percent water treatment."

Corn that received 100 percent ET was bigger and had wider leaves than corn that received 75 percent ET, but that difference didn't translate to a significant difference in yield.

In the 2007 and 2008 crop years, corn fields that Irmak and his team managed averaged about 2 inches less water per year than fields on the same site managed by farmers. In some cases the difference was 1 inch and in others 4 inches. Yields only varied 1-2 percent between the grower-managed versus research team-managed fields.



"It shows that we can cut back on water and maintain high yields," Irmak said. "That has economic benefits, as well as protecting water resources and the environment, which is important for our state."

"This was a great project that has a lot of benefits for farmers and the state as a whole," Irmak said. "It was an excellent partnership between the Nebraska Corn Board, USDA-NRCS and the University of Nebraska, and the farmers involved were great to work with."

Do watermark sensors and evapotranspiration sensors really pay off?

It's one thing to get an understanding on the benefits of watermark sensors and evapotranspiration (ET) sensors from research – it's another to experience it first hand.

The 2008 Farm & Ranch Irrigation Survey (FRIS) showed that a growing number of Nebraska farmers are doing just that – with 30 percent of Nebraska farmers using daily ET gauge readings in 2008, up from 19 percent in 2003. FRIS also noted that 14 percent were using a soil moisture-sensing device in 2008, up from 9 percent five years earlier.

Saving a couple of thousand dollars a year on a one-time investment of less than $400 made a believer of farmer Brandon Hunnicutt of Giltner, while farmer Mark Jagels of Davenport said the devices allow him to save inches in applied water every year – and that means money in his pocket, too.

"ET gauges and watermark sensors take the emotion out of irrigating," explained Jagels, a member of the Nebraska Corn Board. "When it's hot and sunny and you're out in the field you want to believe it is drier than it is, that the crop is using more water. We've learned that isn't always the case. ET gauges and watermark sensors provide data that counter your assumptions and let you know it's okay to wait a few more days before irrigating."

Hunnicutt, president of the Nebraska Corn Growers, echoed Jagels sentiments. "When it's 95 degrees, you're out in the field and hot, it's easy to ignore the signs that there is enough water for a couple of days," he said.

Jagels has two ET gauges across his operation and Hunnicutt has one, but both use watermark sensors buried at 1, 2 and 3 foot depths in their fields. The watermark sensors let them know how much moisture is in their soil, while the ET gauges indicate how much water the plants use each day.

"That's pretty powerful knowledge during the growing season," Jagels said. "It lets you project water use for the coming week so you can adjust your irrigation schedule."

For example, if 2.1 inches of water were used over the last week – or 3 tenths a day – and there is 1.8 inches left in the soil, you can project how much irrigation water to apply to maintain the desired soil moisture.

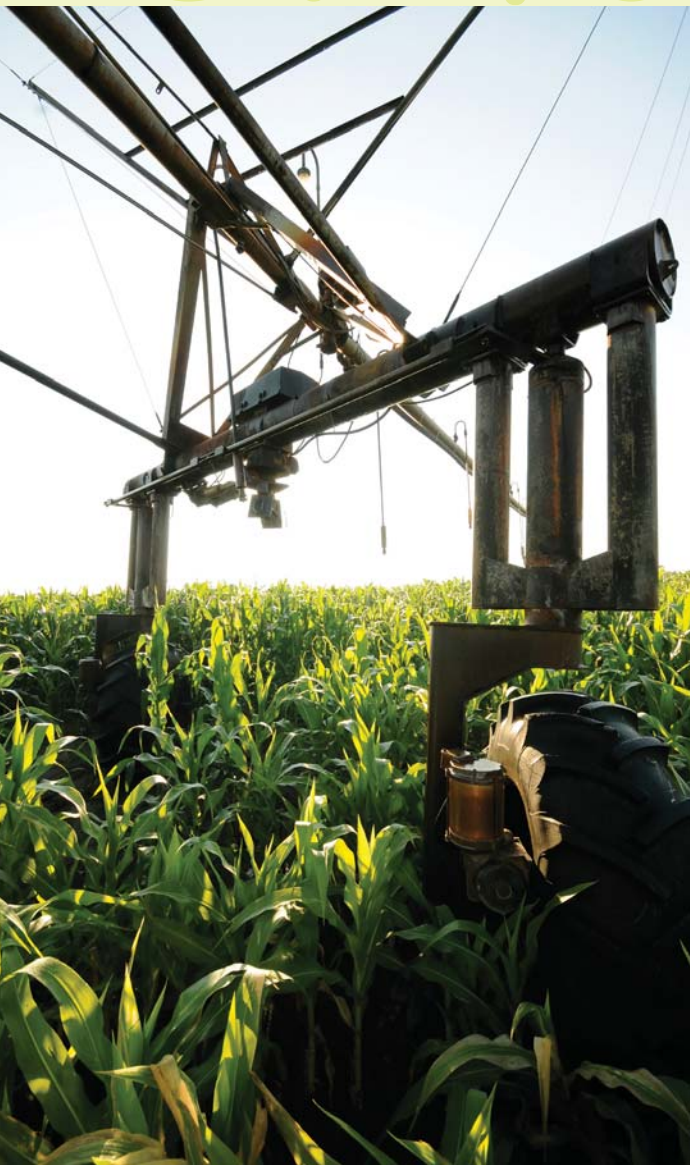
For those just looking to start using these advanced water management techniques, the University of Nebraska maintains an ET gauge and watermark sensor network that farmers can tap into online.

Hunnicutt said the network is valuable and a good tool. He also noted that the soil in every field is different so to localize the information by having your own watermark sensors makes sense.

Jagels, who is the fourth generation on the farm, said utilizing current and future technology to manage water makes good sense. "We look at water as a natural resource, and we want to protect that for future generations that are coming back to the farm," he said.

37%

Benchmarking 'crop per drop'



More downtime. *Applying water more accurately and only when needed based on replacement of evapotranspiration means pivots run less – reducing water and energy use.*

Can farmers within a Natural Resources District cut water use 37 percent without losing a bushel in yield? Can farmers 'ecologically intensify' to produce more corn with fewer inputs? Research says yes on both counts.

An incredibly rich data set collected by the Tri-Basin Natural Resources District (NRD) provided the University of Nebraska's Dr. Ken Cassman and graduate student Patricio Grassini all they needed to crunch thousands of numbers and reveal some pretty amazing facts about corn production and opportunities for farmers within the NRD and across the state.

What started as a look at ways to benchmark the water efficiency parameter – water productivity or "crop per drop" – within the NRD allowed Cassman to look at nitrogen rates and yields, too (see page 6).

In crunching the numbers from the 2005, 2006 and 2007 crop years, the researchers pulled data on water and nitrogen use within a portion of the basin and then surveyed farmers so they would know specific hybrids, planting date, plant populations and tillage practices. This allowed them to look at those areas that were the same, and resulted in more than 700 "pivot years" – or about 260 irrigated fields per year of the study – being included in the analysis.

"It would have taken us 20 years to get this data set on our own, yet here it was waiting for us," Cassman said. Farmer data remained confidential throughout.

Cassman said they looked at the data to figure out why some farmers get higher water productivity than others. "We wanted to be able to put numbers on it, to see over a period of years what works," he said.

The numbers made it pretty clear that farmers can make a significant impact on their water use by adopting specific management and tillage techniques.

Going from gravity-fed irrigation to pivot irrigation reduced water use 4.5 inches on average. Farmers that adopted conservation tillage (strip till, ridge till or no till) used 3 inches less water than farmers who didn't. Farmers already using pivots and conservation tillage could reduce water use another 10-15 percent by applying water more accurately and when needed based on replacement of evapotranspiration.

"These are real world results that can be achieved without lowering yields," he said. "It shows what farmers who have adopted these technologies and techniques have achieved. They should be given credit for that."

John Thorburn, general manager of the Tri-Basin NRD, said he was proud of farmers in the district. "It shows that they are very efficient with their water use," he said, "yet we have opportunities to be even more efficient in certain respects."

One last number that jumped out at Cassman was the impact of rotating corn with soybeans. That rotation, he said, produced an extra 10 bushels of corn per acre with the same amount of water. That significantly boosts water efficiency.

Forgo gravity. *Switching from gravity-fed irrigation to pivot irrigation reduces water use 4.5 inches on average.*

POTENTIAL IMPACT ON ONE DISTRICT

As part of the work within the Tri-Basin NRD, Cassman looked at potential water savings should certain management techniques be adopted. While his research focused on the Republican River portion of the NRD, he extrapolated those figures to the entire NRD.

He noted that 33 percent of irrigated cropland is furrow irrigated in the Tri-Basin (the Central Nebraska Public Power and Irrigation District canal system delivers water to land in the Platte Basin portion of the NRD). Disk till is only used on 22 percent of acres, the rest are conservation tillage. Continuous corn makes up 40 percent of the acres, while a corn-soy rotation makes up 60 percent.

He said if farmers in the entire basin went from disk till to conservation tillage, they would save about 12,000 acre-feet of water. Switching from gravity to pivot irrigation would reduce water use 38,000 acre-feet. Adopting optimal timing and more accurate irrigation levels would reduce water use another 21,000 acre-feet, while adopting limited irrigation methods would save an additional 36,000 acre-feet of water.

That comes to 107,000 acre-feet of water, which is 37 percent of total irrigation used on corn in the NRD. "We could cut water use 37 percent without losing one bushel of yield," he said.

AN OPPORTUNITY

What if farmers banded together to confidentially submit production data to a central database that would allow researchers to better understand and make recommendations on water use and other efficiencies?

Cassman has pondered that – and noted that there would be "tremendous power" in the results because data would come from real fields year after year.

Data could be anonymously submitted, and farmers that contributed could be given a report to see how their farm stacked up to averages within the region. Farmers could see what others did to successfully maximize water efficiency and yields.

"This could help growers fine tune their production methods, resulting in higher yields and profit," he said. "At the same time we'd see a great output per unit of input. It would be tremendous."

By Alan Tiemann, Chairman

One of the most important missions of the Nebraska Corn Board and its stewardship of corn checkoff dollars involves research. It's one of the cornerstones that also include market development, promotion and education.

For more than 30 years the corn checkoff has supported research geared towards helping farmers improve production methods and solve problems. Research has helped grow the marketplace for ethanol, demonstrate the benefits of distillers grains, develop renewable biopolymers like PLA and unlock the corn genome.

In this edition of CornsTALK, we're highlighting several water-related research projects conducted throughout the state over the past several years. One of these projects was supported by corn checkoff dollars, while others were supported by organizations that have an interest in better managing water resources. Together the results provide a very positive picture of efficient water use in corn production and opportunities we can implement to become better stewards of this important resource.

The four-year NRCS Conservation & Innovation Grant helped provide in-field results from research originally conducted by Dr. Suat Irmak. This grant totaled $230,000, with the corn checkoff providing most of the necessary matching dollars.

Conducted in real fields at several locations across Nebraska, the research demonstrates that farmers can save a couple of inches of irrigation water each year while maintaining yields. Understanding this puts money in every corn farmer's pocket through reduced irrigation and related energy costs and helps farmers become more sustainable by reducing water and energy needs.

The Nebraska Corn Board also helped support Dr. Ken Cassman's research highlighted on this page.

By adopting the know-how from this research, farmers become better stewards – and that's something that we've been committed to doing for generations. Over time, we've been able to produce more and more corn with fewer inputs. Certainly more advances are coming, and checkoff-supported research will be critical in helping to identify and validate them – and then move those ideas from the lab to the farm.

Research can be exciting as we identify new technologies and techniques – some will help us be more efficient farmers and others will help us develop new markets. The key, of course, is to keep moving forward and identifying and backing projects with potential.

Survey shows trends in supplemental water use

Data set shows benefits of farming methods

What started as a look at ways to benchmark water efficiency within the Tri-Basin Natural Resources District allowed the University of Nebraska's Dr. Ken Cassman and graduate student Patricio Grassini to look at nitrogen rates and yields, too. Results show that farmers can produce high yields on existing farmland while protecting the environment. This is what Cassman called "ecological intensification," which simply means producing more grain with fewer inputs, allowing farmers to have a smaller footprint on the environment overall.

After crunching the numbers, Cassman highlighted these results with three points:

1. Corn yields in the area are very high, about 210 bushels per acre – much higher than the national average of 150 bushels in 2005-2007.

2. Even though farmers in the NRD used more nitrogen than the average corn farmer in the country (183 pounds versus 148), the much higher yields resulted in better nitrogen efficiency. Cassman said farmers in the NRD were 30 percent more efficient per bushel with their nitrogen use.

3. Corn farmers in the NRD were efficient in their use of irrigation water. Although they could do better, Cassman said, they were more efficient than national averages for irrigated corn.

"This research documents that a large number of farmers can ecologically intensify production to get higher yields – and higher efficiency," Cassman said. "That means these production systems have a smaller footprint on the environment overall."

All corn grown in the United States is watered by Mother Nature. Only a small part of the country's corn crop receives supplemental water in the form of irrigation, and a U.S. Department of Agriculture survey identified some positive trends for irrigation in Nebraska.

The 2008 Farm and Ranch Irrigation Survey (FRIS) provided an extensive look at irrigation use in the United States. Since it is conducted every five years, it provides a nice snapshot of irrigation trends. The survey is a supplement to the Census of Agriculture.

It is important to note that all corn is watered by Mother Nature. Only about 14 percent of the corn acres across the country are supplemented with irrigation. Nebraska, with its unique natural resource known as the Ogallala Aquifer, is the only state where irrigation has been more widely adopted. Yet even the use of irrigation water varies considerably from year to year depending on the amount of natural rainfall.

The 2008 FRIS survey shows that Nebraska has more acres under irrigation for all crops than any other state, at 8.37 million. California was next with 7.39 million and Texas was third with 5.40 million. Of those top three states, however, Nebraska farmers used the least amount of water in the survey year.

California used 22.72 million acre-feet, Texas used 6.88 million and Nebraska 6.70 million on all crops. So even though Nebraska has more acres using irrigation, farmers used less water – they were more water efficient – than other states that use irrigation.

Water use efficiency is calculated as the bushels of corn produced per acre-inch of water applied. Over the last decade, Nebraska farmers improved this figure by 28 percent. If you compare the drought year 2003 (when more water was applied) to 2008, farmers improved water efficiency 49 percent.

Also over the last decade, Nebraska farmers have reduced water use for irrigated corn by 11 percent – at the same time average irrigated yields increased from 161 in 1998 to 184 in 2008. That ability, to increase yields while using less water, is notable as it shows farmers are using new technologies and know-how to have a smaller impact on natural resources and the environment.

Nebraska water use efficiency

Farmers have increased water use efficiency 28 percent over the last decade and 49 percent over the last five years. (Note that 2003 was a drought year so, on average, more water was applied.) Water use efficiency gains show that we're getting more bushels from the same – or less – amount of water. Source: NASS

National irrigation numbers

All U.S. corn acres are rained on – **only about 14 percent are supplemented with irrigation** at some point during the growing season. In the 2009 growing season, of the 86 million planted acres, only about 13 million were irrigated, while the other 73 million were not.

= 1 million acres

Source of data: USDA/FRIS

From the Corner Office

By Don Hutchens, Executive Director

I'm a firm believer that sometimes things do happen for a reason, and my mother always taught me that you have to deal with issues and make the best of them. I also subscribe to the idea that it's probably either luck, timing or divine intervention that puts us in certain places at certain times.

My kids always questioned why I loved meeting other people, striking up conversations with total strangers or going out of my way to do something for someone. I guess it was for the experience, the exposure to something new and more of what I was taught. There are so many intersections in life that influence who we are and what we stand for.

So what does "taking responsibility" (part of last Sunday's sermon and a speech at Commodity Classic by Dr. Jay Lear); "ag activism" (a phrase coined by the National Corn Growers Association) and a Purple Heart "wounded in action" all have in common?

I know there is no comparison of his valor and what we have to do to defend agriculture but there are some similarities. We in agriculture are in a fight for our heritage, our occupation, our values and our future.

You see, there are movies ("King Corn," "Food Inc." and others), *TIME* magazine articles like "Where does your food come from;" *Wall Street Journal* articles and assorted television and radio talk shows that are full of people who think they know more about what you do and how you do it than you.

They portray this image that as farmers you are all industrialized, corporate and non-family who are ruining the soil, air and water. They firmly believe that livestock producers take joy in abusing their livestock, and that meat is not part of a nutritional diet. They have determined it is corn that causes obesity while corn turned into ethanol causes starvation and, oh yes, the deforestation of the Amazon. They know it is better to import foreign oil than to use renewable energy like ethanol. They do most of this under the disguise of

The Nebraska Corn Board needs a list of activists for agriculture so we can put a stop to the likes of HSUS, PETA and others that think they know what you do. Can you help? Contact us to see how.

They intersected with me this last week and provided a message that I hope stimulates you to take responsibility and help us defend agriculture against a wave of opposition.

After church on Sunday, my wife and I were at Home Depot, and in the parking lot were a young man (mid to late 20s) with two little kids, and his wife trying to load a 175-pound box of galvanized pipe and fence for a dog kennel. I heard my mother's voice, and the extrovert in me say "go over and help." We struggled to dislodge the box from the cart he had wheeled it out on, and then to hoist it on top of his small sport utility vehicle. He said very little – a simple thanks – and then when he closed the rear hatch, I noticed the license plate "Purple Heart Wounded in Action."

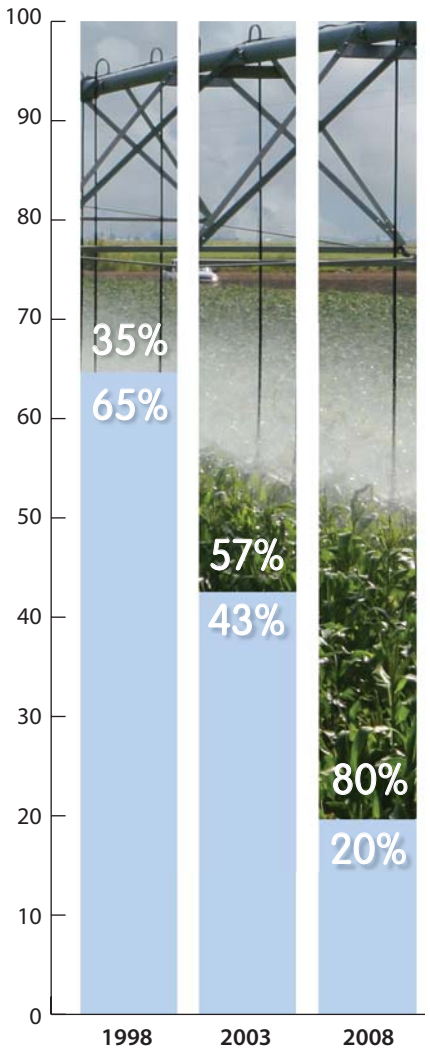
I pointed to the plate and asked if that was him and he replied "yes sir," and I placed one hand on his shoulder and the other in his hand and thanked him for what he did for all of us.

"documentaries" or "their science" when they are merely opinion pieces that avoid balance and have a "don't bore me with the facts" mentality.

Now is the time to stand up, be counted, defend what you do and become part of the Ag Activism efforts that agricultural commodities in the state and nation, along with general farm organizations, are advocating.

Go to our website (www.NebraskaCorn.org), or call your local or state farm organizations and ask how you can help. We need to build a solid database of email addresses, phone numbers and mailing addresses so we can put a stop to the likes of the Humane Society of the United States, People for the Ethical Treatment of Animals and others that think they know what you do.

We can and should take responsibility – if we don't do it for ourselves then who will? And offering to help just seems like the right thing to do.



Farmers have adopted sprinkler irrigation – like through a pivot – over the last decade. This is significant because sprinkler irrigation cuts water use by one-half to one-third of that of a gravity fed system, which also reduces energy use. Source: FRIS

Nebraska Corn Board

A new logo for a new age

The Nebraska Corn Board certainly recognizes that the corn industry in the state and across the country is changing – and that it must continuously adapt, too.

Farmers in Nebraska adapt to change every day, from seed to technology to risk management to weather. Our new logo helps the Nebraska Corn Board represent that as an organization. It goes beyond a kernel of corn to an image that is more complex and more representative of how different components come together to make up the industry and the multitude of products that come from corn.

The contemporary design incorporates the image of corn in a more creative way – just like farmers creatively manage their challenges and the Corn Board creatively approaches its efforts on market development, research, promotion and education.

"The new logo goes beyond a kernel set in the state," said Don Hutchens, executive director of the Nebraska Corn Board. "It better represents something that is growing and green, just like the corn industry in Nebraska."

Blend Your Own program promotes blender pumps

Blend Your Own BYO

The Nebraska Corn Board continues to promote the installation of ethanol blender pumps across Nebraska by participating in the Blend Your Own Ethanol campaign – known as BYO Ethanol.

Several corn and ethanol organizations across the country launched a national ethanol blender pump campaign a year ago. The goal is to greatly increase the number of ethanol blender pumps installed nationwide, expanding fuel choices for motorists and giving gas station owners more product flexibility. You can find more information at www.BYOethanol.com.

As part of the campaign, the Nebraska Corn Board is offering a $5000 grant to the first 10 stations that install a blender pump. This is in addition to federal incentives that reimburse via a tax credit of half of the cost to install a blender pump or e85 pump, up to $50,000. Grants from other ethanol organizations may also be available.

Blender pumps allow retailers to sell e10, mid-level blends like e20 and e30, and e85 from the same pump and same tank of ethanol. All of these blends are allowed in Nebraska and across the country – although blends beyond e10 are only targeted towards flex fuel vehicles.

The BYO campaign is a partnership between several leading corn-producing states, the American Coalition for Ethanol and the Renewable Fuels Association.

The grant application and additional information can be found at www.NebraskaCorn.org or the ethanol blender pump grant tab on our Facebook page, Facebook.com/NebraskaCornBoard.

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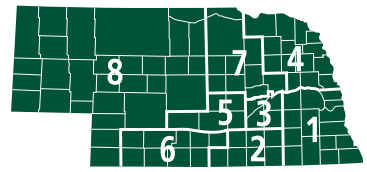

Nebraska Corn Board members represent the eight districts indicated on the map and are appointed by the Governor. One at-large member is elected by the other Board members.

District 1
Dave Nielsen
Lincoln, NE

District 2
Mark Jagels
Davenport, NE

District 3
Curtis Friesen
Henderson, NE

District 4
Bob Dickey
Laurel, NE

District 5
Tim Scheer
St. Paul, NE

District 6
Dennis Gengenbach
Smithfield, NE

District 7
David Merrell
St. Edward, NE

District 8
Jon Holzfaster
Paxton, NE

At-large
Alan Tiemann
Seward, NE