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**2015 Wisconsin CCA of the Year: Nominations open until March 6**

Bryan Jensen, NPM Program

_A Reminder! Nominations for the 2015 Wisconsin CCA of the Year will remain open until March 6._

Please take the time to consider a nomination. The process is simple and won’t take a lot of time. More importantly the satisfaction you will get from recognizing a colleague is priceless.

The nomination criteria, helpful hints and nomination form are available online at [https://uwmadison.box.com/s/5i2rcaolf0bvp8vtmlb](https://uwmadison.box.com/s/5i2rcaolf0bvp8vtmlb)

Electronic submissions are preferred but hardcopies are OK. For more information, please contact Bryan Jensen, IPM Program, bmjense1@wisc.edu, 608-263-4073.

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**Wisconsin Dairy and Beef Well-Being Conference, April, 30 2015**

Aerica Bjurstrom, Agriculture Agent, UW Extension-Kewaunee County

The Wisconsin Dairy and Beef Well-Being Conference will be held at Liberty Hall in Kimberly on April 30th. We are again pleased to welcome Dr. Temple Grandin as our keynote speaker. She’s not the only top quality speaker on the agenda though! We have the Dee Griffin, a pioneer in the Beef Quality Assurance program, Jan Sheaer, a leader in animal welfare from Iowa State University, Kurt Voegel from UW-River Falls, and our own Amy Stanton on the agenda. We are also welcoming Bruce Feinberg from McDonalds and Lily Edwards-Callaway from JBS.

This will be an excellent meeting and worth the travel for producers. The meeting focus in on beef and dairy, but poultry and pork producers will find value in this meeting as well. For more information click on the link below:


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**Winners of the 2014 Wisconsin Soybean Contest are Announced**

Shawn Conley, Soybean and Wheat Extension Specialist

The 1st place winner in Division 4, Bahr Farms Inc. of Darlington, grew Channel 2402R2 Brand and harvested 84.99 bu/a. In second place, McComish Family Farms of Shullsburg grew Channel 2402R2 Brand and harvested 79.62 bu/a. In Division 3, Ellis Farms Inc. of Walworth won 1st place with Jung 1250RR2 at 73.80 bu/a, and in 2nd place, Caliber Custom Services of Kaukauna harvested 63.32 bu/a with DuPont Pioneer P22T69R. Also in Division 3, the Wisconsin Bean Team of UW Graduate students
Adam Gaspar, David Marburger, and Ethan Smidt grew Pioneer P28T33R and harvested 89.58 bu/a. The WI Bean Team is ineligible for official prizes as they are grad students of Dr. Conley; however their efforts are still unofficially recognized. In Division 2, Stetzer Brothers LLC of Melrose achieved 81.78 bu/a from NK Brand 17G8 for first place. In 2nd place, Kloos Acres of Stratford harvested 60.60 bu/a from DuPont Pioneer 91Y90 soybeans. In Division 1 at 54.72 bu/a was Jerry Koser from Almena who planted Pioneer 91M10. 2nd place winner in Division 1 was Paul Graf Farms LLC from Sturgeon Bay. They harvested 38.45 bu/a from Pioneer 90Y90.

The contest is sponsored by the WI Soybean Program and organized to encourage the development of new and innovative management practices and to show the importance of using sound cultural practices in WI soybean production.

For more information please contact Shawn Conley, WI State Soybean Specialist at 608-262-7975 or spconley@wisc.edu

### Video series focuses on field crop management

What are the six most critical stages in the life of a corn plant? Why is variety selection important to soybean yield? During what growth stage are crops most susceptible to disease? What is in a routine soil test? How can I manage weed and insect resistance issues? Can a sponge be used to demonstrate soil moisture?

Everyone agrees that the more you know about farming, the more successful you will be. Growers combine both experience and science to make management decisions. But who has the time to read textbooks or long journal articles? Wouldn’t it be more efficient if someone just took the time to carefully explain the University of Wisconsin research and science related to field crop management in a video I can watch or listen to? Wouldn’t it be great if you could access this information on a smartphone or a tablet?

Well, University of Wisconsin Extension specialists in agronomy, entomology, plant pathology and soil science have just done that! They have recorded the most up-to-date presentations explaining the fundamentals of crop production, pest management, soil and water conservation and nutrient management. The videos present over 18 hours of valuable information. You can watch a little or watch a lot. It’s your choice!

Bryan Jensen of the UW Integrated Pest Management program (IPM) helped organize the recordings and says the videos should be useful to anyone involved in field crop production. As it relates to IPM, he says, “This content can help build or bolster a strong integrated pest management program on a farm or in a crop advisory’s career. While just being posted on the internet in January, the videos have already been used by dozens of agronomists to help with self-study for the Wisconsin CCA (Certified Crop Advisers) exam.”

Look for the videos on YouTube at: [https://www.youtube.com/user/uwipm/playlists](https://www.youtube.com/user/uwipm/playlists)

You can also use the free UW IPM Toolkit app to access the videos: [http://ipcm.wisc.edu/apps/ipmtoolkit/](http://ipcm.wisc.edu/apps/ipmtoolkit/)

The new crop science series is organized into three playlists.

**WI - Soil science fundamentals for field crops** 22 videos

**WI - Field crop and forage fundamentals** 10 videos

**WI - Weed, insect, disease IPM for field crops** 20 videos

Please feel free to contact Bryan Jensen with any questions or comments. bryan.jensen@wisc.edu
**Glyphosate resistance confirmed in two Wisconsin common waterhemp populations**

Recently, Thomas Butts, a graduate research assistant, and Vince Davis confirmed two herbicide-resistant common waterhemp populations in Wisconsin. Two Wisconsin common waterhemp populations from Eau Claire and Pierce Counties clearly exhibited resistance to glyphosate. Progeny plants from the Eau Claire County collection were sprayed at the 0.87 kg ae ha\(^{-1}\) (22 fl. oz. ac\(^{-1}\)) rate. All plants survived and grew to an average of six times their spray date height at that rate. At the 1.74 kg ae ha\(^{-1}\) (44 fl. oz. ac\(^{-1}\)) rate, 95% survived and grew to an average of five times their spray date height at that rate. The glyphosate ED90 for the Eau Claire County and susceptible populations was 3.91 and 0.40 kg ae ha\(^{-1}\), respectively. This indicated a 10-fold level of glyphosate resistance in the Eau Claire County population.

The full report is now available. For more information, please visit the WCWS documents page.

**Palmer amaranth confirmed glyphosate-resistant in Dane County, Wisconsin**

Thomas Butts, a graduate research assistant, and Vince Davis report a new confirmation of a glyphosate-resistant weed in Wisconsin. The Dane County Palmer amaranth population clearly exhibited herbicide resistance to glyphosate. This was determined by two efforts. First, leaf tissue samples were sent to Dr. Patrick Tranel at the University of Illinois where a polymerase chain reaction (PCR) technique detected a 3- to 20-fold amplification of the EPSPS gene indicating high likelihood of glyphosate resistance.

To confirm those results, a whole plant glyphosate dose response bioassay was conducted. Progeny plants from the Dane County collection were sprayed with a 0.87 kg ae ha\(^{-1}\) (22 fl. oz. ac\(^{-1}\)) rate. All plants survived and grew to an average of two times their spray date height at that rate.

Their full report is available here. For more information, please visit the WCWS documents page.

**Managing Corn Rootworm in 2015**

Bryan Jensen, UW Extension and IPM Program

You are probably aware that Bt CRW hybrid field performance issues are occurring. Several states in the Midwest, including Wisconsin, have experienced control problems for several of the Bt proteins. Although my impression is that Wisconsin’s situation lags behind that of some other corn producing states, it is nevertheless a valid concern. There are several monitoring techniques and management options that are available which can slow resistance. However, it is unlikely you will be able to reverse resistance to a Bt protein once it occurs. Therefore, 2015 will be the time to start implementing these practices.

Field monitoring has been, and always will be, an important IPM practice. Scouting beetles during the egg laying period (mid-August to early September) will give you an estimate of control needs in continuous corn. Additionally, that information can also be used to prioritize control practices that include insecticide seed treatments, soil applied insecticides as well as proper selection of Bt CRW proteins.

Evaluating corn roots for signs of feeding during mid-July to early August will also be useful. This information will verify the efficacy of your control practice. Don’t assume straight standing corn does not have significant rootworm feeding and do not assume that all lodged corn is a result of rootworm feeding. Dig and document. Evaluating root damage in Bt CRW hybrids will give you advanced warning regarding early levels of resistance. In first year corn it will give you information on presence (or absence) of rotation resistant rootworm.

Continue to plant refuges. Until we know different, refuges are a source of susceptible adults which could mate with resistant beetles. Although planting refuges is getting easier because of seed blends, block refuges may be difficult to understand especially when combined with lepidopteran Bt proteins. When in doubt, read the tag and/or consult with your seed sales representative.

Using multiple modes of action and diversifying management practices will also be important components to a resistance management program. Topping that list of practices is crop rotation. Assuming you are not in an area where damage from rotation resistance corn rootworms is possible (your root assessments will tell you for sure!) crop rotation is an excellent method of rootworm management.

The high rates of insecticide seed treatments on conventional hybrids may be useful, but only if beetle counts are low. Beetle counts from the previous growing season will indicate which fields are possible candidates for this practice. Fields with moderate or
high beetle numbers maybe a good choice for conventional hybrids planted with a soil applied insecticide. If Bt resistance is not an issue in your fields then traited corn remains an option, especially for those fields with higher beetle populations. However, make sure you rotate your Bt modes of action. If you have been using the same Bt protein for two years (or more!) switch proteins. Cross resistance is a potential issue in the family of Cry3 proteins (YieldGard, Agrisure, Duracade). Make sure you know what protein you have been planting and rotate to a viable option or switch to a soil applied insecticide. All proteins have had field performance issues so there is no silver bullet.

Hybrids with pyramid proteins MAY be a good alternative provided you do not have initial levels of resistance building up in your field. Pyramid hybrids have two modes of action for the same insect and can be a good resistance management tool provided both proteins are effective. If not, you essentially are using a single mode of action. That is, you will continue to select for resistance to the compromised protein while increasing selection pressure on the other. In that situation, you will be painting yourself into a corner without realizing. Just another reason to evaluate roots for damage.

Layering a soil applied insecticides with a Bt CRW hybrid has been a practice adopted by some growers. A soil insecticide with a Bt hybrid can be a valuable management tool ONLY IF beetle populations are high enough that control might be compromised when using a Bt hybrid by itself. Fortunately, Wisconsin had lower beetle populations in 2014 than 2013 in all districts except west central and southwest Wisconsin according to the Wisconsin Department of Agriculture, Trade and Consumer Protection’s (DATCP) Pest Bulletin. The southwest district reported a higher average than 2013 primarily because of one exceptionally high field. For more information on 2014 beetle counts go to the Pest Bulletin https://datcpservices.wisconsin.gov/pb/

Do not use a soil insecticide to mitigate performance issues with Bt hybrids. It won’t work. Soil insecticides are not designed to control beetle populations. Rather they protect a localized area of the root mass. Surviving beetles will continued to put selection pressure on the Bt protein.

In conclusion, diversifying corn rootworm management practices will help prolong all management options not just Bt hybrids. If you notice lodged corn, please don’t assume resistance to the Bt protein. Dig and evaluate roots for damage. Other factors including compaction, high winds and rain may also cause corn to lodge. Also, don’t assume that high beetle numbers in a field means Bt performance has been compromised. If you do see significant damage, in addition to calling the seed sales representative, PLEASE contact the local county extension agent. It will be important for us to know if, and how widespread these performance complain are.

References

Pest Management YouTube videos: http://ipcm.wisc.edu/video/

Bt Trait table: http://www.msuent.com/assets/pdf/28BtTraitTable2014.pdf

CRW webinar http://www.plantmanagementnetwork.org/edcenter/seminars/CRWSeminar/

**Webinar series on irrigation and water management**

UW Extension is setting up a Professional Development opportunity on Irrigation systems and Irrigation water management to help us all increase our knowledge about how to use water efficiently. Irrigation has been a hot topic in some parts of Wisconsin from a combination of some dry years and increased ground water usage. This webinar series will give you the knowledge to help growers use water more wisely and still grow a quality crop.

The series of five webinars will start with Irrigation 101 for those who may not be as familiar with the equipment side or want to look at the consideration that should be taken when deciding to invest in an irrigation system. The second webinar will look at soil water management for crop production and how checkbook irrigation scheduling is done. The third webinar will introduce participants to the WISP-2102 on-line irrigation scheduling program and step people through how to set it up. One of the assignments will be to use it during 2015 to determine when to irrigate a field (or your lawn) for practice. The fourth webinar will cover testing, energy use and maintenance to keep systems operating and using water efficiently as the systems age. The last webinar in the series will look at drip or micro irrigation systems and how to do scheduling.
There will also be a summer field workshop where we will install and use soil moisture sensors, setup a simple drip irrigation system, setup a uniformity test on a center pivot and possibly do a pump test. The dates for the workshop will be scheduled later.

See the attached brochure for more information.

To Register go to: https://uwmadison.qualtrics.com/SE/?SID=SV_eXxhvC6nydstxzf

If you have questions, please contact Scott Sanford, Biological Systems Engineering sasanford@wisc.edu

**Plant Disease Diagnostic Clinic (PDDC) Update, Feb 6**

Brian Hudelson, Sean Toporek and Joyce Wu, UW-Madison/Extension

The PDDC receives samples of many plant and soil samples from around the state. The following diseases/disorders have been identified at the PDDC from January 31, 2015 through February 6, 2015.

<table>
<thead>
<tr>
<th>PLANT/SAMPLE TYPE</th>
<th>DISEASE/DISORDER</th>
<th>PATHOGEN</th>
<th>COUNTY</th>
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<td>VEGETABLES</td>
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<tr>
<td>Carrot</td>
<td>Bacterial Soft Rot</td>
<td><em>Pectobacterium carotovora</em></td>
<td>Fillmore (MN)</td>
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<tr>
<td>Lettuce</td>
<td>Root Rot</td>
<td><em>Pythium sp.</em></td>
<td>Ozaukee</td>
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For additional information on plant diseases and their control, visit the PDDC website at [pddc.wisc.edu](http://pddc.wisc.edu).

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Do We Grow Another Bushel or Save a Buck?

Joe Lauer, Corn Agronomist

The obvious answer is, "Yes!" Most of us try to do both. However, the predictions for the 2015 cropping season are for lower corn prices. Farmers wonder whether they should continue trying to increase production on their farms or should they cut costs and try to save a buck by not going after the most expensive yield. This article reviews some of the important decisions that growers need to make as plans are made for lower corn prices in 2015.

As farmers consider the impact of the most yield limiting factors, it isn't always about inputs and cutting costs. The most important management decision is hybrid selection. The choice of hybrid increasingly dictates management decisions farmers make during a growing season. After the hybrid is selected the main management objective is to reduce stress on corn plants during the growing season.

In many ways we are "back to the future." Corn prices are not as bad as the 1990s and early 2000s, but they are projected to decrease nearly 50% from recent prices. Frugal innovation may be required. When corn prices are low farmers must: 1) know their cost of production for corn, 2) concentrate on the basics, 3) realize that timing of operations is everything, and 4) question every input in their production practices. An increased reliance on scouting for in-season decisions and corrections will increase efficiencies during years of low corn prices.

It is very difficult to get a handle on the cost of production of a crop enterprise. We do know from PEPS data that two inputs that have increased dramatically over the last 25 years. From the 1987 to 2011 seed cost has increased 4 to 5 times. Fertilizer inputs have increased 2 to 3 times. Chemical and equipment costs have remained relatively flat. Harvesting costs fluctuate with the year, becoming higher in cold, wet seasons due to higher drying costs. The cost of land has increased dramatically in the last five years. Using PEPS and USDA data the cost of production of corn in Wisconsin is around $550 to $700 per acre.

Crop production decisions can be divided into categorical and continuous decisions. Examples of categorical decisions are hybrid selection, seed treatment, rotation, tillage, weed control, harvest timing, land, marketing, drainage, and equipment. Examples of continuous decisions are plant density, planting date, soil fertility (N, P, K, micronutrients, and lime), irrigation and scouting (effort). Many other minor decisions must be made that often interact with other decisions.

An example of a continuous input cost is plant density (Figure 1). Like most continuous decisions, plant density costs increase in a linear fashion as the amount of seed planted increases. The yield response of corn to plant density is typically curvilinear. The point on the yield curve where yield is greatest is called maximum yield (MY). The plant density where the distance between input cost and the yield curve is greatest is called the economic optimum (EO). The plant density where yield equals input cost is the equilibrium (EQ) yield where farmers make no profit. Where the yield response intercepts the y-axis is the yield ($Y_0$) level with no input. In the example using plant density, zero plants equal zero yield. Often some grain yield results with no input. For example, nitrogen is continuously mineralized from the soil so even though no nitrogen fertilizer may be applied, some yield can still be achieved. Other decisions like fungicide, tillage and row spacing have little impact on the yield curve.

Figure 1. Determining Maximum Yield v. Economic Optimum Yield.
In corn production, the most important variable with the least management control is weather. We have to accept the fact that Mother Nature has the upper hand. Management decisions and timing are continuously impacted by weather. Drainage is critical in the spring. Crops in the Midwest are challenged by 1) cool, wet springs that often result in lack of root surface area, and 2) dry, hot summer conditions during pollination, kernel set and grain filling. The corn crop grows best in a spring dry enough for early planting, but wet enough to activate herbicides and promote good stands with uniform emergence. Summers should have timely rain of about 1 inch per week, lots of sunshine, and temperatures in the mid-80s during the day and low-60s during the night. Falls should have sunny dry weather to speed dry down and allow harvest of grain at 22% moisture by November 1.

Figure 2 shows data from Lancaster in plots where no nitrogen has been applied since 1966. The average yield of these continuous corn plots is around 50 bu/A. In other rotations involving corn-soybean and corn-soybean-oat-alfalfa yield is at a higher level with zero nitrogen. For the most extended rotation yield has been increasing over time.

Figure 2. Corn Yield at 0 lb N/A for continuous corn, corn-soybean, and corn-soybean-corn-oat-alfalfa rotation at Lancaster, WI. Plots were established in 1966.

Corn hybrid selection is arguably the most important management decision a farmer makes because increasingly the choice of hybrid dictates management. The principles of hybrid selection include: 1) using independent yield trial data and multi-location averages, 2) evaluate consistency of performance, 3) pay attention to seed costs, 4) recognize that every hybrid must stand on its own for performance, and 5) buy the traits you need. Remember that traits do not add to yield, traits protect yield. The UW hybrid evaluation program has conducted 939 corn hybrid trials since 1973. The average yield of these trials is 165 bushels per acre. The difference between the top yielding hybrid and the bottom yielding hybrid in a trial is 70 bushels per acre. If you divide 70 into 165 the average yield swing for a hybrid selection decision is 42%.

In the UW corn hybrid trials, the average yield of conventional hybrids is currently equal to the trial average. There was a period of time between 2001 and 2009 where the average yield of conventional hybrids was up to 10 bushels per acre below the trial average. Since 2010 conventional hybrids have yielded similar to the trial average in four of five years; the only exception being the drought year of 2012.
For corn production in Wisconsin a seed treatment is needed and should be applied to the seed of the hybrid selected. Untreated check seed typically has 20 to 25% seed death. Use of seed treatments decrease the amount of seed death to 5 to 10%. There are many options available to farmers.

The crop rotation decision provides the easiest yield a farmer can get. In our UW trials corn yield increases 10 to 19% when rotated was citing. The rotation effect last at most two years and depends upon the length of the break between the crops of interest. If you have two or more break years then yield of the second year of the continuous crop will be greater than the yield of continuous crops. If only one break year is grown then the yield of the second year equals that of continuous cropping. The rotation effect is even more dramatic and stressful years. In figure the rotation effect lasts two years increasing corn grain yield 15 to 17% for rotated according first-year corn following five users arriving in 6% for second-year corn. Conventional tillage increases corn yields about 4% however there is an interaction that occurs which we will come back to later.

Figure 3. The rotation effect of corn following soybean in Conventional-(CT) and No-Tillage (NT) at Arlington during 1994-2013.

Planting date is a "priceless" decision because it sets up management timing for other inputs during the season. If a farmer is forced to plant late, then a "double whammy" results with lower yield and higher grain moisture. To begin planting, growers need to focus on seedbed conditions and calendar date rather than on soil temperature. Follow local extension recommendations especially as they relate to crop insurance requirements. Disadvantages of early planting including increased seedling diseases, soil crusting, late spring frosts, and European corn borer problems. At Arlington the planting date that produces maximum grain yield is April 28 (Figure 4). The planting date when maximum yield is achieved ranges from April 10 to May 3 depending upon the year. Yield is still at 95% of the maximum yield as late as May 12-19. Grain yield decreases 0.9 bushels per acre per day on May 10 and accelerates to 2.6 bushels per acre per day on June 1.

Figure 4. Corn response to planting date during 2003 to 2012 at Arlington, WI.

Fertilizer, especially nitrogen, is not the place to cut costs. Farmers should soil test and efficiently apply needed nutrients using the cheapest form of fertilizer per unit of nitrogen, phosphorus, potassium. Using manure and
legume credits can help reduce purchased fertilizer costs. Don't cut back on overall nitrogen supplied unless you have been over applying. Do not use micronutrients unless soil test recommendations encourage it. The most economical approach to this decision is the maximum return to nitrogen (MRTN) approach. This approach accounts for corn price and nitrogen cost. The amount of nutrients removed by corn at harvest is 67 pounds phosphate per acre and 51 pounds potash per acre for a 175 bushel yield. For a silage yield of 24 tons per acre, 86 pounds phosphate per acre and 199 pounds potash per acre is removed. These nutrients eventually need to be replaced.

Plant distribution in the field is determined by plant density and row spacing. **Plant density** has the most potential to move a farmer from their current yield levels. Maximum yield plant densities are increasing over time as newer hybrids are commercialized. For most farms in Wisconsin narrower row spacing (15- to 20- inches) is better than row spacings of 36- to 38-inches, however, this decision has relatively low impact on yield.

The effect of plant density on corn grain and forage yield is shown in Figure 5. The response is fairly "broad-shouldered" in that 95% of the maximum for these measurements can be achieved at 26,000 to 32,000 plants per acre. The plant density that maximizes grain yield is 39,000 plants per acre. The economic optimum plant density is about 4000 plants per acre less at 35,000 plants per acre. The economic optimum is calculated using a partial budget approach where yield is multiplied by a corn price determined using the PEPS method and costs are subtracted (handling= $0.02/bu, hauling= $0.04/bu, trucking= $0.11/bu, storage= $0.02 per month/bu, drying= $0.02 per point/bu > 15.5% moisture, and seed cost = $250 per 80K bag).

Forage yield continues to increase up to about 48,000 plants per acre. However there is a yield and quality trade-off. As plant density increases forage quality, as measured by Milk per ton decreases. So the economic optimum for silage, as measured by Milk per acre, is about 6000 plants per acre greater than the grain maximum yield plant density.

**Figure 5. Relationship between corn plant density and grain maximum yield, grain economic optimum, forage yield, Milk/Ton, and Milk/Acre.** Data are derived from studies conducted between 2005 and 2014 at Arlington, WI.

**Pest control** is an important series of decisions in corn production. For most major corn pests, economic injury levels and economic threshold levels are known. In corn weeds are considered more of a problem than insects, and insects are more of a problem than diseases. Plant breeders have done a good job of developing corn hybrids resistant to insect and disease pressure.

We have a number of emerging pest resistance issues in Wisconsin. In southeast Wisconsin corn rootworm resistance has developed to Bt traited corn. In 2014, glyphosate (Roundup) resistance in waterhemp and Palmer amaranth. Finally, there is an increased awareness of nematode issues.

Early-season weed competition can significantly reduce yield in high-yield environments. In a Nebraska study, delaying weed control reduced yield if weeds were not controlled by V5.

For insect management it's all about scouting and timing. Insects are adapting to our cropping practices and they will likely continue to evolve.

For disease management the goal is to improve the corn canopy leading to yield increase and disease decrease. Genetic resistance is the cheapest form of control. Scout for these diseases in particular: anthracnose, northern corn leaf blight, diploïa, and Fusarium/ Gibberella. Recently, foliar fungicides have become more widely used. However, in our research only 2 of 32 studies significantly increased corn yield with fungicide use.
Tillage used to be about controlling weeds and seedbed preparation. Now it is all about stand establishment. We have excellent herbicides. We have had numerous planter technology developments. The tillage response is more often measured in the northern Corn Belt. Conventional tillage increases grain yield 5 to 7% over no-tillage. There is less difference observed between tillage systems when using Roundup ready crops. However, there is an interaction in that tillage does not affect corn yield in rotated corn and first-year corn following five years of soybean, but improves yield in second-year corn 5%. So tillage is not necessary in rotated corn, but becomes increasingly important as the number of years of continuous corn increase. So don't throw away your chisel plow. There may be years where the economics favor continuous corn production.

Figure 6. The interaction between conventional tillage and notill at Arlington during 1994 to 2013.

Finally harvest and store your crop carefully. There's a trade-off between field losses and drying costs. The recommend harvest moisture range is between 20 and 25% moisture. Large field losses can occur with lodging and ear droppage. For safe storage corn must be dried below 15% moisture, so some drying is often needed after harvest. We still have about 20-25% of the acres in NE Wisconsin still standing in the field. By November 1 most of the corn grain drydown has occurred (Figure 7).

Figure 7. Grain moisture drydown of corn left standing in the field at Arlington.

Success with precision farming (PF) is proving elusive. Technology used in PF is available and affordable, but the agronomy is lacking. A new exciting PF technology that is unmanned aerial vehicles (UAVs). UAVs with appropriate sensors have the potential to allow detection of in-season field problems early enough to be corrected.

In conclusion, the relative impact of corn management decisions on grain yield in Wisconsin varies the decision being made. Weather as the largest impact, but we can do little about it. The hybrid that you choose for your fields can have anywhere from a zero to almost 42% yield swing (70 bushels per acre for grain and 12,000 pounds of...
milk per acre for silage). The presence or absence of genetic traits can swing yield 0 to 100%. Crop rotation can impact grain yield from 0 to 30%. A May 1 versus June 1 planting date affect yield from 0 to 30% plus you would need to add the moisture penalty. Soil fertility can change yield by about a 20 to 50%. Plant densities of 39,000 versus 18,000 plants per acre represent a 0 to 22% yield change. With pest control, timeliness of pesticide application is everything. In corn, weeds are more important than insects, and insects are more important than diseases. Crop rotation can impact grain yield from 0 to 30%. A May 1 versus June 1 planting date affect yield from 0 to 30% plus you would need to add the moisture penalty. Soil fertility can change yield by about a 20 to 50%. Plant densities of 39,000 versus 18,000 plants per acre represent a 0 to 22% yield change. With pest control, timeliness of pesticide application is everything. In corn, weeds are more important than insects, and insects are more important than diseases. Tillage has a relatively small impact on yield representing a 5 to 10% change. However, practicing no-till can increase energy savings. Harvest timing can swing yield 0 to 20% between October 15 and December 1. Row spacing has a relatively small yield impact and represents a 0 to 5% yield change as row spacing decreases from 30 inches to 15 inches.
How Much Yield Loss Occurs with Corn Hybrids Sold as "Organic"?

Joe Lauer, Corn Agronomist

Farmers growing corn for the organic market often get a premium and rightly so. Organic farmers are required to go through a certification process that requires a fee and extra effort and time for paperwork. They have more expenses due to increased pest control, especially weeds. Organic farmers have also expressed some concern about the genetic yield potential of the commercial hybrids used in organic corn production.

Since 2004, the UW Corn Hybrid Evaluation program has been testing corn hybrids sold for the organic market. A total of 55 organic hybrid trials have been conducted at 10 locations in Wisconsin (see http://corn.agronomy.wisc.edu/HT/). The average yield of the commercial organic hybrids in these trials was 174 bu/A. The average range between the top- and bottom-ranked hybrids was 73 bu/A. These trials are planted early and managed aggressively for pests. All pests are controlled to the best of our ability. Differences among hybrids are likely due to genetic differences, rather than management interaction differences.

In 53 of the trials, a high-performing conventional hybrid check (nontransgenic) was included. Two treatments were applied to the check conventional hybrid. In one treatment the check hybrid was treated exactly the same as the other organic commercial hybrids in the trial. In the other treatment the check hybrid was hand weeded up to 3x during the growing season. No difference was found between the control and hand weeded conventional check hybrids, so data from these treatments were pooled together. Organic hybrids yielded 7% (14 bu/A) less than the conventional hybrids in these trials (Table 1).

<table>
<thead>
<tr>
<th>Hybrid</th>
<th>Grain yield (bu/A)</th>
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<tbody>
<tr>
<td>Commercial organic</td>
<td>174</td>
</tr>
<tr>
<td>Conventional</td>
<td>188</td>
</tr>
<tr>
<td>LSD(0.05)</td>
<td>3</td>
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</tbody>
</table>

The organic trials are almost always planted adjacent to the public trials. An estimate of relative performance can be made between these adjacent trials by calculating an average for each trial and treating each environment as a replication. In this analysis, the conventional check hybrid included in the commercial organic trial was dropped so that the mean from the organic trials only represent commercial organic hybrids. Hybrids in the public trials include both conventional and transgenic hybrids.

A total of 48 environments had both organic and public trials planted adjacent to each other. The hybrids in the organic trials yielded 12% (24 bu/A) less than hybrids in the public trials (Table 2).

<table>
<thead>
<tr>
<th>Hybrid</th>
<th>Grain yield (bu/A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic</td>
<td>12% (24 bu/A)</td>
</tr>
<tr>
<td>Public</td>
<td>13% (26 bu/A)</td>
</tr>
<tr>
<td>LSD(0.05)</td>
<td>3</td>
</tr>
</tbody>
</table>
program. Data are derived from 48 environments where both trials were grown.

<table>
<thead>
<tr>
<th>Trial</th>
<th>Grain yield (bu/A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic</td>
<td>175</td>
</tr>
<tr>
<td>Public</td>
<td>199</td>
</tr>
<tr>
<td>LSD(0.05)</td>
<td>9</td>
</tr>
</tbody>
</table>

In both analyses, organic hybrids yielded less than modern hybrids. In the organic trials, the conventional check hybrid was consistently the top performing hybrid in the trial. However, the commercial organic hybrids were not far behind (7-12% on average). Again, in these trials, all interactions are minimized to the best of our ability, so the trials represent potential genetic differences. As plant stresses increase in organic systems due to management constraints for certification and pest pressure versus the relative ease of controlling some of those same pests in conventional systems, the relative differences between modern organic and conventional systems would also likely increase.