Managing Competitive Advantage in a Global Grain Market

Dr. Michael J. Swanson, Wells Fargo

One of the givens about commodity businesses is that price competition does not allow everyone to make a profit. Only the above average producers make money over the long-run. This was certainly true in Minnesota grain and oilseed production from most of the 1990s and 2000s. Starting in 2007, everyone started to make profits even the highest cost producers, and in 2012 everyone made great profits. This cycle has run its course, and cost competition is reemerging. Agricultural producers and their suppliers need to revisit their value propositions in a more competitive part of the cycle. There are still plenty of profits to be had in producing $4.50 per bushel corn, but everyone will need to rethink their strategies and tactics in that environment. A big part of the thinking should go to managing the changing technology and practices. Those operators who “adopt and adapt” the technology best will be the long-term winners in a world of technological change. Farmers need to believe in the motto “you need to change to stay the same”.

Integrated Pest Management or Insurance Pest Management: What is the Reality?

Dr. Michael E. Gray, University of Illinois

The classical deployment of integrated pest management (IPM) strategies as described by a group of entomologists at the University of California in the late 1950’s, is under siege across the Corn Belt in many field crop settings. These entomologists believed that crops should be scouted and pesticides used only after an established economic threshold had been reached, thus preventing an insect population from reaching the economic injury level. They believed this approach, along with a thorough integration of other non-chemical tactics, that included conservation of natural enemies, would help delay the onset of resistance and improve overall environmental quality. Across the large-scale corn and soybean production landscape of the Midwest, a new form of IPM is the current reality. An insurance pest management paradigm has taken the form of widespread planting of transgenic crops, extensive use of insecticidal and fungicidal seed treatments, and common tank-mix applications of fungicides and insecticides to corn and soybean fields (often with no scouting information or use of thresholds). This new reality has been fueled in part by higher commodity prices in recent years, management decisions
often made by suppliers of inputs, the move towards a trait-driven market place, industry consolidations, and the large number of corn/soybean acres often farmed by a single entity (farmer, land manager, or other business enterprise). Land managers and producers are making business decisions within a competitive arena and consequently are very risk averse in a highly capitalized industry characterized by increasing input costs. There are consequences that can emerge within this framework and they include resistance by western corn rootworms to certain Bt hybrids, resistance of some pathogens to fungicides, and the loss of effective weed control previously provided by some broad-spectrum herbicides. Will this new reality persist? If the answer is “yes” -- producers will face the reality of a tool kit with fewer effective pest management tools.

10:10  
**Severe Thunderstorms Past and Future: Implications for Agriculture**  
*Dr. Harold Brooks, NOAA/National Severe Storms Laboratory*  
Thunderstorms have important impacts on agriculture in central North America. Much of the growing season precipitation comes from thunderstorms, but severe hazards, such as hail, high winds, and tornadoes, can damage crops and property. In this presentation, I’ll discuss the historical records of these events and how they have changed over the years. Perhaps more importantly, I’ll take a look into the future at how we might expect thunderstorms to change and what those changes might mean for agriculture. The challenges to improving our scientific understanding of the changes will be highlighted, as well as identifying the most likely scenarios and areas of greatest uncertainties.

**CONCURRENT SESSIONS I & II – ROOMS 102 BC AND 208 AB**  
*(Session I jointly offered with Applicator Recertification)*

1:00 & 4:10  
**Dust in the Wind: Advances in Protecting Pollinators During Planting Season**  
*Dr. Christian Krupke, Purdue University*  
Recently there has been unprecedented attention focused on pollinator health, particularly honey bees, which are experiencing annual losses of about one-third. One of the factors identified as having a significant negative impact upon pollinators are pesticides, including those in the neonicotinoid class insecticides used widely in field crops. These include the trade names Poncho (clothianidin) and Cruiser (thiamethoxam) and are applied to the vast majority of seeds of corn, soybeans, wheat, canola and many other annual crops. Dust that arises during planting of these seeds has been identified as a causal agent for honey bee kills during planting time. This presentation will summarize the most recent developments in efforts to measure the distance that this dust may travel, its toxicity to bees, and summarize research into possible mitigation strategies for this source of exposure for honey bees and other non-pest organisms.
1:00 & 4:10  **Root Diseases – Understanding and Managing Their Complexity**  
*Dr. Dean Malvick, University of Minnesota*

Root diseases affect all crops and frequently cause significant yield reductions. While this is not a revelation, the effort and number of products that are being targeted at root diseases and root health has been increasing – especially for soybean. We know much more than we did just a few years ago about the complexity of fungi and other microbes that influence root and plant health. But in many ways we are still at the wild west stage, addressing problems in an unruly place around the root system that may or may not respond to targeted products and management tactics. This presentation will focus on soybean root diseases and root health. It is intended to illustrate the complexity of pathogens and other microbes that influence soybean root health, present some of the challenges and targets for developing products for the root environment, and address reasons why some of the array of seed treatments and other products available may perform inconsistently.

1:55 & 3:15  **All Quiet on the Corn Rootworm Front? Resistance, Rotation and Insecticides**  
*Dr. Ken Ostlie, University of Minnesota*

Corn rootworm resistance issues appear to have quieted in 2013, reflecting more aggressive corn rootworm management and poorer conditions for corn rootworm survival. Yet scattered performance problems occurred, even with SmartStax and Herculex Xtra. This presentation will present the latest information on the status of resistance issues, the performance of traits in lab and field studies, and field research updates on management strategies, including traits, soil and foliar insecticides.

1:55 & 3:15  **EPA’s Drift Reduction Technology Program**  
*Mr. Jay Ellenberger, U.S. EPA, Office of Pesticide Programs*

As part of EPA’s Office of Pesticide Programs’ (OPP) efforts to address spray drift issues, OPP is developing the Drift Reduction Technology (DRT) Program, a voluntary program to encourage the agricultural sector to develop, identify and use pesticide application technologies (e.g., spray nozzles) that have the potential, through verification, to significantly reduce spray drift. OPP plans to initiate the DRT Program in 2014. EPA will focus the DRT Program on technologies used for ground-boom and aerial applications to field and row crops. EPA will encourage pesticide registrants to label their pesticides with directions to apply their products with DRT-rated application technologies. In return, EPA may credit these products with reduced application restrictions for spray drift providing applicators and grower with greater flexibility and other benefits. The presentation will include label examples of proposed draft language which will provide new nozzle recommendations and other drift reduction recommendations in order to assist applicators to understand the Drift Reduction Technology Program recommendations when indicated on the label.
CONCURRENT SESSIONS III & IV – ROOMS 101 FGH AND 205 CD

1:00 & 1:55  Fungicides in Field Crops: Where Will They Be Most Profitable?
Dr. Kiersten Wise, Purdue University

Fungicides are commonly promoted in corn and soybean for foliar disease management, as well as for additional physiological benefits that may enhance yield, even in the absence of disease. The fungicide market has expanded rapidly since 2007, and now there are many questions on which products to use and what application timings and methods will best enhance yields. In this talk, we will examine research data from Midwestern states to determine optimum application timings of fungicides in corn and soybean, as well as product efficacy against specific diseases, and the economic breakdowns for fungicide use. Attendees will learn what to consistently expect from fungicide applications in field crops, and receive information on optimum placement of fungicides in their specific production systems.

1:00 & 1:55  Advancing Agronomic Management to Mitigate Drought Stress in Corn
Dr. Jeff Coulter, University of Minnesota

Moderate drought stress can significantly reduce corn yield, especially if it occurs during tasseling and ear formation. In the Upper Midwest, moderate drought stress most commonly occurs during the grain filling stages of corn. This late-season stress is one of the most frequent and important factors responsible for capping corn yields. However, recent corn yields in regions with dry late-season conditions have been much higher than expected. At the same time, the availability of drought-tolerant hybrids, increasing corn acres under irrigation, and variable-rate technology provide many growers with new opportunities for mitigating drought-stress in corn while taking control of production costs. This session will help participants better understand and predict corn response to moderate drought stress, enabling to make improved agronomic decisions when dry growing conditions are anticipated or when irrigation water is in limited supply.

3:15 & 4:10  Can Yield Maps Predict Future Yields?
Dr. Joe Lauer, University of Wisconsin

To maximize field productivity and profitability, growers are increasingly using site-specific management rather than whole field management practices. Our objective is to describe spatial and temporal yield variability to predict grain yield of specific land cells (parcels of land). The goal is to determine if yield maps allow accurate delineation of management zones for prescription applications. Grain yield data for twenty-six years of continuous corn (CC), continuous soybean (SS), and corn-soybean rotations (CS) in no-tillage (NT) and conventional tillage (CT) systems were used in the analysis. Spatial variability is the variation of land cells within a field for a given year (i.e. yield map). Temporal variability is the variability of a land cell over time. Specific questions that will be addressed include: 1) How much spatial and
temporal variability exists within uniform fields?, 2) How many years are needed to detect land cell differences?, and 3) Can corn yield predict soybean yield and vice versa?

3:15 & 4:10  New Targets and Technologies for Scouting Insects in Soybeans

_Dr. Robert Koch, University of Minnesota_

Scouting is an essential component of integrated pest management. Large, late-season infestations of soybean aphid this year provided a reminder of the importance of a regular scouting program. Scouting and management recommendations for the soybean aphid will be reviewed. Beyond traditional scouting for soybean aphid, new technologies and targets are emerging for soybean insects. Emerging technologies related to remote sensing and unmanned aerial vehicles may facilitate soybean-aphid scouting in the near future. Recent research related to the use of remote sensing for identification of soybean aphid infestations will be summarized.

An overview will also be provided of new alien insects that may be observed while scouting soybean. One of these new alien insects is the brown marmorated stink bug, a potential threat to Minnesota soybean production. Recent research related to the impacts of the brown marmorated stink bug on soybean will be reviewed. The other two insects are tiny parasitic wasps that attack soybean aphid and leave dead mummified aphids on the plants. One wasp is being intentionally released for control of the soybean aphid. It is unknown how the other wasp arrived in North America. The status and impacts of the new parasitic wasps will be discussed.

THURSDAY, DECEMBER 12, 2013
CONCURRENT SESSION I – ROOM 102 BC

8:00 & 11:10  Is Foliar Fertilization an Effective Nutrient Management Tool?

_Dr. Antonio P. Mallarino, Iowa State University_

Foliar fertilization is viewed as a complement of fertilizer application to the soil, but there are questions in the upper Midwest about its effectiveness to alleviate deficiencies and increase crop yield. The presentation will address these questions by sharing results of research in many Iowa farmers' fields with phosphorus, potassium, and micronutrients mainly in soybean but also some in corn.

8:55 & 12:30  Back to Reality with Nitrogen Management

_Dr. Fabián G. Fernández, University of Minnesota_

Decisions on how to best manage nitrogen are often influenced by economic and practical issues that can have long-term implications on sustainability, both in terms of environmental quality and profitability. Nitrogen fertilizer is one of the most expensive inputs for farmers, but it is critical since
corn is generally very responsive to nitrogen fertilization. At the same time, nitrogen that is not used by the crop can cause environmental degradation as it escapes to the atmosphere or gets loaded into surface- and ground-waters. Because of economic and environmental reasons, often the main concern is to determine how much nitrogen to apply to ensure adequate availability to the crop while minimizing the amount of unused fertilizer by the end of the growing season. Beside nitrogen rate, however, other management practices such as the source of nitrogen and the time and method of application can make important differences on the efficient use of this important input. In this presentation we will integrate basic principles of the nitrogen cycle as we explore recent research findings on various timings and sources of nitrogen (including additives) as they relate to nitrogen use efficiency by corn and some of the environmental implications of such management practices.

10:15 & 1:25  **Realistic Expectations on the Use of Starter Fertilizer for Corn**  
*Dr. Daniel Kaiser, University of Minnesota*

Starter fertilizer is commonly used in Minnesota to speed up early plant growth with the intention of influencing yield. Increases in grain yield can be elusive and reports of yield increases are sometimes anecdotal such that the perceived benefits far outweigh the realistic expectations of yield responses. Due to the popularity of the practice research on the positive and negative implications of starter fertilizer have been conducted around the state. Studies on what source and rate to fertilizer to apply have shown positive yield benefits to the use of starter fertilizer for corn. Research also has shown negative aspects from over-application of fertilizer directly on the seed. A recent research project conducted on three soils in the greenhouse identified rates of several liquid and dry products that could be safely applied on the seed. This data could be used to develop methodologies for predicting how much fertilizer could be safely applied by knowing only the nutrient concentration and salt index of the fertilizer source. The results of this work will be discussed along with other research focused on utilization of starter for corn. The results of many studies have indicated that there may not be one best product to use on all acres and that some flexibility should be exhibited when choosing what should be used to ensure the greatest possible economic impact.

**CONCURRENT SESSION II – ROOM 208 AB**

8:00 & 1:25  **Now That the Weeds Have Our Attention: Lessons to be Learned**  
*Dr. Jeff Gunsolus, University of Minnesota*

Herbicide-resistant weeds continue to expand in range and several weed biotypes are resistant to multiple herbicide sites of action. Weeds have responded to the strong herbicide-based selection intensities that we have placed upon them. As a result the frequency and density of herbicide resistant weed populations has increased.
Now that the weeds have our attention how do we respond? This presentation will discuss some of the lessons learned from the past growing season; what is working and what is not working. Topics will include what you need to know about weed biology, herbicide resistance mechanisms, and crop and spray management in an effort to help you manage the risks associated with weed management for 2014 and into the future.

8:55 & 12:30 Return of the Seedbank: A Long-Term Perspective Towards Weed Management
Dr. Bob Hartzler, Iowa State University

Prior to the introduction of modern herbicides, cropping systems were designed to provide farmers every advantage possible to stay ahead of weed problems. With each new generation of herbicide, less emphasis was placed on mechanical and cultural practices. Roundup Ready crops were the culmination of the movement from integrated weed management to a chemical based system.

One approach to improved weed management is to view it as a long-term endeavor. Taking the long-view switches the focus from simply killing weeds to managing the weed seedbank. The importance of this strategy is that the seedbank is the real weed problem in the field - without a seedbank there would be no weeds. The goal of weed management should be to reduce the size of the weed seedbank, or in historically well-managed fields, maintain the seedbank at its current level. Managing the weed seedbank requires a basic understanding of the fate of weed seeds, including seeds recently shed by weed escapes and those already within the seedbank. This session will describe the numerous processes that influence the persistence of weed seedbanks, and opportunities that exist to manage fields in ways that enhance losses of weed seed.

10:15 & 11:10 Implications for Growers When Roundup Ready (RR1) Goes Off Patent
Dr. Jim Orf, University of Minnesota

The first generation Roundup Ready soybean trait (RR1) will come off patent in 2015. There are many implications that growers need to be aware of as this happens. The presentation will discuss the various forms of intellectual property protection including patenting (utility patents) and Plant Variety Protection (PVP). The first possibility of planting saved seeds from Roundup Ready (RR1) varieties will be for the 2015 soybean crop (using seed from the crop harvested in 2014). Many RR1 varieties will have intellectual property protection in addition to the RR1 trait, therefore soybean growers may not be able to use seed of those varieties for planting the 2015 crop. It is the responsibility of the soybean grower to be aware of restrictions, licenses or limits on how saved seed may be used in 2015 and beyond. We will review the options which Minnesota soybean growers will have to grow soybeans with the Roundup Ready soybean trait (RR1) from both private and public sources as well as yield results from replicated public trials.
Integrating Soybean Aphid and Soybean Cyst Nematode Management  
Mr. Michael McCarville, Iowa State University

Soybean aphids and soybean cyst nematodes (SCN) can interact through the soybean plant. Recent research has suggested soybean aphid feeding can increase SCN reproduction on both SCN-susceptible and SCN-resistant plants. The management of SCN is heavily reliant on the planting of PI 8877-derived SCN-resistant varieties, however SCN populations are increasing in their ability to overcome the PI 88788 resistance source. Therefore, it is increasingly important to manage any factor that increases SCN reproduction on SCN-resistant varieties. The presentation will cover recent greenhouse and field studies investigating the impact of soybean aphids on SCN reproduction. The presentation will also cover field trials from 2013 examining the potential of both foliar insecticides, insecticidal seed treatments, and host plant resistance to both manage aphid populations and their subsequent impact on SCN reproduction.

The Reality of Farming with Soybean Cyst Nematode: 2014 and Beyond  
Dr. Greg Tylka, Iowa State University

The soybean cyst nematode (SCN), Heterodera glycines, is a microscopic, plant-parasitic roundworm that infests much of the soybean-producing cropland in the Midwestern United States. Many people consider SCN to be the most damaging pathogen of soybeans in the country because it is widespread and can reduce soybean yields directly and indirectly. Concern about SCN among farmers and those who advise farmers seems to have waned in recent years, perhaps because of the threat of other invasive pathogens and insect pests. But SCN continues to affect the reality of soybean production in the region because of the nematode’s prolific reproduction, tremendous survival, and potential to cause significant yield loss. Simply put – long-term profitable soybean production is not likely in fields infested with SCN unless steps are taken to manage the nematode. The foundation of successful management of SCN is an understanding the basic biology of the nematode and how it interacts with other pathogens and pests and its physical environment. Research results will be presented and discussed concerning the current state of knowledge about SCN, its interactions with biotic and abiotic factors, and the effectiveness of resistant soybean varieties and nematode-protectant seed treatments in managing the pest.

Mite Have Seen It Coming: Neonicotinoid Insecticide Seed Treatments and Their Impact on Non-Target Organisms  
Dr. Adrianna Szczepaniec, South Dakota State University

Neonicotinoid insecticides are widely used to manage pests of crops, mainly as seed treatments that are often used as a preventative control measure. Increasing prevalence of these insecticides, however,
may have unanticipated effects on non-target organisms. In particular, increases in numbers of spider mites have been reported to follow applications of neonicotinoid insecticides. This presentation will summarize past and present research on spider mite outbreaks associated with the use of neonicotinoid insecticides, and their implications for sustainable management of pests of field crops.

**CONCURRENT SESSION IV – ROOM 205 CD**

**8:00 & 1:25**  
**Soybean Production Research: A National Approach**  
*Dr. Seth Naeve, University of Minnesota*

U.S. soybean growers are looking for alternative methods to increase soybean yields and recent increases in commodity prices have given producers more freedom to invest in additional crop inputs or products. Unfortunately, quality data from studies addressing multiple contemporary inputs is scarce. The objective of this work was to evaluate the effectiveness of combined soybean inputs on seed yield. These high input systems were tested in six states to evaluate their value across a broad geography. Evaluated in a drop-out system, a prophylactic application of pyraclostrobin at the R3 growth stage appeared to provide the greatest yield benefit of any additional products used in a combined high input treatment. Although not an input per se, narrow row spacing appeared to provide the greatest yield benefit of any treatments imposed. Preliminary results from a follow-up study in nine states in 2012 and 2013 will also be provided.

**8:55 & 12:30**  
**Nitrogen in Minnesota Surface Waters: Conditions, Sources, Trends and Reductions**  
*Mr. Dave Wall, Minnesota Pollution Control Agency*

River and stream monitoring results from over 700 sites (50,000 water samples) were analyzed to characterize recent surface water nitrogen conditions across Minnesota. The findings provide a clear picture of how nitrogen concentrations and loads vary in Minnesota. Nitrogen concentrations and loads are high throughout most of southern Minnesota (exceeding 5 mg/l) and are low in northern Minnesota. Fifteen southern Minnesota watersheds contribute 74% of the load to the Mississippi River, with the highest loads coming from the Minnesota River Basin in south-central Minnesota.

Statistical trend analyses at 51 river sites show how flow-adjusted nitrate concentrations have changed over time between 1976 and 2010. Mississippi River nitrate concentrations have more than doubled since the mid-1970’s and are still increasing. The Minnesota River nitrate levels remain very high, but show some recent signs of stability or improvement.

Nitrate reaches rivers from a variety of sources. The largest source is cropland, contributing an estimated 73% of the statewide load during an average precipitation year. The largest pathway to surface waters is row-crop tile drainage, followed by groundwater baseflow that originates under cropland. Cropland runoff contributes much less nitrate to surface waters compared to the subsurface
pathways. Wastewater point sources of nitrogen, dominated by municipal wastewater, contribute an estimated 9% of the load. The estimated sources correlated reasonably well with river monitoring results.

Progress can be made to reduce nitrate through widespread adoption of a series of best management practices, including optimal fertilizer rates and timing, tile drainage management and treatment, and strategic use of perennial vegetation. Minnesota state planning authorities have been using a spreadsheet tool (NBMP) that enables watershed planners to evaluate expected nitrogen reductions to rivers when different combinations of cropland BMPs and BMP adoption rates are considered.

10:15 & 11:10  Developing High-Efficiency Agricultural Systems: A Forever Green Agricultural Initiative
Dr. Donald Wyse, University of Minnesota

Over the last half century, ‘Green Revolution’ technologies have dramatically enhanced crop yields, but these increases have often come at the expense of food security and sustainability. Globally, many fear that agriculture is nearing a tipping point, with concerns that population pressure, declining natural capital, and diminished ecosystem service delivery will reduce global food security. As a result, a new Green Revolution is needed – a ‘Forever Green Revolution’ – that embraces continuous living cover on working lands through the development of a new suite of high yielding perennial and winter annual crops that improve multiple ecosystem services. By adding such crops to agricultural systems we can: enhance agricultural productivity, reduce soil erosion, support rural economic development, and provide major environmental benefits to all citizens. Since these systems have longer growing seasons, they are able to capture more solar energy, water, and nutrients than purely annual systems. This, in addition to a strong base of additional evidence, indicates that these new production systems can raise crop yields, produce new high-value commodities (food, feed, and biomaterials), enhance soil quality, provide wildlife habitat, increase species biodiversity, and improve water resources. Additionally, agricultural systems including perennial and winter annual crops may show greater resilience to climate change, as well as weed, disease, and insect pressures. In order to accomplish a ‘Forever Green’ landscape, we propose that a paradigm shift is required in three areas: 1) focus public plant breeding programs on continuous living cover development, 2) diversify and enhance agricultural stakeholder engagement in sustainable enterprise development, and 3) reevaluation of concepts of production and efficiency in agricultural systems.