2022 SOYBEAN MANAGEMENT FIELD DAYS

WORK SMARTER, NOT HARDER

Aug. 9 – Blue Hill, NE
Toepfer Farms

Aug. 10 – Central City, NE
Greg Greving Farm

Aug. 11 – Brownville, NE
Daryl Obermeyer Farm

Aug. 12 – Decatur, NE
Method Farms

4 Days, 4 Locations

Demonstration-based, Rotating Sessions with Interactive Discussion

9:30 a.m. - 2:30 p.m. * Complimentary admission and lunch

- Soybean Insect Management
- Soybean Disease Management
- Irrigation Management
  (Blue Hill, Central City, Decatur)
- Cover Crops (Brownville)
- Weed Management
- Ag Economics
- Precision Ag
- Biodiesel & Renewable Diesel: Fuels from the Farm

This booklet, recorded presentations from past field days, research results and more at:

enrec.unl.edu/soydays

Questions: 402-441-3240

NEBRASKA SOYBEAN BOARD

EXTENSION

University of Nebraska–Lincoln

2022 SOYBEAN MANAGEMENT FIELD DAYS

Scott Ritzman
Executive Director
Nebraska Soybean Board

Aaron Nygren
Nebraska Extension
Educator

Nebraska Soybean Grower,

On behalf of the Nebraska Soybean Board and Nebraska Extension welcome to our 24th year of the Soybean Management Field Days program. Our goal remains the same as the first field day – to help soybean growers maximize productivity and profitability through smart decisions and efficient use of resources. Meeting the world's growing food and energy needs starts right here in Nebraska – at the 2022 Soybean Management Field Days. Today's program represents a grass root approach to research and extension education. Members of the Nebraska Soybean Board who are soybean growers like yourself, have partnered with University research and extension professionals to identify questions and topics important to the profitability of your soybean enterprise. We have established demonstration plots for these topics with four soybean growers representing unique growing regions of the state .

We encourage you to ask questions and share your experiences during today's presentations. Contact information for each trainer is listed on the back page.

Again, thank you for investing your time in atending this field day and providing the world with a sustainable source of protein and oil.

Aaron
Aaron Nygren
Nebraska Extension Educator

Scott
Scott Ritzman
Executive Director
Nebraska Soybean Board

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Soybean Disease Update: Choose A Fungicide to Target a Specific Disease

Dylan Mangel
Nebraska Extension
Plant Pathologist

This year's mixed bag of weather conditions and storms put stress on plants and opened the door for disease-causing pathogens. We will examine what diseases have been problematic and what the best approaches are for managing them in various situations.

Nebraska has experienced mixed weather conditions this spring which have in some cases increased the chance of observing disease in soybean fields. When making management decisions about disease it is important to take the following steps to ensure your management decision is effective. First, ensure the symptoms that you are observing are caused by disease, and not environmental or other conditions like drought stress or herbicide damage. Second, determine which pathogen you are observing, and last, apply a pesticide which has proven efficacy on the given pathogen.

A few diseases you may have seen or can expect to see in Nebraska this season are persistent seedling diseases, bacterial diseases like bacterial blight and bacterial pustule, frogeye leaf spot, soybean cyst nematode, sudden death syndrome, and white mold.

Phytophthora Root and Stem Rot

The persistent seedling disease, Phytophthora root and stem rot (PRSR), has developed in plants in some soybean fields that received rain in recent weeks. The fungal-like organism causing PRSR, Phytophthora sojae, requires moisture for swimming zoospores to be produced and swim to roots for infection. PRSR causes the most damage as a seedling disease but can develop and kill plants throughout the entire season, differentiating it from other seedling disease. Affected plants often have a prominent dark lesion on the lower stems (Figure 1). PRSR can develop in single plants randomly scattered around the field or in low, wet areas.

Figure 1: Phytophthora root and stem rot (PRSR) can cause severe root rot, wilting, and often development of a dark lesion near the bottom of the plant.

Frogeye Leaf Spot

Early frogeye leaf spot (FLS) lesions look like water spots and later turn gray to brown with dark purple margins (Figure 2). When the lesions are younger, they are smaller in size. As the spots age they grow larger. If there are too many spots on the leaf, they can merge and lose their circular shape, and blight larger areas of the leaf. Since 2019, FLS populations in 48 Nebraska counties have been identified to be resistant to QoI fungicides (Group 11) (Figure 3). This resistance means that FLS in Nebraska can no longer be effectively controlled with Group 11 fungicides. To improve efficacy, treat FLS with fungicides that contain multiple non-group 11 modes of action.

Figure 2: Frogeye leaf spot on soybean

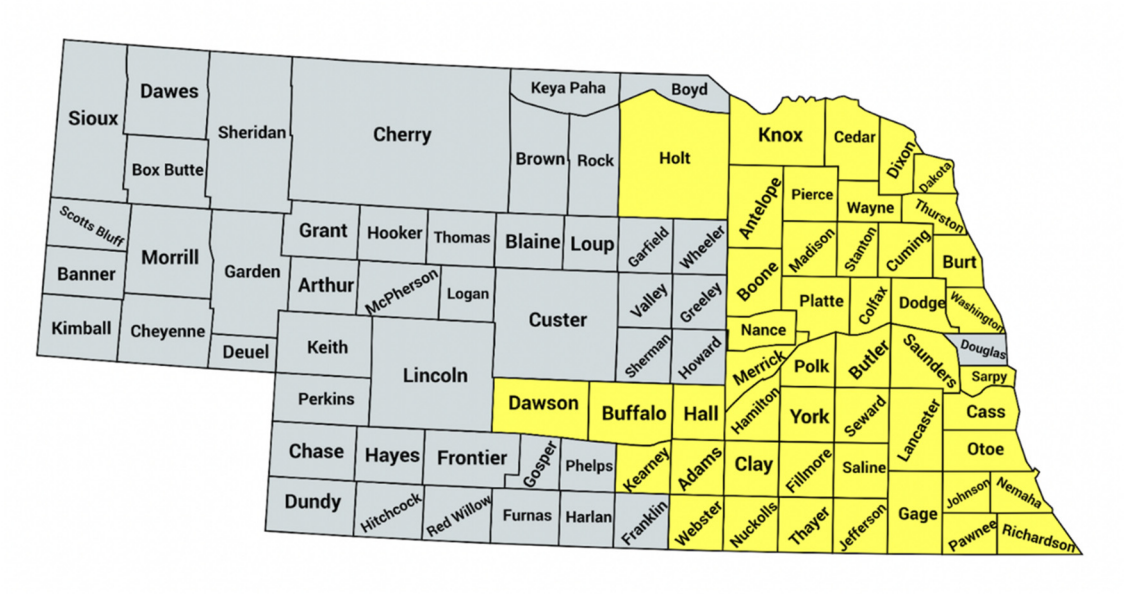


Figure 3: Group 11 QoI fungicide resistance confirmed in the frogeye leaf spot fungi population in 48 highlighted Nebraska counties

Soybean Cyst Nematode

Damage caused by soybean cyst nematode (SCN) is often under-estimated. The nematode can cause up to 30% yield loss with no above-ground symptoms. Use of crop rotation and SCN-resistant soybean varieties can be an effective combination to manage SCN. However, adaptation of SCN to resistant varieties has significantly reduced their efficacy, especially to PI 88788, the most common source of resistance used in resistant varieties during the last decade. In Nebraska, almost 50% of SCN populations can reproduce on soybean varieties with PI 88788 resistance. In some states, 100% of SCN populations can reproduce on these commonly used varieties.

SCN management recommendations are to rotate the use of resistant varieties whenever possible, including varieties with other sources of resistance, such as Peking. However, options are sometimes limited in maturity groups best suited for production in Nebraska. Recently, 2 varieties were released that contain another source of resistance, PI 89772. Although this source of resistance has only recently become

available, it was identified long ago and has been part of past research trials. Results from research conducted by Kyle Broderick, UNL, show that more than 25% of Nebraska SCN populations could already reproduce on PI 89772 as of 2014. These results imply that we still must use caution to use this, and other, sources of resistance as part of a carefully planned rotation of resistant varieties and crops to effectively manage SCN long-term. Be sure to monitor your SCN population densities every 2 to 3 years by collecting and submitting samples for FREE analyses to the UNL Plant & Pest Diagnostic Clinic.

Sudden Death Syndrome

Foliar symptoms of sudden death syndrome start with interveinal necrosis. Spots coalesce to form brown streaks with yellow margins between the leaf veins (Figure 4). Leaves eventually drop, leaving the petiole (leaf stem) attached. The root system will have a deteriorated tap-root and lateral roots will only be evident in the upper soil profile. Plants will typically pull very easily and there may be a dark blue fungal growth on the roots.

Figure 4: Leaf damage from sudden death syndrome

Figure 5: White mold on soybean

White Mold

White mold or Sclerotinia stem rot is a disease that starts earlier in the season during flowering. Plant infection occurs on the senescing flower which is used by the fungus as a food source. Infections in soybean typically start at a node. You can tell when the infection occurred based on how high up the plant the stem l during years with temperatures greater than 85°F during flowering, there is a esions and fungal growth are. Infection is dependent on temperature and much lower risk of development. The optimum temperature for growth of this fungus is 75°F.

Typically, plant symptoms will not appear until you notice individual or small pockets of dead or dying plants. Upon close inspection you will see a white cottony fungal growth on the stems (Figure 5). You may also see dark black bodies (sclerotia) of the fungus on the stems. If it is drier and plants are dead, the stems will be very light (bleached) in color. When dead stems are split, often you will see the sclerotia inside.

TAKE HOME POINTS:

- Make sure to identify the pathogen in your field so you can target it with the most effective fungicide.
- Phytophthora root and stem rot can best be managed with them use of seed treatment fungicides specific for Phytophthora root and stem rot and selection of soybean varieties with effective race-specific Rps genes.
- Group 11 QoI (formerly Strobilurin) fungicide resistance has been confirmed in the frogeye leaf spot fungus in 48 Nebraska.
- White mold can only infect soybean plants during flowering and when weather conditions are favorable. Fungicide management is effective when these conditions are met.

Resources for Proper Identification and Fungicide Selection

If you are uncertain what disease is causing damage to your field, I encourage you to send samples to UNL's Plant & Pest Diagnostic Clinic

Cropwatch Soybean Disease Resources

Regional Foliar Fungicide Efficacy Ratings (Crop Protection Network)

UNL Plant and Pest Diagnostic Clinic

New Irrigation Scheduling Software to Make the Process Quicker and Easier

Steve Melvin
Nebraska Extension Educator,
Irrigated Cropping Systems

Bruno Patias Lena
Nebraska Extension Educator,
Water and Integrated Cropping Systems

Irrigation management is critical to optimize both yields and water resources. With so many factors to consider, we will demonstrate new irrigation scheduling software that helps easily put all the pieces together.

Authors: Steve Melvin, Nebraska Extension Educator, Irrigated Cropping Systems; Bruno Patias Lena, Nebraska Extension Educator, Water and Integrated Cropping Systems; Christopher Neale, Director, Water for Food Institute; and Mitch Maguire, Post-Doctoral Research Associate

Deciding when to irrigate and selecting how much water to apply per irrigation are longtime challenges. Over the years several irrigation scheduling tools have been developed to help make these decisions. The process is fairly straightforward and easy to understand. All that needs to be done is to keep track of how much water is added to the soil from rain and irrigation, plus how much water is used by the crop, soil surface evaporation and any deep percolation. However, as you can imagine, the challenge is in getting these numbers figured out correctly for each day is very difficult and time consuming.

This summer we are field testing the **Spatial EvapoTranspiration Modeling Interface (SETMI)** model that strives to not only keep track of the current soil water status, but also predict the rest of the irrigation season using historical weather data. The overall goal is to make a quick and accurate method for farmers to schedule their irrigations.

At its core, the SETMI model keeps track of how much water is within the rootzone of a crop and how much water is available for the crop to use before water stress occurs. Knowing this information about soil water content, SETMI is able to determine how much irrigation should be applied and when it should be applied. The following is a basic explanation of how SETMI works, what data is needed in order to run the model, and what outputs are provided for scheduling irrigations.

What is SETMI?

SETMI uses what is called a water balance model that tracks the different amounts of water entering and leaving a field which includes precipitation, irrigation, runoff of water during precipitation events, deep percolation of water into soil layers below the rootzone, and evapotranspiration. While items like precipitation and irrigation are easier to determine, the runoff, deep percolation, and evapotranspiration are not so easy and must be estimated or modeled. If the different amounts of water entering or leaving the field can be measured or modeled on a daily basis, then the amount of water within the soil can be tracked. Equation 1 shows the method of how the different sources of water entering and leaving a field are accounted for on daily basis, where SWC_{today} and $SWC_{yesterday}$ represent the soil water content (*SWC*) for today and yesterday, respectively, *Precip* represents the precipitation received, *Irr* represents the irrigation applied, *RO* represents the amount of water runoff from the field that occurred during a precipitation event (if there was precipitation), *DP* represents the deep percolation or infiltration of water below the crop rootzone, and *ET* represents the water lost from evaporation from the soil surface and from crop transpiration. To track the soil water content over time, Equation 1 is used every day where the current day soil water content is used as the starting soil water content for the next day. Runoff (*RO*) is determined using a method provided by the NRCS. This method determines the amount of water that runs off the field during a precipitation event and is dependent upon the amount of precipitation received and the field characteristics like soil type and whether the field is sloped. Deep percolation (DP) is the amount of

water that infiltrates through the soil below the crop rootzone, which means this water is no longer accessible to crops. Deep percolation typically occurs after precipitation events when the soil water content is wet enough that the soil can no longer store water.

$$SWC_{today} = SWC_{yesterday} + Precip + Irr - RO - DP - ET \qquad \text{(Equation 1)}$$

The term evapotranspiration, also known as ET, is the amount of water that leaves the field through evaporation from the soil surface and through transpiration of crops. The term ET is usually denoted as mm/day or inch/day of water leaving the field and is very important when it comes to tracking the amount of water within the soil. ET for a well-watered corn or soybean field at its peak growth stage is typically between 0.2-0.4 inches/day where ET is the major mechanism of water leaving the field. There are different methods of measuring and modeling ET on a daily basis. Given that measuring ET within a field is not feasible in most scenarios, the next best option is to model it, which is what SETMI does.

SETMI uses what is called the crop coefficient method to estimate ET within a field, with the equation for this method shown in Equation 2. The ET_r in Equation 2 represents reference ET, which is used to denote how much water that could be potentially lost through ET from an alfalfa surface that is well-watered. The purpose of using an alfalfa-based reference ET is to obtain a standardized way of estimating how much water is lost from a known surface, which can then be used to estimate ET for other crops such as corn and soybean. SETMI uses the American Society of Civil Engineers Penman-Monteith approach for calculating ET_r which requires meteorological data such as solar radiation, air temperature, air humidity, and wind speed. For more information on reference ET, please visit the UNL CropWatch website at https://cropwatch.unl.edu/et_resources.

The K_e term in Equation 2, known as the evaporative coefficient, represents the fraction of water that is lost to evaporation from the soil surface, where the value of K_e is dependent on whether the soil surface is wet or dry. The K_s term in Equation 2, known as the stress coefficient, represents whether the crop is undergoing water stress or not. A crop undergoing water stress will have a lower transpiration rate compared to a well-watered crop, where K_s is equal to 1 when the crop is not water stressed and K_s is less than 1 when the crop is undergoing water stress. For most irrigated fields, the goal is to avoid crop water stress meaning that the value of K_s is typically 1.

The K_{cb} term in Equation 2, known as the basil crop coefficient, represents the amount of water lost through crop transpiration. The value of K_{cb} changes throughout the growing season, with K_{cb} starting from a small value (0.1) at crop emergence and then increases as the crop reaches full canopy (~1.0). The value of K_{cb} is related to the current growth stage of the crop. Due to this relationship, satellite images (or images from drones or manned aircraft) can be used to estimate K_{cb}. SETMI uses satellite images to estimate K_{cb}, which provides a more real-time method of obtaining the K_{cb} of a field.

$$\mathrm{ET} = (\mathrm{K_{cb}K_s} + \mathrm{K_e})\mathrm{ET_r} \qquad \text{(Equation 2)}$$

In order to calculate ET on a daily basis, there is a need to know the K_{cb}, K_e, and K_s terms on a daily basis. SETMI is able to model these terms through different methods. The K_e term is dependent upon whether the soil surface is wet or dry, and SETMI is able to determine this through recent precipitation events. The K_s term is calculated based on a certain soil water content threshold. Once the soil water content drops below a certain threshold (the water stress threshold), the K_s term begins to decrease from its initial value of 1. The K_{cb} term represents the current growth stage which SETMI determines through satellite images. SETMI uses satellite images to first model K_{cb} on days with images. It then interpolates K_{cb} in time between satellite images using growing degree days to develop what is called a crop coefficient curve, which can be seen in Figure 1. This crop coefficient curve provides K_{cb} on a daily basis which is then used in Equation 2 to estimate ET.

An additional factor that is important in managing irrigation is the crop root depth, as root depth plays a role in the amount of water that is available to crops for growth. SETMI uses a minimum and maximum root depth that is specified by the user as different crops have different maximum root depths. SETMI models the growth of roots in a linear fashion, where the maximum root depth is reached when the maximum K_{cb} is reached. Once the maximum root depth is reached, it does not decrease like K_{cb}.

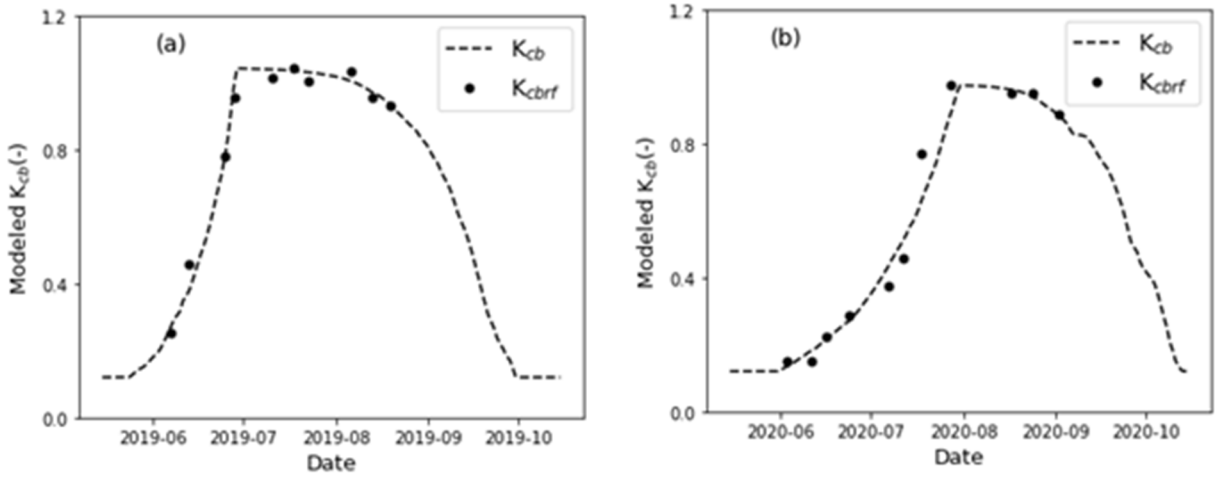


Figure 1. K_{cb} curves generated by SETMI using satellite images for (a) corn and (b) soybean.

After measuring (precipitation, irrigation) and modeling (runoff, deep percolation, ET) the different sources of water entering and leaving a field, the soil properties can be used to determine when irrigation is needed. Figure 2 displays the different sources of water entering and leaving the field as well as the soil field capacity (FC) and wilting point (WP). Field capacity is a soil property that represents the maximum amount of water that a soil can store, and wilting point represents the soil water content level where crops are no longer able to extract water from the soil. Crop water stress typically occurs at a soil water content at the middle point of field capacity and wilting point; however, this level is crop specific and may vary slightly between different crops. When managing irrigation, the term Management Allowable Depletion (MAD) is used to define how much water will be allowed to deplete from the soil before irrigation is required. A typical MAD is about 50%, which means if the soil water content at field capacity is %40 and at wilting point it is 20%, an irrigation would be needed once the soil water content reaches 30%, or when depletion of soil water content is 50% of the difference between field capacity and wilting point.

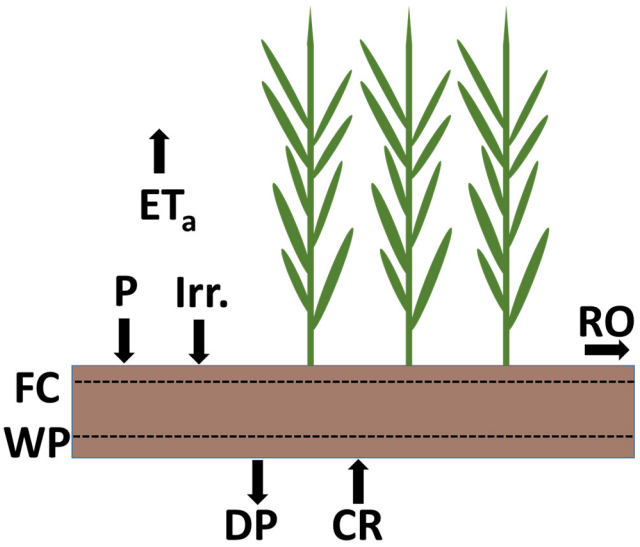


Figure 2. Diagram showing the different water sources entering and leaving a field along with the soil field capacity (FC) and wilting point (WP).

In order to run SETMI, there are various data sources required:

- Satellite images to model the K_{cb} curve.
- Weather data like precipitation events, air temperatures, and reference ET obtained from a nearby public or private weather station.
- Soil property data obtained through the USGS SSURGO database.
- Any irrigation events that are applied throughout the growing season.

After running SETMI, the model outputs various information shown in Figure 3. Figure 3d shows the reference ET (ET_r) and estimated crop ET using the crop coefficient method from Equation 2. ET is typically less than ET_r early in the growing season as the crops are young while ET is more similar to ET_r in the middle of the growing season as crops are more mature and are transpiring more. Figure 3c shows the K_{cb} curve along with the estimated K_e and K_s. Figure 3b shows when and how much irrigation is needed. Figure 3a shows the precipitation and irrigation events along with soil water content depletion and soil water content at the 50% MAD level. The black dashed line in Figure 3a represents the soil water depletion (how much water has left the soil from the field capacity soil water content), and the red dashed line represents the depletion of soil water content at %50 MAD. To avoid

crop water stress, the black dashed line should always stay above the red dashed line. Whenever the black dashed line is close to the red dashed line, an irrigation is applied. This ensures that the crop has enough water and does not undergo water stress.

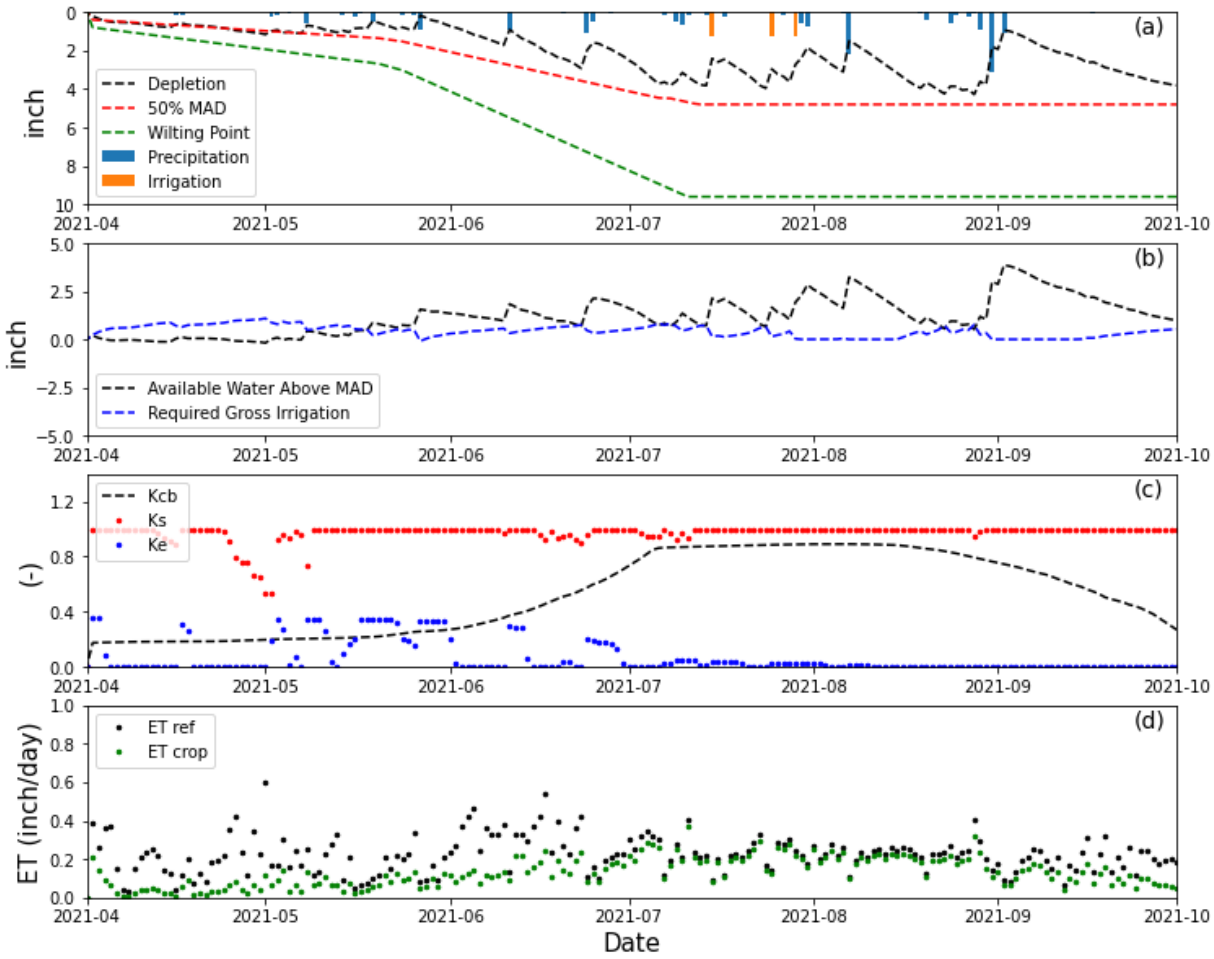


Figure 3. Outputs from the SETMI model. (a) SETMI water balance showing soil water content depletion, precipitation, and irrigations. (b) Timing of required irrigation and depth of irrigation needed. (c) SETMI modeled crop coefficient variables. (d) Reference ET (ET ref) and estimated ET of the crop (ET crop) from the crop coefficient method.

Soil Microbes Benefit from Cover Crops

Katja Koehler-Cole
Soil Health Management
Extension Educator

- Rye cover crop can improve soil microbial abundance
- Soil bacteria populations increased more than fungal populations
- Increasing cover crop biomass may lead to greater benefits

Background and justification

The formation of soil organic matter, the breaking down of plant residue and the release of plant available nutrients are all carried out by soil organisms. Planting a cover crop between main crops can improve the conditions in the soil for these microbes. Cover crop roots leak simple sugars and amino acids, and these root exudates are a preferred food sources for a multitude of soil organisms. The space adjacent to living plant roots, called the rhizosphere, is where most soil microbes live, illustrating the importance of plant roots as habitat.

Bacteria are the most prevalent microbes in agricultural soils. They break down simple organic compounds such as the ones found in fresh cover crop residue, are hardy and can quickly reproduce. **Fungi** are more delicate than bacteria and are disturbed by tillage. *Saprophytic fungi* can break down more complex organic compounds, such as the ones found in corn stalks. *Arbuscular mycorrhizal fungi (AMF)* colonize plant roots, and transfer nutrients to the plant in exchange for sugars from the plant. Fungi are essential in forming soil aggregates by excreting glomalin, a glue-like substance that binds soil particles.

Increasing the amount of living plant roots in the soil, for example by using winter annual cover crops such as cereal rye, may lead to greater microbial activity which in turn may improve soil structure and nutrient cycling. Further, nutrient uptake by the plant itself may reduce contamination of groundwater and surface water, a reason why cover crops are now subsidized in several states.

Our objectives for this study were to increase soil microbial abundance, especially that of fungi, by using a winter cover crop before soybean. In addition, we wanted to document the effect of the cover crop on soil nutrients.

Our research questions were:

1. Can rye cover crops growing before soybean increase microbial abundance as a whole?
2. How do rye cover crops influence different groups of soil microbes?

Research methods

This report includes results from trials at Soybean Management Field Day sites near Pilger, Plymouth and Waverly. Cereal rye was planted at 60 lb/a in November of 2018. We compared plots with cereal rye to plots without cereal rye (control plots), a total of 8 plots per site. Soybean were no-till planted in mid-May and cereal rye terminated with glyphosate within 5 days after soybean planting. Soil properties for the three sites are in Table 1.

Table 1. Soil properties at the three on-farm sites

Site	Chemical soil properties					Soil texture			
	pH	OM	NO3-N	K	P	Sand	Silt	Clay	Texture
		%	ppm			%			
Pilger	6.2	1.3	8.7	145	176	78	9	13	Sandy Loam
Plymouth	6.5	3.1	5	305	49	18	45	37	Silty Clay Loam
Waverly	6.5	3.6	8.4	253	33	48	13	39	Sandy Clay

Rye biomass was measured just before termination in May and is reported as dry matter. We took 10 soil samples (4" depth) in May from the plots without cover crops (NONE treatment) and from the plots with cereal rye cover crop (RYE treatment). Soil microbial abundance was assessed using phospholipid fatty acid analysis (PLFA) which shows different microbial groups (bacteria, AMF, saprophytic fungi, and many others) present in the soil and their abundance. Total microbial biomass is the sum of the microbial biomass of each group. All soil tests were carried out by Ward Laboratories in Kearney, NE.

For statistical comparisons, an ANOVA was conducted in Proc Glimmix using a significance level of 0.1. Random variables were block and site and the fixed variable was treatment (rye or control).

Results

Rye produced moderate amounts of dry matter, around 1,000 lb/a. This was likely due to the late planting date.

We found greater total microbial biomass in the cover crop plots (Figure 1). The increase in total microbial biomass was mostly due to the higher numbers of bacteria in cover crop plots (Figure 2). Bacteria can quickly increase their population when conditions in their environment improve, for example when a cover crop is grown.

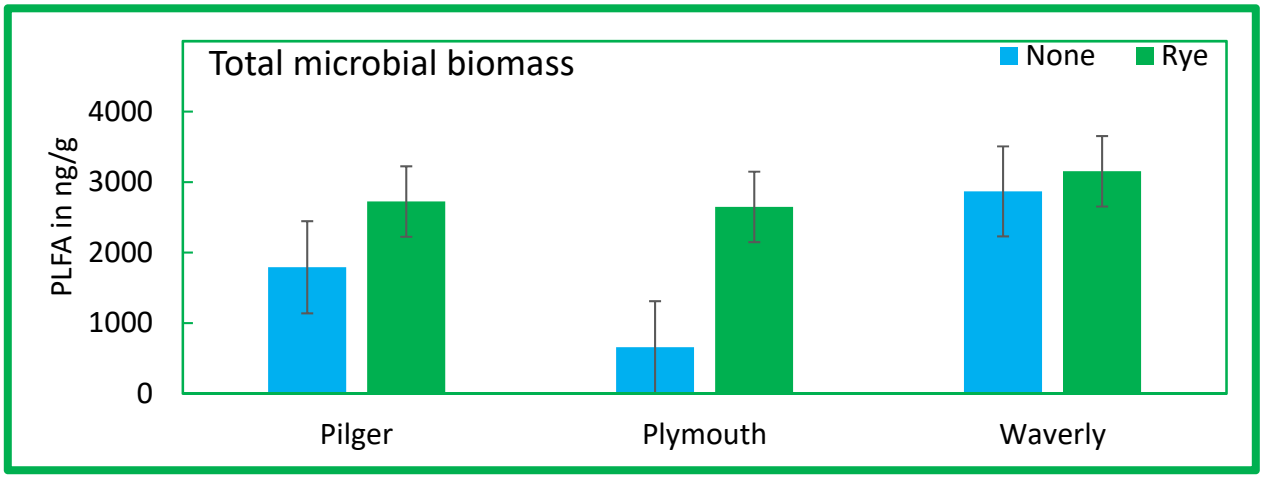


Figure 1. Total soil microbial biomass (the sum of all microbial groups) at the Pilger, Plymouth and Waverly sites. The green bars indicate plots with a cover crop (RYE) and the blue bars are the control plots without a cover crop (NONE). Microbial biomass is measured in PLFA (phosphor-lipid fatty acids) in ng/g. Lines above bars denote standard errors.

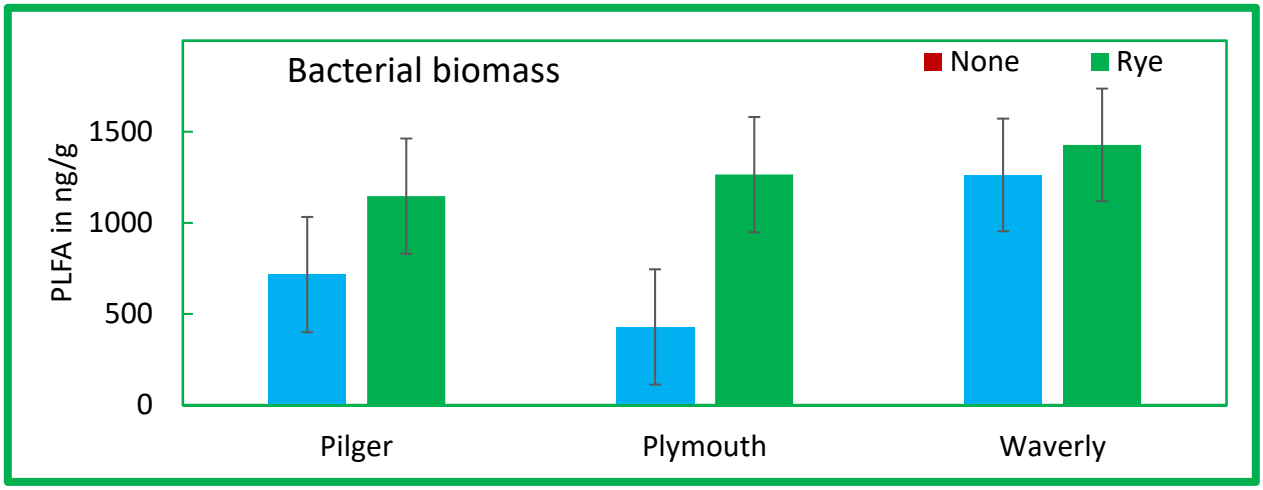


Figure 2. Bacterial biomass in the soil at the Pilger, Plymouth and Waverly sites. The green bars indicate plots with a cover crop (RYE) and the blue bars are the control plots without a cover crop (NONE). Microbial biomass is measured in PLFA (phosphor-lipid fatty acids) in ng/g. Lines above bars denote standard errors.

When looking at fungi populations (Figures 3 and 4), we notice that AMF populations are similar between the treatments. There seems to be a trend of greater saprophytic fungi populations in cover crops than in control plots. However, this was not a significant difference.Soil fungi populations may not have responded to the rye cover crop, because of several reasons. Rye did not produce much biomass, so there was likely not a great amount of root exudates available that could have supported more microbes. Building up fungi populations may take several years of cover cropping, but this was only the first year at this site. Site-specific conditions, such as weather, soil nutrients, texture and organic matter concentrations also impact soil microbial populations.

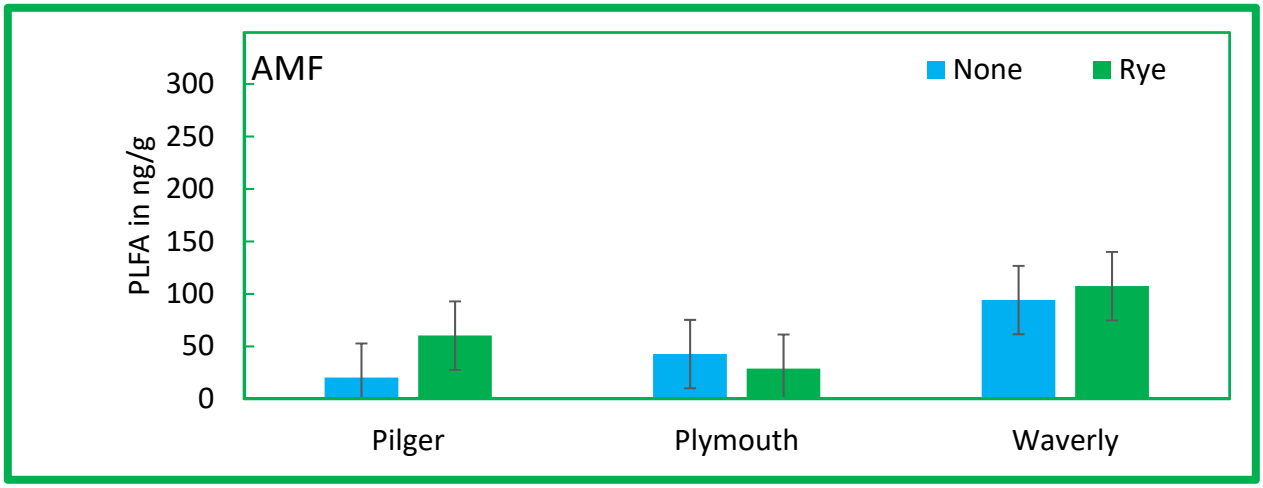


Figure 3. Biomass of arbuscular mycorrhizal fungi (AMF) in the soil at the Pilger, Plymouth and Waverly sites. The green bars indicate plots with a cover crop (RYE) and the blue bars are the control plots without a cover crop (NONE). Microbial biomass is measured in PLFA (phosphor-lipid fatty acids) in ng/g. Lines above bars denote standard errors.

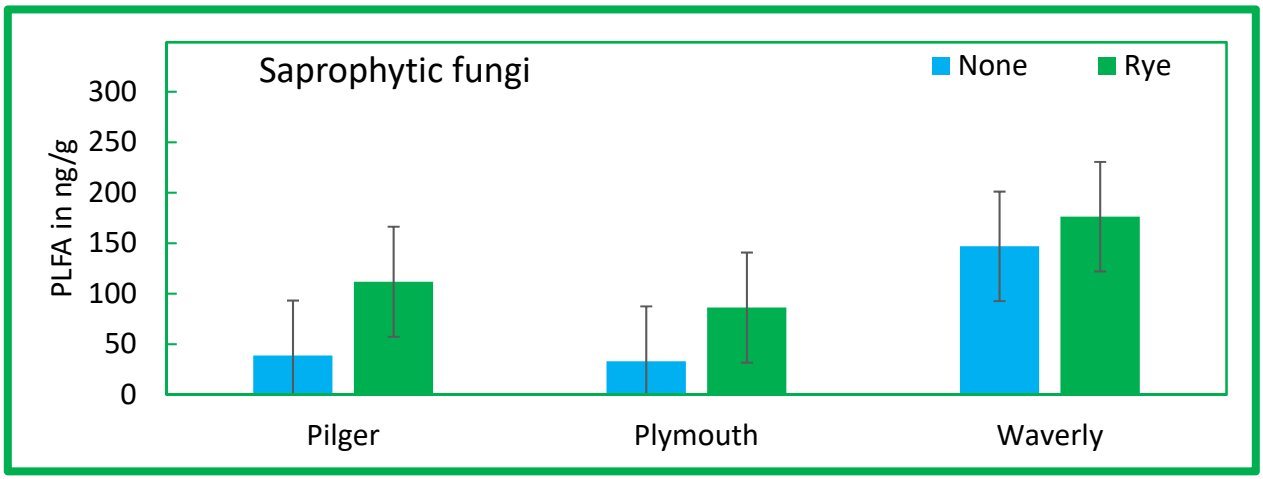


Figure 4. Biomass of saprophytic fungi in the soil at the Pilger, Plymouth and Waverly sites. The green bars indicate plots with a cover crop (RYE) and the blue bars are the control plots without a cover crop (NONE). Microbial biomass is measured in PLFA (phosphor-lipid fatty acids) in ng/g. Lines above bars denote standard errors.

TAKE HOME POINTS:

- Improved overall soil microbial abundance, in particular bacteria
- Could improve soil structure
- Larger and more stable aggregates

Planter's Downforce

Luan Oliveira, Aaron Nygren, Bruno Lena, Nate Dorsey

Luan Pereira de Oliveira
Nebraska Extension Educator,
Water and Integrated Cropping Systems

How can precision ag be implemented in soybean production? We will discuss planter settings, provide a drone demonstration and answer questions on how you can make it work for vou.

How is Downforce Margin Calculated?

Row-Unit Weight + Downforce (Hydraulic, Pneumatic, or Mechanical) – Soil Penetration Resistance = Downforce Margin

Downforce systems on the market

- Hydraulic (Figure 1 A), uses hydraulic fluid to adjust the downward forces on individual row-units, allowing it to immediately react and change loads to different soil conditions. This system allows the loads pre-settings from in-the-cab. Some commercial systems work automatically, applying uplift or downforce to keep a pre-set downforce target.
- Pneumatic (Figure 1 B), uses inflatable airbags to increment row-unit downforce. This system uses an air compressor to fill the airbags, the system control could be in or outside of the cabin.
- Mechanical (Figure 1 C), uses uncompressed springs to apply downforce on individual row-units. This system is the most known and used worldwide. The loads must be set using the mechanical notch.

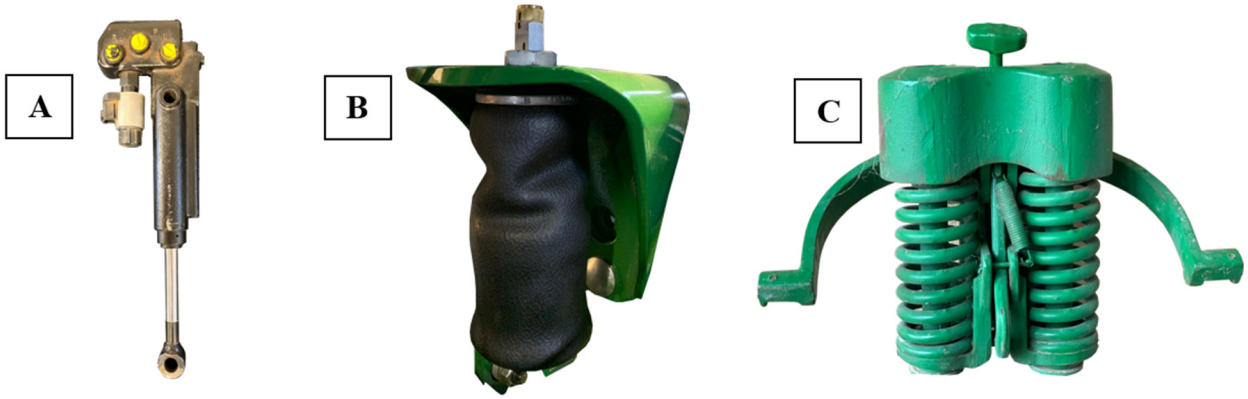


Figure 1: Downforce systems A: Hydraulic; B: Pneumatic; C: Mechanical.

Influence of Downforce on Row-Unit Vibration

The soil reaction force for the opening disks and gauge-wheels can cause row-unit vibration increase. In this study, we tested different downforce loads using a mechanical downforce system (springs), and different planter speeds with the objective of capturing the row-unit vibration using one device called an accelerometer.

In Figure 2, it is possible to visualize that when the downforce was incremented from Zero Downforce (0 lbs) to High Downforce (375 lbs) the row-unit vibration was decreased. The vibration was also decreased when the speed was reduced, and when operating in high speeds (7.5 mph), row-unit vibration was lower at the high downforce setting.

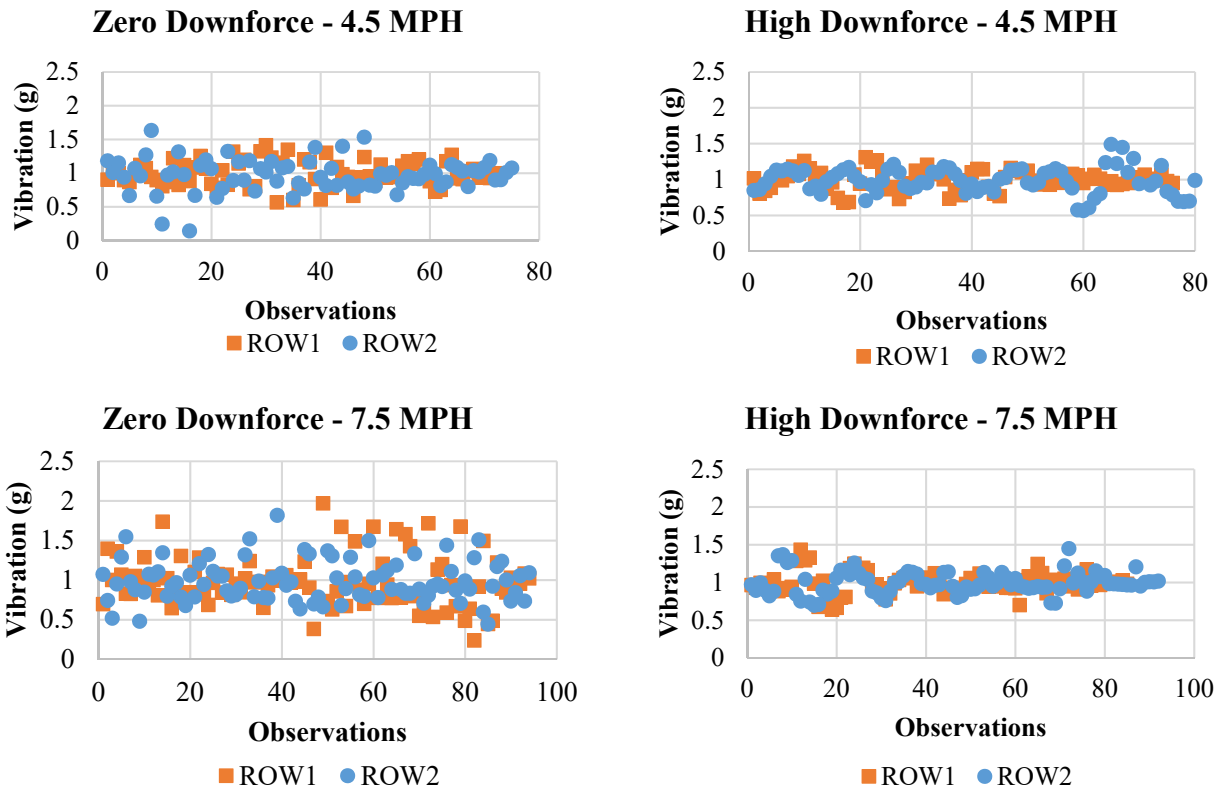
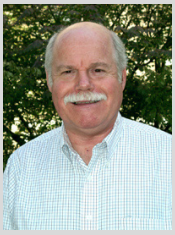


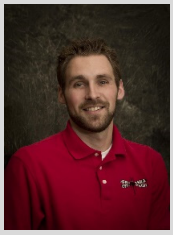
Figure 2: Row-unit vibration when submitted to different downforces and speeds

Strategies for Soybean Gall Midge and Dectes Stem Borer

Tom Hunt
Nebraska Extension Entomologist



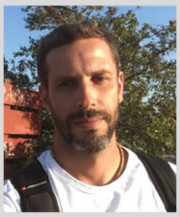
Robert Wright
Nebraska Extension Entomologist



Justin McMechan
Crop Protection and Cropping Systems Specialist

Ron Seymour
Nebraska Extension Educator

Gabi Carmona



Matheus Ribeiro

University of Nebraska Post-Doctoral Research Associates

Natasha Umezu
UNL Masters Graduate Student

What pests are most troublesome in your operation? We'll look at what growers are seeing in their fields and discuss the best management approach for various situations. This includes soybean gall midge (Brownville, Decatur) and stem borer (Central City, Blue Hill)

Soybean Gall Midge: A New and Emerging Pest of Soybean

Distribution and Adult Activity

Soybean gall midge (SGM) was identified as a new species in 2019 in the Midwest of the United States and has been causing extensive injury to soybean in parts of eastern Nebraska (Fig. 1) as well as western Iowa, southwestern Minnesota, and eastern South Dakota.

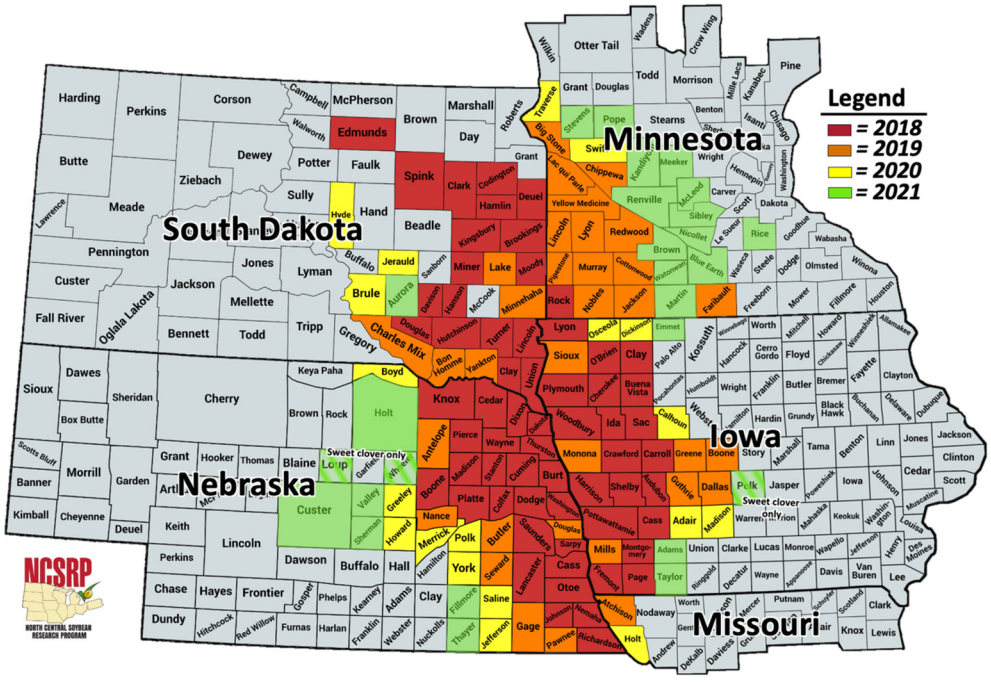


Figure 1. Counties where the presence of soybean gall midge has been documented in 2018, 2019, 2020 and 2021.

Adult Emergence

Since 2019, soybean gall midge adult emergence has been monitored from last year's soybean fields at approximately 30 locations per year across four states with support from the Nebraska Soybean Board and North Central Soybean Research Program. First adult detection from last year's soybean typically occurred in early- to mid-June. Duration of adult emergence varies considerably between sites within a year, however, we observed an increase in the number of days that adults emerge from last years soybean from 2019 (16.0 days), 2020 (25.6 days), and 2021 (34.2 days). Duration was reduced in 2022 with an average of 22.4 days of emergence. An overlap in adult emergence from last year and this year's soybean has been observed since 2019. This extended and overlapping adult emergence poses a significant challenge for managing soybean gall midge.

The interaction between rainfall and adult emergence was studied in the field and growth chamber this season. Results from the field show an increase in adult emergence with excessive rainfall, however, further studies will be needed to study this interaction. In addition, growth chamber experiments show that soybean gall midge needs some water to emerge as adults but too much can reduce total emergence.

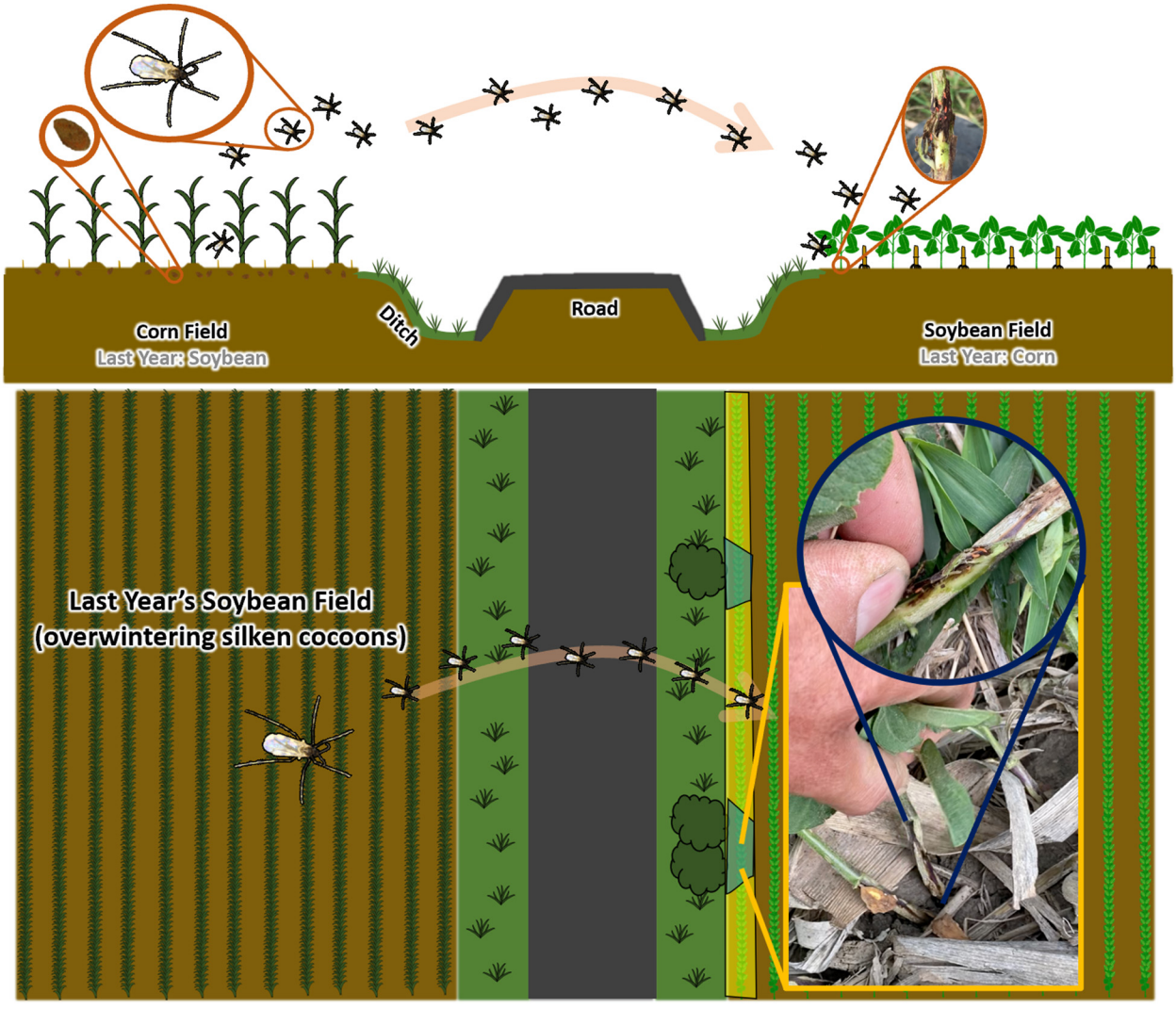


Figure 2. Soybean gall midge overwintering emergence from last year's soybean field and the movement of adults to adjacent soybean fields.

Scouting

It's important to determine if you have soybean gall midge in your field even if you don't see signs of dead or dying plants. To scout for soybean gall midge, focus on the edge of the field, especially in soybean fields that are adjacent to a field that was soybean theprevious year (Fig. 2). Look for signs of wilting or dying soybean plants. Approximately two weeks after adult activity, dark discolorations become visible at or near the soil surface. Peel back the outer layer of tissue on these areas and look for the presence of orange or white larvae.

If you experience hail late in the season (late-July through August) be sure to scout your soybean fields approximately two weeks after the hail event. Studies conducted in east-central Nebraska have shown an increase in larval number per plant after late-season hail events. Larvae were found on the plant in areas where wounding occurred on the stems from hail stones. An increase in the abundance of larvae per plant could pose an increased risk to adjacent fields the following year.

Management

Several studies are being conducted this season to evaluate the efficacy of seed treatments, in-furrow, and foliar insecticides, host plant resistance, and cultural control strategies on soybean gall midge. Nebraska Soybean Board funded studies have shown a lack of potential interactions between soybean gall midge and plant diseases. In addition, field studies have shown that planting date of soybean can impact the extent of injury from soybean gall midge. Planting dates (early- to mid- May) that result in V2 at first adult emergence are most susceptible to plant injury. Of the insecticide treatments tested, none evaluated during the 2022 season completely eliminated the soybean gall midge, however, some chemistries, especially in combination with cultural control strategies (planting date) showed early season potential to mitigate soybeangall midge injury to soybean plants. In 2021, ridge tillage or hilling soybean at the V2/V3 had a significant reduction in larval number and injury with a high potential as a control strategy in 2021. This strategy was further explored in 2022 to better understand the interaction between the timing of infestation of soybean gall midge and its impact on yield. Data on hilling at different times during soybean development as well as the unhilling of soybean that were hilled early in the season, will be presented. The adoption of hilling as a management strategy will be difficult for many soybean growers, especially those using 15-inch

TAKE HOME POINTS:

- Soybean gall midge is a new species causing significant injury to soybean in eastern Nebraska
- The long duration of adult emergence from last year's soybean fields will make management difficult
- Scouting for soybean gall midge in early- to mid-August is important to determine risk for the following year
- Hail damage to soybean late in the season could increase risk to adjacent soybean fields the following year.
- Several studies have been conducted on insecticides but very few show consistent control of soybean gall midge
- Hilling soybean at V2 is very effective against soybean gall midge but it is unlikely to be adopted due to its conflict with current management practices.

Soybean Stem Borers in Nebraska

Robert J. Wright, Extension Entomologist
Thomas E. Hunt, Extension Entomologist

NebGuide 2082

Identification, life cycle, injury symptoms, and cultural and chemical management of soybean stem borer.

The soybean stem borer, *Dectes texanus texanus*, is a long-horned beetle (Family Cerambycidae) native to the central U.S. It has a wide host range, including soybeans, sunflowers, and several broadleaf weeds, including cocklebur, ragweed, and wild sunflowers.

Soybean stem borer injury can be found in some south central Nebraska soybean fields. This beetle has been moving into Nebraska from north central Kansas over the last decade. It was first documented as a soybean pest near Hardy in Nuckolls County in 2000, and has been moving into south central Nebraska since then. Soybean stem borer injury has been reported on soybeans in Fillmore, Clay, and Saline counties and surrounding areas to the west, east, and south.

Description and Life Cycle

The adult is a gray, elongate beetle about 1/2 inch long with antennae that are longer than the body (*Figure 1*). The antennae have alternating black and gray bands. Females lay eggs singly from late June to August on various plants, including cocklebur, giant ragweed, sunflower, and soybean. On soybean, eggs are primarily laid in the leaf petioles.

Larvae feed within the petiole and tunnel down into the main stem. Each of four larval stages tunnels up and down the stem. Larvae are cream-colored, legless, and widest at the head with the body gradually narrowing to the tail end (*Figure 2*). Larvae are 1/2 to 5/8 inch long at maturity. The larvae are cannibalistic and only one larva will survive per plant. Larvae overwinter at the base of the plant in the stem. Pupation occurs in early summer and adult emergence begins in late June. Adults are active from late June through August. There is one generation per year.

Injury Symptoms

Initial injury is seen when larvae tunnel down the leaf petiole and enter the stem. The leaf tissue above this point

Figure 1. Adult soybean stem borer, *Dectes texanus texanus*.

Figure 2. Larval soybean stem borer, *Dectes texanus texanus*.

wilts and dies (*Figure 3*). If you split the leaf petiole, you can see the tunneling and may still see the larva. The appearance of individual dead leaves in an otherwise healthy canopy can be an early indication of the presence of *Dectes*. Split the stems of these plants to confirm the presence or absence of *Dectes* larvae.

Larvae tunnel up and down the stem, and end up at the base of the plant at plant maturity. Mature larvae girdle the inside of the stem to make a cell for overwintering. This weakens the stem and may lead to stem breakage or lodging. Economic damage is caused primarily by lodging and

Figure 3. Dead leaf caused by Dectes larval tunneling in leaf petiole *(Photo by Greg Carpenter, Pioneer Hybrids).*

subsequent harvest difficulties. Girdling is most severe in earlier maturing varieties, and lodging is most severe in earlier planted soybean. In the absence of harvest losses from lodging, direct yield loss from larval feeding has been limited or absent.

Management

Cultural Controls

Several cultural practices can be implemented to reduce potential loss from stem borers.

- Weed control to reduce alternate hosts of soybean stem borers, such as wild sunflower, ragweed, and cocklebur, can help reduce soybean stem borer populations.
- Research at Kansas State University indicates that *Dectes* prefers commercial sunflower to soybeans. Sunflowers may be used as a trap crop to protect adjacent soybean fields.
- Research from North Carolina has found that burying borer-infested stubble after harvest can reduce soybean stem borer populations the next year; however, this practice may not be desirable where soil erosion is a concern.
- The adults are not strong fliers and crop rotation may reduce damage in areas where soybean acreage is limited.
- Field observations in Kansas suggest that early planted, short-season varieties may be more likely to have harvest losses from lodging. Longer season varieties mature later in the year, allowing more time to harvest before lodging is likely.
- Entomologists at Kansas State University have been studying this insect as a pest on soybeans for several years. They have not identified resistance in any commercially available soybean cultivars.

Chemical Controls

Chemical treatment of larvae is ineffective because the larvae are in the stem; effective chemical control of the adults is difficult due to the extended adult emergence period. Research in Kansas indicates that multiple foliar insecticide applications are needed to significantly reduce adult populations and larval injury, and may not be economically justified unless harvest is late and lodging losses are high.

Recommendations for Harvest

Fields with a history of injury or with injury symptoms this year should be carefully watched during August and September. Fields with extensive stalk tunneling (greater than 50 percent of plants) by the soybean stem borer are most at risk for lodging and harvest losses, depending on weather conditions. Those fields should be targeted for harvest first to minimize harvest losses due to soybean stem borer injury. In the absence of lodging losses, this insect does not usually cause noticeable yield reductions.

This publication has been peer reviewed.

UNL Extension publications are available online at *http://extension.unl.edu/publications*.

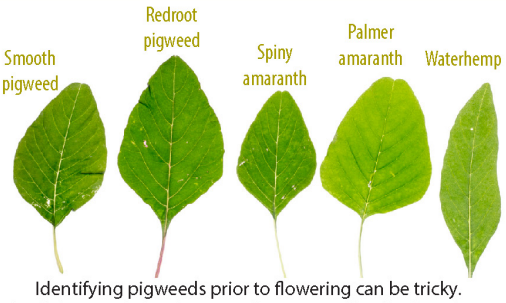
Weed Management

Chris Proctor
Nebraska Weed Management
Extension Educator

Dan Smith
Agronomy Specialist,
University of Wisconsin-Madison

Develop an effective integrated weed management plan - we will discuss seed selection, traits and tolerance, resistance, weed seed production, viability, the spread of common weeds and more. This session includes a close up look at combine clean out and weed seedbank dynamics. Waterhemp and giant ragweed studies results will also be discussed.

Identification for some WI pigweed species



Identifying pigweeds prior to flowering can be tricky. Leaf characteristics alone aren't accurate. Use the flowchart below to determine what type of pigweed you have.

First ► If the pigweed is low growing and sprawling, then it is **Prostrate pigweed** (not pictured).

Next, look at or feel the stem, is it:

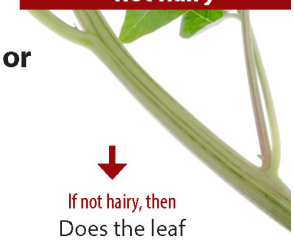
hairy

If hairy, then could be either **Redroot pigweed** (left), or **Smooth pigweed** (right) **Powell amaranth** (not pictured).

If yes, then it is **Spiny armaranth**.

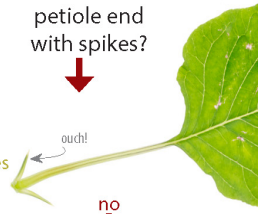
or

not hairy



If not hairy, then Does the leaf petiole end with spikes?

yes

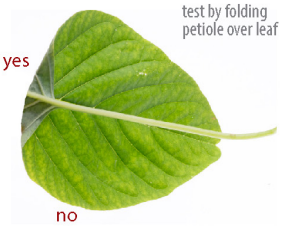


no

Is the petiole longer than the leaf ?

yes

test by folding petiole over leaf



no

If yes, then it is **Palmer amaranth,** confirm leaf being round-shaped

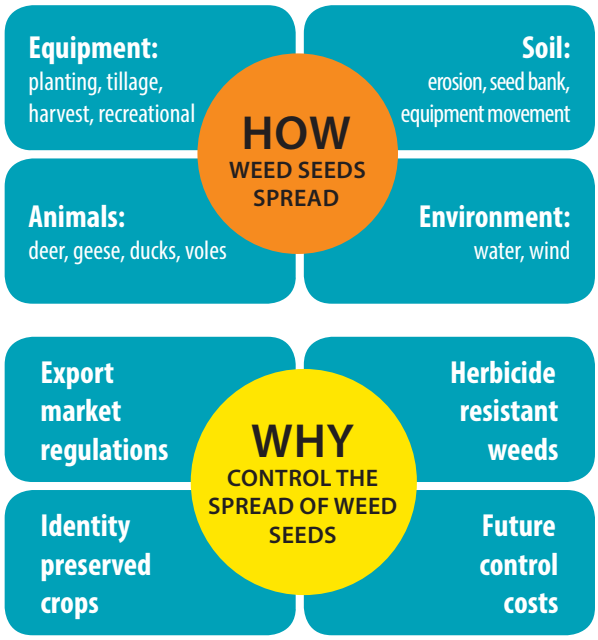
If no, then it is **Waterhemp,** confirm leaf being spear-shaped

WEED SEED MANAGEMENT AT CROP HARVEST

Weed seed in harvested crops can negatively impact a farm's potential profits. Sometimes the impact can be immediate like crop yield reduction, the rejection of a grain load due to export market regulations; and at other times, it can set the stage for future problems like herbicide resistance and increased control costs.

Although weed seed can spread in ways that can't be controlled (animals, wind), there are management strategies that can prevent seeds from further spreading farm to farm (cleaning equipment, hand weeding before harvest, reducing erosion).

The timing of weed seed control is also important; **weed seed management at crop harvest is critical** because at harvest, weeds that have survived other control attempts during the growing season and produced viable seed (also called weed escapes) can be spread from farm to farm if equipment is not properly and thoroughly cleaned. Many species have the potential to be troublesome but waterhemp has proven to be exceptionally challenging in recent years.



Watch our video!
How to Clean a Combine to Limit the Spread of Weed Seeds
https://youtu.be/nDMq1UanSkE

WEED SEED PRODUCTION & RETENTION IN SOYBEAN

TABLE 1

		Seed Production per plant		Seed Retention % at harvest	
		2013	2014	2013	2014
Palmer amaranth	Arkansas	50,022 ± 8,209	33,195 ± 5,775	99.98 ± 0.00	99.85 ± 0.05
	Illinois	26,038 ± 3,753	-	99.95 ± 0.03	-
	Nebraska	36,978 ± 5,399	58,004 ± 9,434	98.89 ± 0.23	99.93 ± 0.02
	Missouri	13,384 ± 27,363	60,221 ± 21,991	99.98 ± 0.00	99.67 ± 0.20
	Tennessee	22,833 ± 4,914	-	99.96 ± 0.01	-
Waterhemp	Illinois	25,649 ± 5,800	11,833 ± 2,277	99.98 ± 0.01	94.98 ± 0.94
	Nebraska	60,228 ± 8,348	82,811 ± 15,051	99.99 ± 0.00	99.63 ± 0.10
	Missouri	19,727 ± 2,493	23,787 ± 4,200	100.00 ± 0.00	99.84 ± 0.04
	Wisconsin	17,459 ± 2,625	38,221 ± 7,956	99.96 ± 0.00	98.80 ± 0.30

Adapted from: Schwartz, L., Norsworthy, J., Young, B., Bradley, K., Kruger, G., Davis, V., Steckel, L., Walsh, M. (2016). Tall Waterhemp (*Amaranthus tuberculatus*) and Palmer amaranth (*Amaranthus palmeri*) Seed Production and Retention at Soybean Maturity. Weed Technology, 30(1), 284-290. doi:10.1614/WT-D-15-00130.1

TABLE 2

	Total Seed Captured per plant	% Seed Shattered before crop harvest	% Seed Shattered during harvest delay	% Retained on plant after simulated harvest
Redroot pigweed	149,427 ± 27,267	7.2 ± 1.1	7.7 ± 0.9	85.1 ± 17.5
Common ragweed	2,204 ± 382	7.2 ± 1.2	14.1 ± 2.4	78.7 ± 15.3
Common lambsquarters	62,091 ± 11,332	4.3 ± 0.7	40.6 ± 8.1	55.2 ± 12.0
Common cocklebur	1,325 ± 155	14.4 ± 3.5	48.2 ± 8.2	38.9 ± 5.5
Giant foxtail	26,334 ± 2,124	26.3 ± 3.6	24.0 ± 2.8	49.8 ± 5.2
Large crabgrass	84,721 ± 11,637	46.3 ± 6.9	13.7 ± 1.9	40.0 ± 7.7

Adapted from: Haring S. (2017) Harvest Weed Seed Control: An Integrated Weed Management Strategy for Organic and Conventional Production System. M.S. Thesis. Blacksburg, VA: Virginia Tech. 64 p

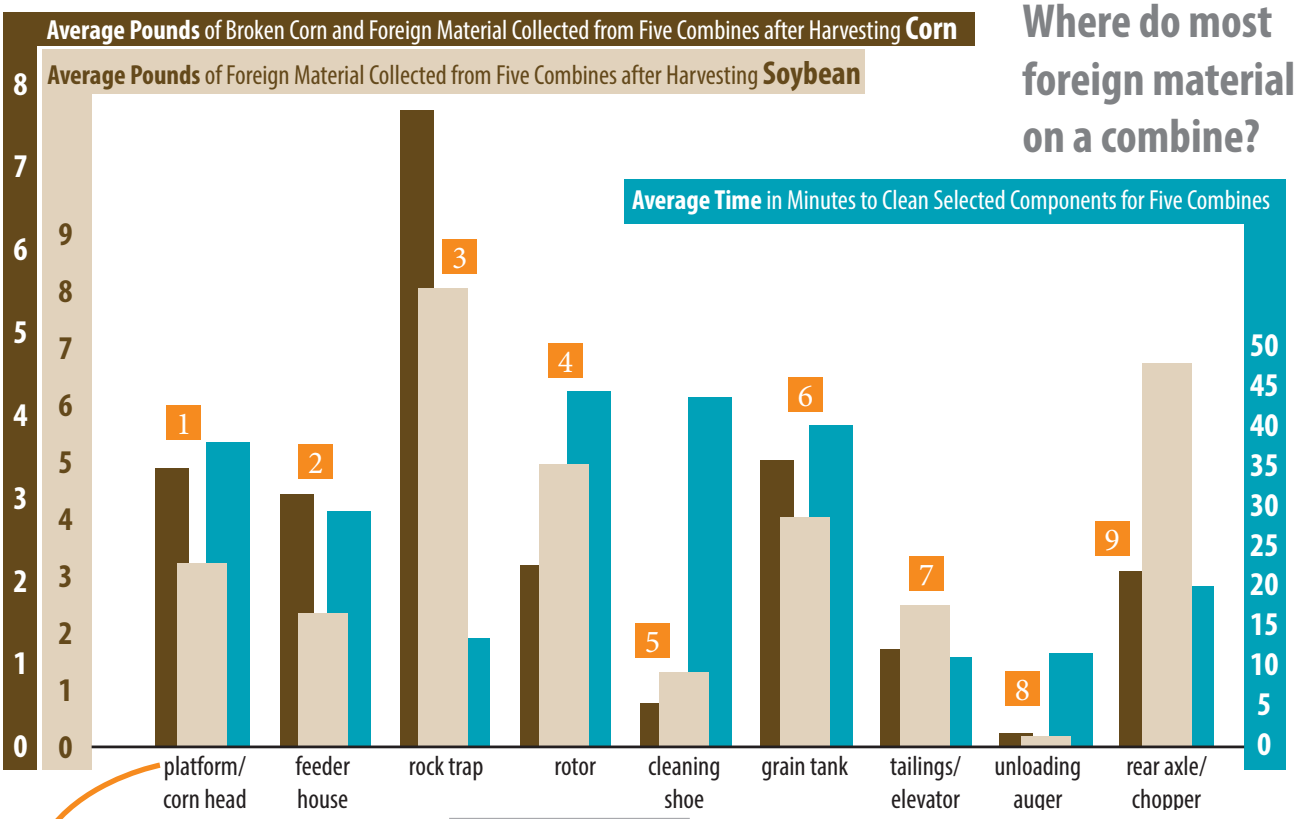
BURIED WEED SEED LONGEVITY AND NUMBER OF SEEDS PRODUCED

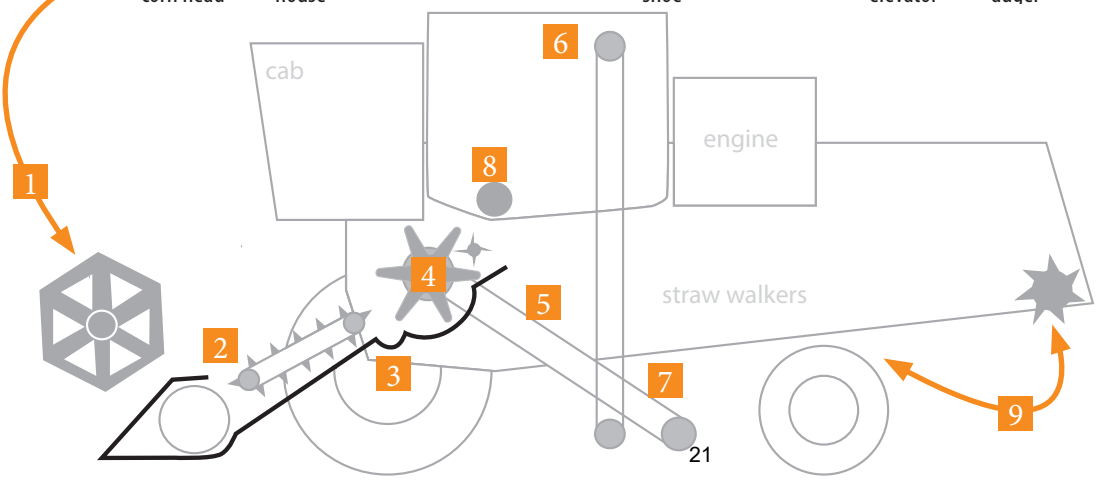
TABLE 3

	Years of Seed Burial when exhumed											
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**12**	**17**
	% germination											
Barnyardgrass	17	4	4	19	16	35	20	8	3	8	3	1
Common cocklebur	10	60	36	16	16	4	3	0	18	20	0	0
Common lambsquarters	28	53	43	40	40	17	48	36	21	37	42	28
Pennsylvania smartweed	11	3	1	1	1	30	0	0	0	1	0	7
Redroot pigweed	66	73	27	5	8	1	3	3	0	2	7	0
Waterhemp	40	38	10	7	12	10	14	3	2	7	6	3
Velvetleaf	15	32	23	43	17	40	70	5	24	41	25	25
Canada thistle	60	47	39	44	40	35	31	29	28	34	14	9
Curly dock	76	83	73	88	88	89	87	87	91	86	83	77
Dandelion	2	3	6	3	1	5	1	0	0	1	0	0

Adapted from:
Burnside, O., Wilson, R., Weisberg, S., & Hubbard, K. (1996). Seed Longevity of 41 Weed Species Buried 17 Years in Eastern and Western Nebraska. Weed Science,44(1), 74-86. doi:10.1017/S0043174500093589
Zimdahl, R. (2018). Fundamentals of Weed Science. 5th ed. Academic Press, Cambridge, MA

Where do most foreign materials hide on a combine?





Adapted from:
Adapted from figure data from Hanna HM, Jarboe DH, Quick GR (2009) Grain Residual and Time Requirements for Combine Cleaning. Applied Engineering in Agriculture

Quick note about safety!

Prior to cleaning any farm equipment, read and understand all manuals for cleaning procedures and always use recommended personal protective equipment.

Cleaning a combine creates large volumes of dust; take extra care to protect eye, ear, and respiratory health!

Using Cost of Production in Decision Making – It's as Easy as ABC!

Glennis McClure
Extension Educator / Farm and Ranch Management Analyst

The Ag Budget Calculator (ABC) program is an online budgeting tool designed to assist growers in determining their cost of production and projected cash and economic returns. Learn how your operation can benefit from the analysis this free tool provides.

The University of Nebraska–Lincoln's Department of Agricultural Economics and Center for Agricultural Profitability continues to develop the Ag Budget Calculator (ABC) program for use as a producer's resource in developing cost of production enterprise budgets along with program features to assist in making farm management decisions. The budget calculator is designed to be user friendly and "easy as ABC". It's free to access and use on the web with each farm and ranch entity able to create and update its own customized budgets. ABC provides cost and return metrics useful in production, cost control, and other management decision-making.

Producers and farm managers are invited to begin using the online Agricultural Budget Calculator (ABC) program (agbudget.unl.edu) at any time for crop enterprises, with the livestock module now in the works. ABC allows producers to estimate their crop enterprises' cost of production based on field operation expenses, machinery, labor, and material inputs.

Figuring cost of production by enterprise can guide producers in making management and marketing decisions. While production costs can move up or down, adding in estimated commodity prices and revenue into enterprise budgets provides a broader picture. Even in the higher input cost period that we've experienced in 2022, opportunities for profitability existed.

Table 1 is a summary of cash and economic costs per acre for two soybean enterprises that would closely represent the fields featured in 2022 Soybean Management Field Days.

Table 1

Enterprise	Cash Cost/Acre	Economic Cost/Acre
2022 SMFDays Dryland Soybeans (No Till, after Corn)	**$4.76**	**$8.95**
2022 SMFDays Irrigated Soybeans (No Till, after Corn)	**$5.72**	**$10.41**

Provided next are the soybean budget reports created using the ABC program, providing details of the two enterprise budgets. In our field day discussions, we will look at some similarities and differences of the two budgets (one dryland and one irrigated enterprise report). Producers are encouraged to use the ABC program to create their own cost of production budgets and use those created for demonstration purposes as guides.

Thanks to the Nebraska Soybean Board for assistance with initial funding to begin developing the program. Additional funding for this project is from the North Central Extension Risk Management Education Center, USDA National Institute of Food and Agriculture under Award Numbers 1018-70027-28586 and 2021-70027-34694, and the Nebraska Corn Board.

2022 SMFDays 2022 Soybeans, Dryland, No Till after Corn

Total acres: 155 Yield per acre: 70 bushels

Economic Enterprise Budget

Category	amt applied	cost per unit	cost per acre	Enterprise Total
Revenue		**Value / bushel**	**Value / acre**	**Total**
Value of Production		**$13.00/bu**	**$910.00**	**$141,050.00**
▶ **Additional Revenue**			**$0.00**	**$0.00**
Total Gross Revenue		**$13.00/bu**	**$910.00**	**$141,050.00**
Operating Costs	**Amount / acre**	**Cost / unit**	**Cost / acre**	**Total**
▶ **Seed**			**$73.44**	**$11,383.66**
▶ **Fertilizer**			**$2.16**	**$334.80**
▶ **Pesticide**			**$85.35**	**$13,229.15**
▶ **Custom Services**			**$8.00**	**$1,240.00**
▶ **Labor**			**$17.59**	**$2,726.04**
▶ **Fuel and Energy**			**$14.01**	**$2,172.11**
▶ **Repairs and Maintenance**			**$23.70**	**$3,673.69**
▶ **Other:**			**$11.21**	**$1,737.55**
Interest on Operating Capital			**$6.48**	**$1,003.67**
Total Operating Costs		**$3.46/bu**	**$241.94**	**$37,500.68**
Net Return Above Total Operating		**$9.54/bu**	**$668.06**	**$103,549.32**
Ownership and Overhead Costs		**Cost / bushel**	**Cost / acre**	**Total**
General Overhead			$25.00	$3,875.00
Facility Cash Costs			$0.00	$0.00
Vehicle Cash Costs			$0.00	$0.00
▶ **Land Rent:**			**$0.00**	**$0.00**
▶ **Real Estate Taxes:**			**$66.00**	**$10,230.00**
Equipment Depreciation			$32.84	$5,090.39
Facility Depreciation			$0.00	$0.00
Equipment Opportunity Cost			$10.69	$1,657.51
Facility Opportunity Cost			$0.00	$0.00
Land Opportunity Cost			$250.00	$38,750.00
Total Ownership and Overhead Costs		**$5.49/bu**	**$384.53**	**$59,602.90**
Total Economic Cost		**$8.95/bu**	**$626.47**	**$97,103.58**
Net Return Above Total Costs		**$4.05/bu**	**$283.53**	**$43,946.42**

2022 SMFDays 2022 Soybeans, Dryland, No Till after Corn

Total acres: 155 Yield per acre: 70 bushels

Field Operation Costs / Acre

Field Operation	Labor	Fuel	Repairs	Deprec.	Opp.	Total / acre
Plant Cover Crop	**Labor**	**Fuel**	**Repairs**	**Deprec.**	**Opp.**	**Total / acre**
UNL Medium Tractor >80 hp	2.29	2.34	1.07	3.51	0.62	
Drill - grain or grass			0.50	1.13	0.88	
	$2.29	**$2.34**	**$1.57**	**$4.64**	**$1.50**	**$12.35**
Plant Soybeans (No-Till)	**Labor**	**Fuel**	**Repairs**	**Deprec.**	**Opp.**	**Total / acre**
UNL Medium Tractor >80 hp	2.75	2.81	1.29	4.21	0.74	
UNL Planter - no till			7.61	2.18	1.37	
	$2.75	**$2.81**	**$8.90**	**$6.39**	**$2.11**	**$22.96**
Spray Spring Burndown Herbicide	**Labor**	**Fuel**	**Repairs**	**Deprec.**	**Opp.**	**Total / acre**
UNL Medium Tractor >80 hp	0.92	0.94	0.43	1.41	0.25	
UNL Boom Sprayer			0.67	0.62	0.27	
	$0.92	**$0.94**	**$1.10**	**$2.02**	**$0.51**	**$5.49**
Spray Herbicide	**Labor**	**Fuel**	**Repairs**	**Deprec.**	**Opp.**	**Total / acre**
UNL Medium Tractor >80 hp	0.92	0.94	0.43	1.41	0.25	
UNL Boom Sprayer			0.67	0.62	0.27	
	$0.92	**$0.94**	**$1.10**	**$2.02**	**$0.51**	**$5.49**
Combine Dryland Soybeans	**Labor**	**Fuel**	**Repairs**	**Deprec.**	**Opp.**	**Total / acre**
Combine	4.58	6.03	8.33	15.00	5.13	
UNL Combine Head			1.85	2.36	0.75	
	$4.58	**$6.03**	**$10.18**	**$17.36**	**$5.87**	**$44.03**
Haul Soybeans	**Labor**	**Fuel**	**Repairs**	**Deprec.**	**Opp.**	**Total / acre**
Truck with box (no trailer)	6.13	0.96	0.85	0.39	0.18	
(No Implement / Trailer)			0.00	0.00	0.00	
	$6.13	**$0.96**	**$0.85**	**$0.39**	**$0.18**	**$8.52**
Operations Totals:	**$17.59**	**$14.01**	**$23.70**	**$32.84**	**$10.69**	**$98.84**

Machine costs shown in this report do not include taxes, housing, insurance or licensing costs. 'THILM' expenses may be entered in detail for your own enterprises as cash overhead costs and summarized in 'Ownership and Overhead' costs.

2022 SMFDays 2022 Soybeans, Dryland, No Till after Corn

Total acres: 155 Yield per acre: 70 bushels

Purchased Materials, Inputs, and Services

Operation / Name	% of acres Applied	Qty Applied / acre	Cost / unit	Total $ / acre
Plant Cover Crop	**% acres**	**qty / acre**	**cost / unit**	**total / acre**
Cover Crop Seed (before soybeans)	100	1 acre	$32.55/ acre	32.55
				$32.55
Plant Soybeans (No-Till)	**% acres**	**qty / acre**	**cost / unit**	**total / acre**
Soybean Seed, RR2, Xtend, Treated	100	0.86 seedunit	$47.55/ seedunit	40.89
				$40.89
Spray Spring Burndown Herbicide	**% acres**	**qty / acre**	**cost / unit**	**total / acre**
Authority Supreme	100	9 ounce	$530.00/ gallon	37.27
Detonate	100	16 ounce	$52.45/ gallon	6.56
Absorb 100	100	8 ounce	$20.50/ gallon	1.28
Dry Guard	100	1 pound	$1.86/ pound	1.86
				$46.96
Spray Herbicide	**% acres**	**qty / acre**	**cost / unit**	**total / acre**
Outlook	100	10 ounce	$80.00/ gallon	6.25
Buccaneer 5 Extra	100	26 ounce	$62.00/ gallon	12.59
Vapor Guard Complete	100	32 ounce	$20.17/ gallon	5.04
Engenia	100	12.8 ounce	$97.00/ gallon	9.70
				$33.59
Aerial Spray - Insecticide (Custom Service)	**% acres**	**qty / acre**	**cost / unit**	**total / acre**
WarriorII/Zeon	100	1.6 ounce	$3.00/ ounce	4.80
Spray Pesticide	100		$8.00/ acre	8.00
32-0-0	100	3 lbsN	$0.72/ lbsN	2.16
				$14.96
			Material, Input, and Service Total:	**$168.95**

2022 SMFDays Soybeans, Irrigated-Diesel Pivot, No Till, after Corn

Total acres: 155 Yield per acre: 80 bushels

Economic Enterprise Budget

Category	amt applied	cost per unit	cost per acre	Enterprise Total
Revenue		**Value / bushel**	**Value / acre**	**Total**
Value of Production		**$13.00/bu**	**$1,040.00**	**$161,200.00**
▶ **Additional Revenue**			**$0.00**	**$0.00**
Total Gross Revenue		**$13.00/bu**	**$1,040.00**	**$161,200.00**
Operating Costs	**Amount / acre**	**Cost / unit**	**Cost / acre**	**Total**
▶ **Seed**			**$55.00**	**$8,525.00**
▶ **Fertilizer**			**$0.00**	**$0.00**
▶ **Pesticide**			**$131.77**	**$20,424.79**
▶ **Custom Services**			**$19.60**	**$3,038.00**
▶ **Labor**			**$13.60**	**$2,108.33**
▶ **Fuel and Energy**			**$40.39**	**$6,259.80**
▶ **Repairs and Maintenance**			**$38.40**	**$5,951.74**
▶ **Other:**			**$30.00**	**$4,650.00**
Interest on Operating Capital			**$9.04**	**$1,401.34**
Total Operating Costs		**$4.22/bu**	**$337.80**	**$52,359.00**
Net Return Above Total Operating		**$8.78/bu**	**$702.20**	**$108,841.00**
Ownership and Overhead Costs		**Cost / bushel**	**Cost / acre**	**Total**
General Overhead			$25.00	$3,875.00
Facility Cash Costs			$0.00	$0.00
Vehicle Cash Costs			$0.00	$0.00
▶ **Land Rent:**			**$0.00**	**$0.00**
▶ **Real Estate Taxes:**			**$94.50**	**$14,647.50**
Equipment Depreciation			$63.81	$9,889.99
Facility Depreciation			$0.00	$0.00
Equipment Opportunity Cost			$21.51	$3,334.56
Facility Opportunity Cost			$0.00	$0.00
Land Opportunity Cost			$290.00	$44,950.00
Total Ownership and Overhead Costs		**$6.19/bu**	**$494.82**	**$76,697.05**
Total Economic Cost		**$10.41/bu**	**$832.62**	**$129,056.05**
Net Return Above Total Costs		**$2.59/bu**	**$207.38**	**$32,143.95**

2022 SMFDays Soybeans, Irrigated-Diesel Pivot, No Till, after Corn

Total acres: 155 Yield per acre: 80 bushels

Field Operation Costs / Acre

Field Operation	Labor	Fuel	Repairs	Deprec.	Opp.	Total / acre
Spring Burndown Spray	**Labor**	**Fuel**	**Repairs**	**Deprec.**	**Opp.**	**Total / acre**
UNL Medium Tractor >80 hp	0.92	0.94	0.43	1.41	0.25	
UNL Boom Sprayer			0.67	0.62	0.27	
	$0.92	**$0.94**	**$1.10**	**$2.02**	**$0.51**	**$5.49**
Plant - 30" Rows	**Labor**	**Fuel**	**Repairs**	**Deprec.**	**Opp.**	**Total / acre**
UNL Medium Tractor >80 hp	2.75	2.81	1.29	4.21	0.74	
UNL Planter			3.38	10.00	1.35	
	$2.75	**$2.81**	**$4.67**	**$14.21**	**$2.09**	**$26.53**
Spray Herbicide	**Labor**	**Fuel**	**Repairs**	**Deprec.**	**Opp.**	**Total / acre**
UNL Medium Tractor >80 hp	0.92	0.94	0.43	1.41	0.25	
UNL Boom Sprayer			0.67	0.62	0.27	
	$0.92	**$0.94**	**$1.10**	**$2.02**	**$0.51**	**$5.49**
Combine Irr SB	**Labor**	**Fuel**	**Repairs**	**Deprec.**	**Opp.**	**Total / acre**
Combine	4.58	6.03	8.33	15.00	5.13	
UNL Draper Flex Platform			3.20	5.85	1.05	
	$4.58	**$6.03**	**$11.53**	**$20.85**	**$6.17**	**$49.17**
UNL Pivot D 125' Lift	**Labor**	**Fuel**	**Repairs**	**Deprec.**	**Opp.**	**Total / acre**
System	4.44		14.81	19.26	10.56	
Pump			2.96	2.96	0.89	
Power Unit		29.68	1.48	1.48	0.33	
Well			0.74	0.99	0.44	
	$4.44	**$29.68**	**$20.00**	**$24.69**	**$12.22**	**$91.03**
Operations Totals:	**$13.60**	**$40.39**	**$38.40**	**$63.81**	**$21.51**	**$177.71**

Machine costs shown in this report do not include taxes, housing, insurance or licensing costs. 'THILM' expenses may be entered in detail for your own enterprises as cash overhead costs and summarized in 'Ownership and Overhead' costs.

2022 SMFDays Soybeans, Irrigated-Diesel Pivot, No Till, after Corn

Total acres: 155 Yield per acre: 80 bushels

Purchased Materials, Inputs, and Services

Operation / Name	% of acres Applied	Qty Applied / acre	Cost / unit	Total $ / acre
Spring Burndown Spray	**% acres**	**qty / acre**	**cost / unit**	**total / acre**
Glyphosate 5# w/ Surfactant	100	32 ounce	$60.00/ gallon	15.00
21-0-0-24S	100	1.7 pound	$0.60/ pound	1.02
Authority MTZ	100	16 ounce	$48.00/ pound	48.00
				$64.02
Plant - 30" Rows	**% acres**	**qty / acre**	**cost / unit**	**total / acre**
Soybean Seed - XtendFlex	100	1 seedunit	$55.00/ seedunit	55.00
				$55.00
Spray Herbicide	**% acres**	**qty / acre**	**cost / unit**	**total / acre**
Select Max	100	6 ounce	$140.40/ gallon	6.58
Liberty	100	43 ounce	$90.00/ gallon	30.23
21-0-0-24S	100	1.7 pound	$0.60/ pound	1.02
Outlook	100	10 ounce	$80.00/ gallon	6.25
				$44.09
Aerial Spray Fungicide & Insecticide (Custom Service)	**% acres**	**qty / acre**	**cost / unit**	**total / acre**
Aerial spray	100		$10.00/ acre	10.00
Quilt Xcel	100	10.5 ounce	$230.00/ gallon	18.87
WarriorII/Zeon	100	1.6 ounce	$3.00/ ounce	4.80
				$33.67
Truck soybeans to market (Custom Service)	**% acres**	**qty / acre**	**cost / unit**	**total / acre**
Haul Grain	100		$0.12/ bushel	9.60
				$9.60
			Material, Input, and Service Total:	**$206.37**

- Figuring enterprise cost of production can assist producers in marketing and risk management decisions.
- The Ag Budget Calculator (ABC) program is a free user-friendly resource to use in projecting cost of production, net returns, along with analysis information.
- The annual UNL crop budgets are loaded into the ABC program and can be used as a guide in creating and customizing your own budgets.

Increasing Demand for Nebraska Soybeans through Biodiesel

Hoon Ge
Founder and President of MEG Corp
Ge is a chemical engineer with more than 35 years of experience in the petroleum and renewable fuel industries including refining, additive formulation and alternative fuels. MEG Corp provides technical expertise to fuel distributors, fleet managers, end users and mechanics through education and technical support.

One of Nebraska Soybean Board's strategic goals targets growth in demand for Nebraska soybeans as a feedstock for biodiesel and renewable diesel. As more than half of all the biodiesel produced in the US is made from soybean oil, the biodiesel industry is an important, high-volume customer of soybean farmers. To increase demand for biodiesel, NSB has partnered with MEG Corp Fuel Consulting to increase the awareness, availability and utilization of biodiesel in Nebraska by providing education and technical support to fuel distributors, fleet managers, farmers and other end users. MEG Corp assists NSB in increasing availability and use of biodiesel in a variety of ways including:

- Building partnerships with fuel suppliers and retailers to increase infrastructure that makes it easier for fuel suppliers to blend biodiesel with petroleum diesel in blends such as 5%, 10% and 20%, and for retailers to offer these blends to their customers. Six projects have been implemented through the NSB Biodiesel Infrastructure Partnership program to-date, with another site to come on-line later this year.
- Educating the next generation of diesel mechanics by conducting diesel and biodiesel trainings at community colleges and technical schools in the state. Diesel technicians are very influential with their customers. The more they know about biodiesel, the better they can support biodiesel use among their customers.
- Participating in conferences and trade shows of target audiences including fuel industry, farmers and fleets. For example, MEG Corp hosts a biodiesel booth annually at the Petroleum and Convenience Expo to speak with fuel suppliers and retailers and answer their questions about biodiesel. MEG Corp staff are on hand at the NSB booth during Husker Harvest Days to speak with farmers about the benefits of biodiesel use.
- Providing workshops for farmers, fleets and other audiences. MEG Corp provides diesel and biodiesel presentations at conferences, NSB events, and cooperative meetings to help end users understand the benefits biodiesel provides and dispel common myths about biodiesel use.
- Operating the Regional Diesel Helpline. This Helpline is available to diesel users and fuel distributors for general questions about diesel and biodiesel use and to troubleshoot fuel problems and provide recommendations. Troubleshooting includes analysis of fuel and filter samples through in-house testing and the use of outside laboratories when more extensive analysis is required. Farmers are encouraged to reach out with any fuel related questions, problems, or guidance. We can be reached at (800) 929-3437 or info@megcorpmn.com.

Recent studies show that the biodiesel industry contributes 13% to the price of a bushel of soybeans – currently that is $2 or more in added-value. Requests from farmers are important in the effort to expand biodiesel availability throughout the state. Ask your fuel supplier about including biodiesel in your next delivery.

About MEG Corp

MEG Corp provides technical expertise to fuel distributors, fleet managers, end users and mechanics through education and technical support. Hoon Ge, founder and president of MEG Corp, is a chemical engineer with more than 35 years of experience in the petroleum and renewable fuel industries including refining, additive formulation and alternative fuels.

COMMON BIODIESEL BLENDS

Blends like B5, B11 and B20 are the most common biodiesel blends for a variety of reasons.

B5: The physical properties of biodiesel blends up to five percent (B5) do not change from the physical properties of ultra-low sulfur diesel (ULSD) and therefore are included in the same fuel specification, ASTM D975. Blends up to B5 should be treated the same as No. 2 diesel (B0) and are used year-round throughout the country.

B11: States like Illinois and Iowa have implemented incentives to help increase use of B11 or higher blends. These incentives reduce or eliminate certain fuel taxes, putting the higher biodiesel blends at a price advantage to diesel with low or no biodiesel blends.

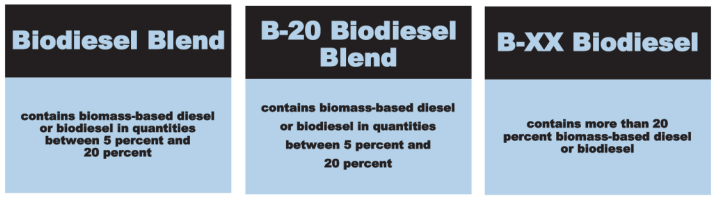
B20: Diesel vehicles and equipment can use biodiesel blends up to B20 with no modifications. Fleets, fuel marketers, farmers and other end users utilize B20 to maximize the renewable content, local economy, energy security and emissions reduction benefits biodiesel provides. The state of Minnesota requires a 20 percent biodiesel blend during warm weather months and a 5 percent blend during cold months of the year. Retail chains throughout the country offer higher biodiesel blends like B20 to maximize profit margin, taking advantage of biodiesel's often lower price.

BIODIESEL AT THE PUMP

Because No. 2 diesel fuel can contain up to 5% biodiesel, B5 does not require additional labeling at the pump.

Blends from B6 to B20 require the FTC-compliant label "Biodiesel Blend" or "B-20 Biodiesel Blend." If the biodiesel blend varies during the year but does not drop below five percent, this decal can remain on the dispenser. If the biodiesel blend does drop below five percent, this decal must be removed.

Dispensers offering biodiesel blends above 20 percent must post a decal stating the specific blend. For example, a dispenser offering a 50 percent biodiesel blend would require a decal stating B-50.



COLD WEATHER OPERABILITY

The cloud point of a fuel is the temperature at which the first solids form and are visible to the naked eye. Typical Nebraska No. 2 diesel fuel has a cloud point of approximately 10°F and No. 1 diesel fuel has a cloud point of -40°F or less. That means without the use of additives to improve cold flow properties, No. 2 diesel will begin to gel and plug filters at the cloud point. Blends of No. 1 and No. 2 diesel fuel, cold flow additives and/or fuel heating systems are used to keep fuel from gelling at temperatures below the cloud point.

Biodiesel blends are used year-round, even in northern cold climates. Like petroleum diesel fuel, biodiesel blends will gel in very cold temperatures. The cloud point of biodiesel blends up to 5% will be virtually the same as those of the diesel fuel used in the blend. Biodiesel blends over 5% will have higher cloud points and require the use of additional cold flow additives or No. 1 diesel in order to operate in cold climates. All diesel fuel is different. Work with your fuel distributor to achieve the desired cold weather protection through the use of a blend of No. 1 and cold flow additives as needed. Proper tank maintenance and housekeeping practices will further ensure cold weather operability.

BIODIESEL QUALITY

Biodiesel must meet strict quality standards before it is accepted into the fuel distribution system. B100 must meet the American Society for Testing and Materials (ASTM) standard D6751. It is then blended with petroleum diesel to meet the corresponding ASTM specification: B5 - ASTM D975, or B6 to B20 - D7467. As diesel fuel and engines have changed over the years, the biodiesel ASTM specification is continuously reviewed and adjusted to ensure successful operation.

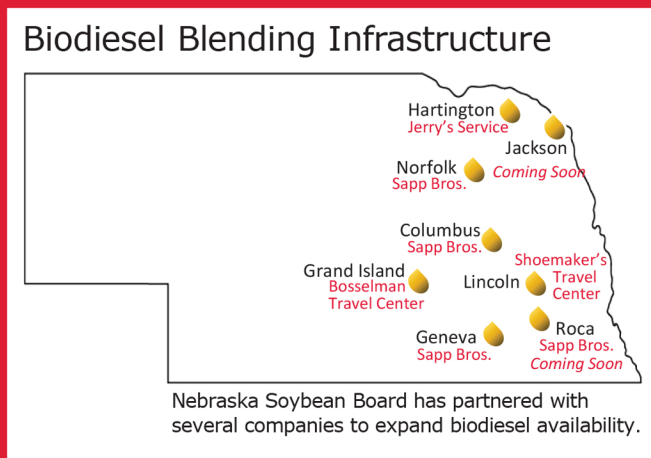
The biodiesel industry implemented a quality assurance program called BQ-9000 that ensures that biodiesel is produced, maintained and sold against the current ASTM D6751 specification. More than 92 percent of biodiesel now in the market is produced and handled by BQ-9000 approved companies. Recent surveys by the National Renewable Energy Lab show biodiesel production consistently meets and exceeds strict quality standards. Fuel marketers should purchase biodiesel from a BQ-9000 accredited producer.

Soybeans are Nebraska's second-most harvested crop

- **Nebraska averaged 63 bushels per acre in 2021[1]**
  - **At 5,570,000 acres harvested, that's 350,910,000 bushels[1]**
- **Nebraska ranked 4th in the US for soybean production in 2021**
- **At $1 or more per bushel, biodiesel provides more than $350 million in added-value for Nebraska soybean farmers**

Soybeans contain approximately 80% protein and 20% oil

- **A 60-pound bushel of soybeans yields about 48 pounds of protein-rich meal and 11 pounds of oil**
- **30% of soybean oil is used for biodiesel and bioheat, 60% is used for food and 8% for industrial uses[2]**
- **1 bushel of soybeans can make 1.5 gallons of biodiesel**



Sources: 1. USDA NASS Crop Production 2020 Summary (January 2021); 2. United Soybean Board Market View Database, 2017/2018

BIODIESEL FREQUENTLY ASKED QUESTIONS

Q Can I use biodiesel blends in my vehicle?

A Biodiesel blends up to B20 can be used in diesel vehicles and equipment without modification. Most major engine companies have formally stated that use of blends up to B20 will not void their parts and workmanship warranties. Some manufacturers based outside of the U.S. do not recommend blends above B5, however in states like Illinois and Minnesota where higher biodiesel blends are common, those manufacturers have sent letters to registered car owners stating that higher biodiesel blends can be used in their vehicles. Original Equipment Manufacturer (OEM) information can be found at: http://biodiesel.org/using-biodiesel/oem-information.

Q Will I void my warranty if I use a biodiesel blend?

A Vehicle warranties cover parts and workmanship, not fuel. Unless use of a higher-than recommended blend of biodiesel is the cause of engine or parts failure, the warranty must be honored. However, if the engine parts fail because of out-of-specification diesel or biodiesel, the failure may not be covered by the warranty.

Q Do biodiesel blends have similar performance to petroleum diesel?

A Diesel vehicle drivers should see no loss of power or performance when using blends up to 20 percent. Biodiesel enhances the lubricating properties of diesel fuel, reducing wear and prolonging engine life. Biodiesel has a detergency effect to keep injectors and fuel systems clean. Using B11-B20 with DPF filters results in longer intervals between regeneration, resulting in less fuel consumption.

Q Does biodiesel have a shorter shelf life than ultra-low sulfur diesel?

A As with ultra-low sulfur diesel fuel (ULSD), biodiesel without additives has a shelf life of six months. Biodiesel producers utilize stabilizing additives to prevent product degradation. With these additives and proper housekeeping, the shelf life of biodiesel blends can be extended up to two years.

Q Does biodiesel use increase risk of microbial contamination?

A Federal regulations reduced sulfur levels in diesel fuel in 1993 – from 5000 or more parts per million (ppm) before then, to 15 ppm or less by 2006. Though high sulfur levels negatively impacted the environment, health and vehicle pollution control equipment, it acted as a natural anti-microbial in diesel fuel, preventing growth of bacteria and fungus. The reduction of sulfur removed these anti-microbial properties and bacteria and fungus are now able to grow in the water-fuel interface, whether a biodiesel blend is used or not. Preventing water contamination is key to preventing microbial growth.

Q Does biodiesel production compete with food?

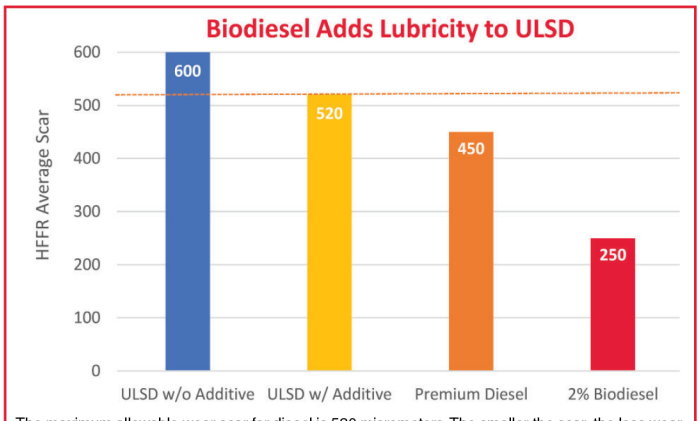
A Produced from a variety of renewable resources, such as plant oils, fats and recycled grease, biodiesel is the most diverse fuel on the planet. Soybean-based biodiesel actually has a positive impact on the world's food supply. Processing biodiesel from soybeans uses only the oil portion of the soybean (20%), leaving all of the protein available to nourish livestock and humans. By creating a new market for the soybean oil, we increase the availability of protein-rich meal for human and animal consumption.

Q Is renewable diesel the same as biodiesel?

A While both fuels can be made from plant oils, renewable diesel and biodiesel are not the same thing. Biodiesel is produced by the transesterification process and contains oxygen atoms (oxygenates). Renewable diesel is produced through the hydrotreating process, which removes oxygen and other atoms, converting the triglyceride molecules into paraffinic hydrocarbons. Renewable diesel is chemically the same as petroleum diesel.

BIODIESEL BENEFITS

- Biodiesel is made from renewable sources. More feedstock is produced each year.
- Biodiesel has the highest energy balance of any commercially available fuel, returning 3.5 units of energy for every one unit of energy used to produce it.
- Removing sulfur from diesel to produce ultra-low sulfur diesel (ULSD) also removes important lubricity from the fuel. Biodiesel increases lubricity and its high cetane rating provides for quicker starts with less smoke.
- Made in the U.S. at more than 90 biorefineries, biodiesel production reduces our dependence on oil, while expanding and diversifying our domestic fuel supply.
- Biodiesel production also bolsters local jobs, incomes and economies, in agriculture, biofuel production and businesses that support these industries. According to a recent study by LMC International for the National Biodiesel Board, the U.S. biodiesel and renewable diesel industry supports 65,000 U.S. jobs and more than $17 billion in economic activity each year.
- Biodiesel is recognized as an Advanced Biofuel by the U.S. Environmental Protection Agency, reducing lifecycle greenhouse gas emissions by 57 to 86 percent compared to petroleum diesel. Biodiesel blends are an easy way for individuals and businesses to reduce their carbon footprint.
- Biodiesel blends can reduce tailpipe emissions from diesel vehicles and equipment, including particulate matter and other harmful pollutants, reducing risk of exacerbating asthma and other respiratory diseases.



The maximum allowable wear scar for diesel is 520 micrometers. The smaller the scar, the less wear has occurred, and the better the lubricity of the fuel. ULSD requires the use of lubricity additives or biodiesel to meet this specification.

IDENTIFYING COMMON DIESEL ISSUES

Use the tips below to help you identify the cause, solution and best practices for preventing the most common diesel problems.

WATER CONTAMINATION AND ICING

Water is the number one cause of filter plugging issues in diesel engines.

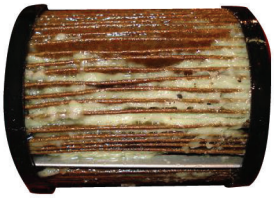
- Free water accelerates fuel degradation and tank corrosion.
- Icing can occur when temperatures get below 32°F. The excess water on the filter freezes and blocks the flow of fuel through the filter.
- The presence of water can also pull monoglycerides out of solution. When filters swell with water, monoglycerides may become attracted to water on the filter and build up until the filter plugs.

Prevention: Prevent water contamination throughout the fuel system. Keep vehicle/equipment tanks and storage tanks full to eliminate air space. Fleets should fill at the end of each day. Keep fuel caps tight and regularly check hoses and gaskets for leaks. If using a water separating filter, check and drain if water is found. Avoid water absorbing filters.

MICROBIAL CONTAMINATION

Since the introduction of ULSD in 2006, microbial contamination has become a more common problem. Prior to ULSD, higher sulfur levels acted as a natural anti-microbial. The reduction of sulfur removed these anti-microbial properties. Bacteria and fungus can grow in the water/fuel interface. They can be present in supply tanks and lines, vehicle tanks and fuel system components. A distinct, pungent odor is normally present on a filter with microbial contamination.

Prevention: Follow all recommendations to prevent water contamination. If microbial contamination is suspected, treat with a universally soluble biocide (soluble in fuel and water) at the kill rate.



PARAFFIN WAX

Paraffin is naturally occurring in diesel fuel. It does not come from biodiesel fuel. Since the introduction of ULSD, diesel is less soluble, meaning it cannot hold the paraffin in solution. When the temperature of the fuel is at or below its cloud point, paraffin material can precipitate out and collect on the bottom of the tank. When warmed to room temperature, the paraffin wax will turn back into liquid.

Prevention: Wax Anti-Settling Agent additives keep paraffins suspended in solution rather than collecting at the bottom of the tank where they can cause filter plugging. Winter fuel additives must be administered when the fuel is at least 10-15 degrees above the cloud point of the fuel.

SEDIMENT

Sediment caused by rust, tank scale and other contaminants will plug fuel filters. Filters plugged by sediment are characterized by sediment in the folds of the filter and solid particles in the filter casing. Sediment on the filter also attracts glycerin which further plugs the filter.

Prevention: Regularly monitor tanks and clean when necessary in order to reduce tank contaminants.

THERMAL OXIDATION

ULSD is more prone to thermal breakdown. High pressure common rail engines have also compounded this problem. Oxidation is characterized by fine, black sediment on the filter as if the pleats have been covered by permanent marker. This is caused by hot fuel return which causes coking of the fuel (burning of the fuel causing it to break down and create sediment) and leads to filter plugging. Oxidation may look similar to microbial contamination, however will not have the distinct, pungent odor of microbial contamination.

Prevention: It is recommended that diesel users use premium diesel with a stability or anti-coking additive. If anti-coking additive is already being used, check for a mechanical reason that the engine is running hot.

MONOGLYCERIDE BUILD UP

Filters plugged with a substance similar to petroleum jelly can indicate one of three possible situations:

- Use of water absorbing filters, which hold water on the filter media and then attract monoglycerides.
- Sediment on the filter attracting monoglycerides.
- Biodiesel that does not meet specification ASTM D6751.

Monoglycerides will continue to accumulate and do not go back into liquid form. Unlike paraffin, it takes temperatures of 150°F or more to melt monoglycerides back into liquid.

Prevention: Regularly check tanks and equipment for water and contaminants and remove when necessary. Use particulate filters instead of water absorbing filters. Purchase biodiesel from a BQ-9000 certified producer and marketer.

OUR SOY CHECKOFF™

DIESEL HELPLINE: 1-800-929-3437 or info@megcorpmn.com

This Helpline exists to assist diesel users with diesel and biodiesel-related questions, troubleshoot and diagnose filter plugging problems and provide guidance on proper fuel handling and tank maintenance practices.

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BEST PRACTICES FOR DIESEL VEHICLE AND EQUIPMENT OWNERS

- For best performance, follow oil and fuel filter change intervals as directed by the owner's manual.
- If the vehicle/equipment will not be driven for a period of time, fill the tank to capacity to prevent fuel degradation.
- Monitor engine oil levels. If they rise, take the vehicle in for an oil change.
- Avoid water absorbing fuel filters.

BEST PRACTICES FOR DIESEL STORAGE TANK OWNERS

- Before introducing a biodiesel blend into a storage tank, sample the tank to make sure there is no water or sediment present.
- Always install a high capacity, 30-micron paper-pleated dispenser filter on a storage tank to keep contaminants from reaching vehicle tanks. Water-absorbing and fiberglass filters are not recommended.
- Check tank bottoms twice a year (April and October) with a Bacon Bomb tank sampling device. If water is found, have it removed.
- Routinely check fill and vapor caps, hoses, and gaskets for leaks.
- Check fill area for water regularly and remove if found.
- Keep tanks as full as possible to reduce the amount of air and water entering the tank.
- Before colder weather sets in:
  - Check tank bottoms for water.
  - Install a new dispenser filter, 30-micron or higher, to handle the increased viscosity of the fuel.
  - Make sure fuel meets cold flow operability by discussing your needs with your supplier prior to purchase.
  - Winter fuel additives need to be administered when the fuel is a minimum of 15 degrees above the cloud point of the fuel.
- Buy your biodiesel blend pre-blended from your fuel supplier to ensure proper blending.
- As with any ultra-low sulfur diesel fuel (ULSD), biodiesel has a shelf life of 6 months to avoid product degradation. With the proper housekeeping and additives, the shelf life can be extended. Consult your fuel supplier.


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NEBRASKA SOYBEAN BOARD

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