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Extension Agronomy

eUpdate

09/23/2016

These e-Updates are a regular weekly item from K-State Extension Agronomy and Steve Watson, Agronomy e-Update Editor. All of the Research and Extension faculty in Agronomy will be involved as sources from time to time. If you have any questions or suggestions for topics you'd like to have us address in this weekly update, contact Steve Watson, 785-532-7105 swatson@ksu.edu, or Curtis Thompson, Extension Agronomy State Leader and Weed Management Specialist 785-532-3444 cthompso@ksu.edu.

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1. Utilizing cover crops for weed control: Be sure to consider all aspects

Cover crops may be able to suppress weeds in some cases, but this is just one of many considerations that producers should take into account when selecting cover crops. The following are some questions to guide you when considering cover crops for your field, with weed management as a goal.

What are the potential benefits and costs of cover crops?

Cover crops provide a range of possible benefits:

- Reduce fertilizer costs by scavenging nutrients or adding N to soil through fixation
- Reduce or prevent soil erosion
- Reduce soil compaction
- Conserve moisture by reducing evapotranspiration
- Use up excess soil moisture when soils are very wet
- Protect water quality by reducing phosphorus runoff
- Provide weed management benefits
- Adding diversity to soil biosphere

Be aware of the costs associated with cover crops:

- Seed cost and equipment to plant
- Requires one or more additional passes through the field for planting, terminating
- Unwanted use of soil moisture when soils are dry
- Can become a volunteer weed
- May be difficult to control volunteer wheat or other pest problems
- Timing of termination can be inconvenient and ability to terminate (mowing, tilling, rolling, spraying, etc) can be a challenge in some cases

You'll need to match the choice of a cover crop with your specific goal(s).

How will you plant it, and when?

Consider the crop rotation that you have planned and determine the best time to seed and establish the cover crop. For the greatest weed management benefit, know when the key weed species you are targeting germinate and emerge. Establish the cover crop prior to that key point in the lifecycle of the weed for most impact.

Classification of weeds based on emergence timing:

Sept – Nov (winter annuals) – marehail, mustard species, cheat, downy brome

Very early spring (April) - kochia

Mid-spring (May) – common sunflower, giant ragweed, common lambsquarters

May – June (summer annuals) – Palmer amaranth, waterhemp, velvetleaf, foxtails, large crabgrass, barnyardgrass, shattercane

How can cover crops help control weeds?

Ways that cover crops can provide weed management benefits:

- Living cover crops or a layer of residues will reduce sunlight reaching the soil surface; smother and outcompete weeds for light, water, and nutrients
- Alter the moisture and temperature environment in the soil surface layer during weed seed germination and emergence
- Some cover crops release chemicals from roots or decaying residue, inhibiting weed seed germination
- Improve overall soil health and benefit crop growth and vigor to compete effectively against weeds



Figure 1. A cover crop mixture of oats and spring peas. All photos by Anita Dille, K-State Research and Extension.



Figure 2. Palmer amaranth in field without cover crop.



Figure 3. A cover crop mixture of oats and spring peas has suppressed Palmer amaranth growth.

All three photos above were taken May 12, 2015 before termination and spraying with either glyphosate, or glyphosate with a residual herbicide. Many of these Palmer amaranth are glyphosate-resistant, so some would survive the glyphosate-only termination method, but there would be a better chance of control with the glyphosate-plus-residual treatment. Also, the cover crop residue remaining on surface and the subsequent soybean crop no-till planted into that residue provided further suppression of the weeds. The Palmer amaranth was much larger by in the field without a cover crop at the time of these photos, and Palmer amaranth is more difficult to control when it gets bigger. In the field with the cover crop, there were fewer Palmer amaranth plants and the plants were smaller, easier to control, and smothered by the cover crop after terminating.

What will precede and what will follow the cover crop in your rotation?

- Some cover crops tie up nitrogen, so it is important to consider the carbon-to-nitrogen ratio of the cover crops being considered. This will influence the rate of residue breakdown and future release of nutrients in the subsequent crop.
- Some pre-emergence herbicides applied in the spring before corn or soybean, can persist into the fall, impacting the establishment of some cover crop species, causing some injury, and sometimes loss. The length of residual activity will be influenced by herbicide chemical properties (half-life) and environmental conditions, such as rainfall, temperature, soil pH, soil type, and soil organic matter. Conduct a soil bioassay if uncertain about soil-applied herbicides and your cover crop of choice.

Which cover crop will you plant?

Depending on your geographic location, many options are available. Resources:

- Midwest Cover Crops Councils' [Cover Crop Decision Tool](#); data available for Kansas
- Managing Cover Crops Profitably, 3rd Edition, SARE publication
- [Integrating Cover Crops in Soybean Rotations, Challenges and Recommendations for the North Central Region](#). Published by Midwest Cover Crops Council.

There are many questions about whether a single species or a mixture is most beneficial for weed suppression. The key aspect is trying to achieve enough biomass by the cover crop to minimize weed growth.

How will you terminate your cover crop?

Consider how to terminate the cover crop along with what will need to be done to control any weed species present. A residual herbicide may need to be included with the burndown application in some cases. Some cover crops will die out over the winter and leave residue on the soil surface (e.g., mustards, peas, spring cereals). Others may require some active methods to terminate, with proper timing being important. For example, to terminate overwintering cereal rye or wheat, apply glyphosate and a residual herbicide at 9 to 12" cover crop height, or use a roller/crimper at the soft dough stage. For perennial clover, treat with herbicide tank mixes (2,4-D, glyphosate, and a residual herbicide) 2 to 4 weeks before planting the following cash crop. A roller/crimper is not effective on clovers.

The standard recommendation is to spray / terminate the cover crops at least 2 weeks before planting corn or soybean crops in eastern Kansas. Check with crop insurance providers, USDA-FSA, or NRCS offices for local rules on termination timing, particularly in the western half of Kansas.

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2. The ongoing battle with pigweeds in soybeans

Palmer amaranth and waterhemp were once again fairly prevalent in many Kansas soybean fields this year. Many of the uncontrolled pigweeds have produced seed and will be a continuing problem in those fields in future years.



Figure 1. Glyphosate-resistant Palmer amaranth in soybeans. Photo by Dallas Peterson, K-State Research and Extension.

Other fields, sometimes just across the road from a weedy field, are relatively clean. The dramatic differences in pigweed populations from one field to another are most likely related to differences in the prevalence of glyphosate-resistant populations, weed seed bank, management practices, rainfall patterns, and a little bit of luck.

Glyphosate-resistant waterhemp and Palmer amaranth are now fairly common throughout the state. Most fields actually have a mixed population of susceptible and resistant biotypes, but the uncontrolled resistant plants are the ones that we notice. The proportion of resistance in the population will continue to increase as long as we continue to use glyphosate and eliminate the susceptible individuals. There may still be some fields in which the waterhemp or Palmer amaranth are mostly susceptible to glyphosate, but they are becoming fewer as we spread resistant seed to new fields and continue to rely on glyphosate.

Producers who are still trying to rely primarily on postemergence herbicides to control pigweeds are having an increasingly hard time getting good control. It used to be that glyphosate would provide excellent control of both waterhemp and Palmer amaranth even if those weeds were a foot tall or more. Other herbicide options for postemergence pigweed control in soybeans are most effective if the weeds are less than 3 inches tall.

That means producers have to watch their fields closely early in the season and spray the weeds when they first see them emerging. That's an entirely different mindset than just a few years ago when glyphosate was more consistently effective on pigweeds. Both waterhemp and Palmer amaranth grow very quickly once they have emerged, and can quickly get too tall for good control with postemergence herbicides. If these weeds get to be more than several inches tall, postemergence herbicide alternatives to glyphosate often just burn back the tops of the weeds but will not kill them.

Consequently, a good residual herbicide program in the spring will continue to be important for pigweed management in the future, regardless of the postemergence program. Rain is essential to activate residual herbicides, but too much rain can move the herbicide deeper into the soil and dilute the concentration in the surface zone where the pigweed is germinating.

Many areas experienced excessive rains in late May, followed by 3 to 4 weeks of dry weather in June. Consequently, early preplant treatments may not have persisted as long as desired and started to break. Preemergence herbicides that were applied when it got dry enough to plant in May often did not get enough rain to activate the herbicides until several weeks later. Pigweeds that germinated during that timeframe escaped control.

This scenario often complicates postemergence control decisions as there may not be a lot of weed escapes early and we know there will be more weeds germinating when it finally rains. However, the early emerging weeds grow very rapidly with warm temperatures and quickly get beyond optimum treatment sizes. It probably is best to go ahead and make a timely postemergence treatment to those early emerging pigweeds and not wait for rain, as the preemergence herbicide will get activated when it finally does rain. Additionally weeds that emerge with, or soon after, crop emergence are the most competitive and can result in greater yield losses than later-emerging weeds. Unfortunately, the weather often doesn't cooperate with us to get things done in a timely manner and optimize herbicide performance.

Where glyphosate-resistant pigweeds have become a problem, producers may want to consider planting Liberty Link or conventional soybeans. These soybeans also will need a diversified weed control program that utilizes residual herbicides and timely applications. In addition to applications to small pigweeds, Liberty and most other postemergence pigweed herbicides need to be applied at higher spray volumes of at least 15 gallons per acre to achieve good spray coverage. Liberty also works better with higher humidity and when sprayed during the daylight hours. If weeds aren't controlled within 7 days of Liberty application, a second application 7 to 10 days after the first application generally controls any surviving plants. Always follow label guidelines regarding rates, adjuvants, and application procedures to achieve the best results with any herbicide treatment.

Several new herbicide resistant traits may be fully approved for use in soybeans in the next several years. The new traits will provide new weed control options, but also may increase the complexity of management. The new traits include 2,4-D resistant soybeans (Enlist), dicamba resistant soybeans (Roundup Ready 2 Xtend), and HPPD resistant soybeans (Balance GT and MGI). Most of these soybeans will be stacked with more than one herbicide-resistant trait, but won't be stacked with all of the different traits.

Regardless of the herbicide-resistant trait, the most effective weed control programs are integrated programs with multiple weed control methods and diversified herbicide programs. Postemergence treatments with these programs also will need to be applied before pigweeds exceed 3 to 4 inches

tall to maximize control.

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3. Fall control of bindweed

Field bindweed is a deep-rooted perennial weed that severely reduces crop yields and land value. This noxious weed infests just under 2 million acres, and is found in every county in Kansas. Bindweed is notoriously difficult to control, especially with a single herbicide application. The fall, prior to a killing freeze, can be an excellent time to treat field bindweed -- especially in a year like 2016 when good fall moisture has been received. This perennial weed is moving carbohydrate deep into its root system during this period, which can assist the movement of herbicide into the root system.



Figure 1. Field bindweed ready for a fall treatment. Photo by Curtis Thompson, K-State Research and Extension.

The most effective control program includes preventive measures over several years in conjunction with persistent and timely herbicide applications. The use of narrow row spacings and vigorous, competitive crops such as winter wheat or forage sorghum may aid control.

Dicamba, Tordon, 2,4-D ester, and glyphosate products alone or in various combinations are registered for suppression or control of field bindweed in fallow and/or in certain crops, pastures,

and rangeland. Apply each herbicide or herbicide mixture according to directions, warnings, and precautions on the product label(s). Single herbicide applications rarely eliminate established bindweed stands.

Applications of 2,4-D ester and glyphosate products are most effective when spring-applied to vigorously growing field bindweed in mid to full bloom. However, dicamba and Tordon applications are most effective when applied in the fall. Most herbicide treatments are least effective when applied in mid-summer or when bindweed plants are stressed.

Facet L, at 22 to 32 fl oz/acre, a new quinclorac product which now replaces Paramount at 5.3 to 8 oz or QuinStar quinclorac products, can be applied to bindweed in fallow prior to planting winter wheat or grain sorghum with no waiting restrictions. All other crops have a 10-month preplant interval. Quinclorac products can be used on a sorghum crop to control field bindweed during the growing season. In past K-State tests, fall applications of Paramount have been very effective as shown in two of the tables below.

Additional noncropland treatments for bindweed control include Krenite S, Plateau, and Journey.

Considerable research has been done on herbicide products and timing for bindweed control. Although the research is not recent, the products used for bindweed control and the timing options for those products haven't changed much since this work was done. As a result, the research results in the charts below remain very useful today.

Fall vs. Spring and Summer Herbicide Application for Control of Field Bindweed in the Texas Panhandle: 1976-1982				
Season of application				
Treatment	Rate (lbs ai/acre)	Spring (April or May)	Summer (June, July, or Aug.)	Fall (Sept. or Oct.)
% Control one year after treatment				
Roundup	2.9	83	77	60
Banvel	1.0	56	41	71
2,4-D ester	1.0	65	49	55
Tordon + 2,4-D ester	0.25 + 0.5	55	56	84
Tordon + Banvel	0.25 + 0.25	47	73	87
Tordon + Roundup	0.20 + 1.6	52	73	79
% Control two years after treatment				
Roundup	2.9	67	63	32
Banvel	1.0	31	37	34
2,4-D ester	1.0	46	42	10

Source: Field Bindweed Control in Field Crops and Fallow, MF-913
<http://www.ksre.ksu.edu/bookstore/pubs/MF913.pdf>

September-Applied Treatments for Control of Field Bindweed:		
Randall Currie and Curtis Thompson, Southwest Research-Extension Center 1992-1993		
Treatment	Rate	Average % Control in Spring

Banvel	4 oz	31
Banvel	8 oz	44
Banvel	1 pt	85
2,4-D	1 pt	48
Banvel + 2,4-D	8 oz + 8 oz	82
Paramount	5.3 oz	91
Paramount + Banvel	5.3 oz + 4 oz	98
Paramount + Banvel	5.3 oz + 8 oz	97

Source: 1995 Field Day Southwest Research-Extension Center, Report of Progress 739
www.ksre.ksu.edu/historicpublications/pubs/SRP739.PDF

September-Applied Treatments for Control of Field Bindweed:		
Randall Currie, Southwest Research-Extension Center 1992-1997		
Treatment	Rate	Average % Control in Spring
Banvel	4 oz	19
Banvel	8 oz	65
Banvel	1 pt	89
2,4-D	1 pt	72
2,4-D	1 qt	81
Glyphosate	1 qt (IPA)	68
Paramount	5.3 oz	90
Tordon	8 oz	75
Tordon	1 pt	98

Source: 1999 Field Day Southwest Research-Extension Center, Report of Progress 837
www.ksre.ksu.edu/historicpublications/pubs/srp837.pdf

For more information on controlling bindweed, see [2016 Chemical Weed Control for Field Crops, Rangeland, Pastures, and Noncropland](#), K-State publication SRP-1126.

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4. Bur ragweed control with early fall treatments

With good moisture conditions in parts of Kansas this year, this is a good time to treat fields for perennial broadleaf weeds such as bur ragweed, bindweed, and Canada thistle.

Bur ragweed (also called woollyleaf bursage) is a perennial broadleaf weed, and is classified as a noxious weed in Kansas. It is a significant problem on nearly 94,000 acres in the western half of the state. It is adapted to low areas where water runoff collects in cultivated fields or in noncropland areas. Its ability to extract water with its deep perennial root system, which can reach a depth of 15 feet, allows bur ragweed to survive extended periods of drought or harsh weather. These circumstances make it very difficult to control.



Figure 1. Bur ragweed. Photo courtesy of Curtis Thompson, K-State Research and Extension.

Woollyleaf Bursage Distribution in Kansas

2014 summary 93855 no change from 2013 of 93829

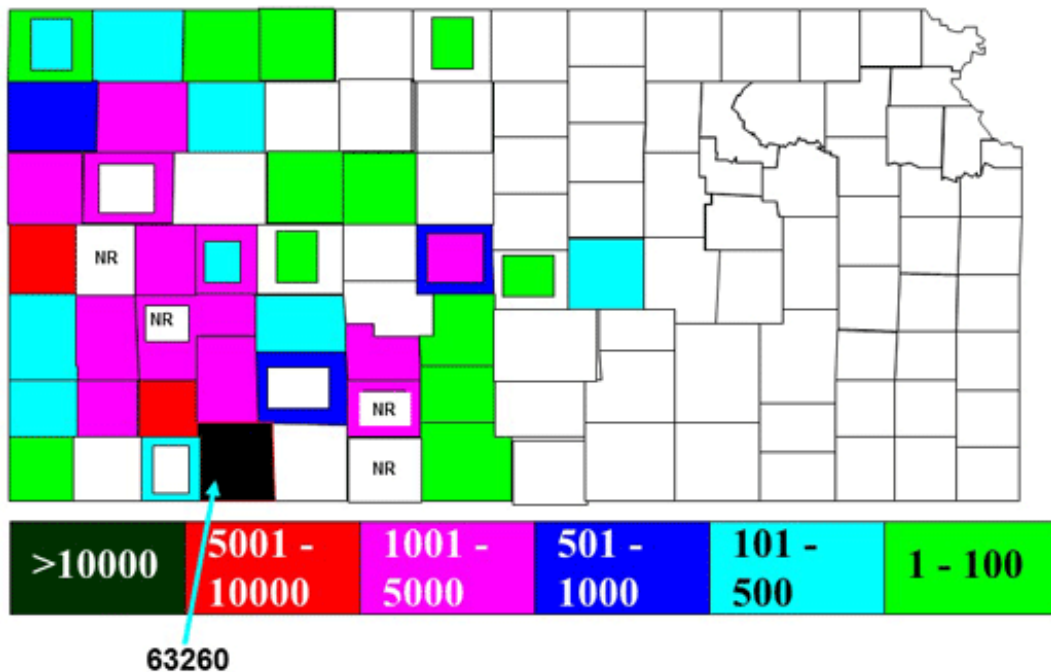


Figure 2. Distribution of bur ragweed in Kansas, in terms of acreage.

Bur ragweed is extremely competitive with crops, and can reduce grain yield by 100 percent in dry years. Even with irrigation, losses of 40 to 75 percent are common. Bur ragweed is more competitive with summer crops than with winter wheat because bur ragweed growth is minimal during much of the winter wheat life cycle. However, in dry years, bur ragweed will deplete soil moisture for fall-planted wheat and without adequate moisture will thereby reduce grain yield significantly.

Flower development begins in late July or early August. Seed contributes to the spread of bur ragweed and likely is a source of new infestations. New plants also arise from the vegetative buds, which develop on the root stocks, thus contributing to the spread of bur ragweed. Tillage also can redistribute vegetative buds, aiding the spread of bur ragweed.

Bur ragweed control is best when treated in late summer or fall, prior to a killing frost with Tordon tank mixed with dicamba or 2,4-D ester. Control will not be as effective if the bur ragweed plants are under stress at the time of treatment. Bur ragweed is a difficult weed to control, and a single treatment application will usually not be sufficient. A fall treatment with the herbicides mentioned above followed by glyphosate treatments in glyphosate-tolerant crops during the growing season can help manage bur ragweed long-term. However, spring crops may be injured severely from fall applications of Tordon. Wheat has the most tolerance and can be planted 45 days following a ½ pint of Tordon 22K application. Apply each herbicide or herbicide mixture according to directions,

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warnings, and precautions on the product label(s).

Control of Bur Ragweed in Western Kansas with mid-September Treatments		
Treatment	Rate (lbs/acre)	% Control 11 months after treatment (2-year average)
Tordon + Banvel	0.25 + 0.5	82
Tordon + 2,4-D LVE	0.25 + 1	74
Roundup + Banvel	1.5 + 0.5	16
Roundup + 2,4-D LVE	1.5 + 1	27

Source: Woollyleaf Bursage Biology and Control, MF-2239 <http://www.ksre.ksu.edu/bookstore/pubs/MF2239.pdf>

For more information, see [2016 Chemical Weed Control for Field Crops, Rangeland, Pastures, and Noncropland](#), K-State publication SRP-1126, or [Woollyleaf Bursage Biology and Control](#), K-State publication MF-22239.

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5. Summer field crop status in Kansas

At this point in the 2016 growing season, all summer field crops around the state are in their final reproductive stages. Corn has already gone through the dent stage (R5) on most fields and, depending on the weather conditions, could take from a few days to weeks to become fully mature -- 25-35% moisture content, formation of black layer (65% of the corn in Kansas is mature). Soybean and sorghum will be ending the grain filling stage and reaching maturity in the coming weeks. Grain fill duration will be connected to temperature and precipitation conditions, and the source:sink balance within the plant, which involves the leaf-to-grain relationship. A lack of functional green canopy will result in a short grain fill period; and a similar situation will occur if the grain number was reduced.

At the national level, the most recent [USDA crop progress report](#) estimated total corn production at about 15 billion bushels, 11% higher than in 2015. The average yield is predicted to be close to 174 bu/acre, 6 bushels higher than in 2015. Soybean is forecast at a record close to 4.2 billion bushels, 7% higher than in 2015. Sorghum yield per acre was projected at September 1 to be close to 76 bu/acre, and an estimated overall production of 488.5 million bushels.

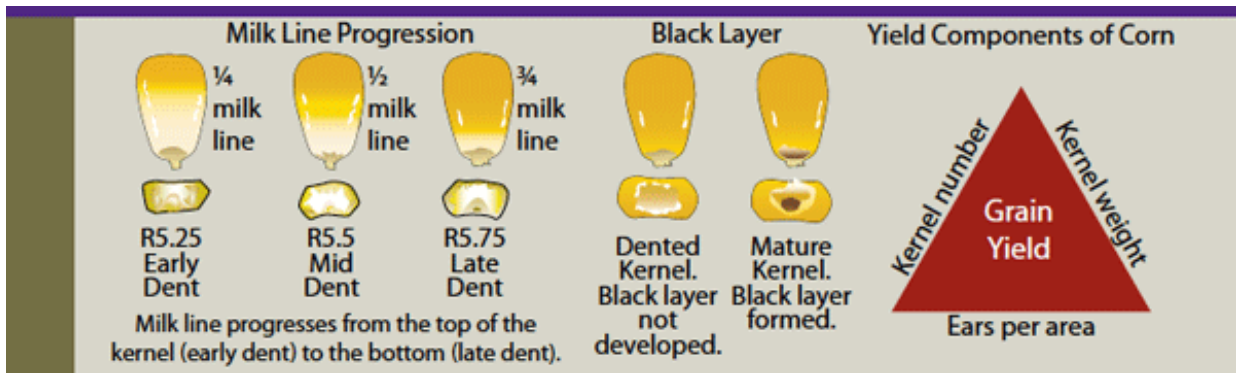
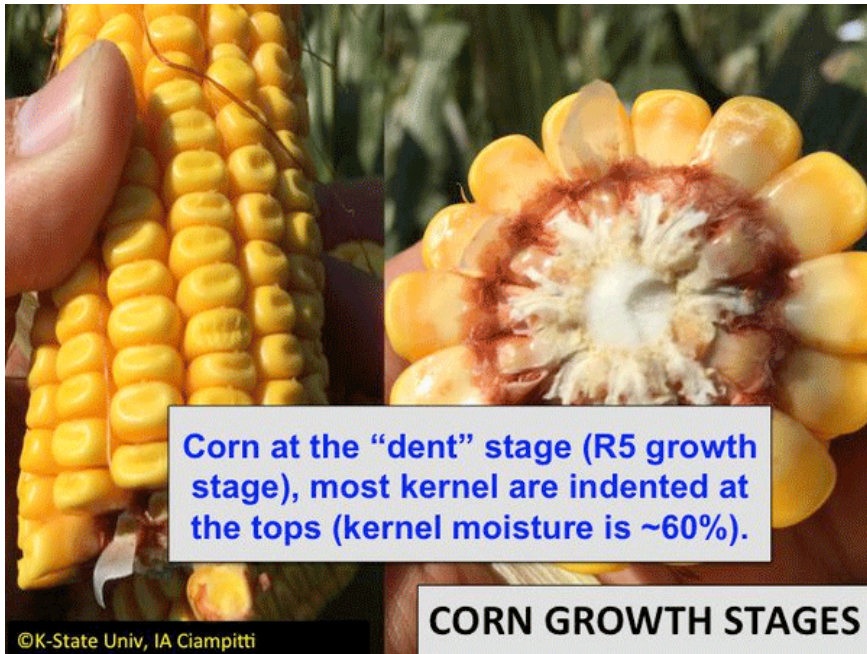
Corn

The most recent [Kansas Agricultural Statistics Service crop progress](#) report estimates that 96% of the corn crop in Kansas is has reached at least the dent stage, more than 60% of the crop is mature, and 17% has been harvested. Overall, 66% of the corn crop in Kansas was classified by the USDA as being in good or excellent condition. Pollination and grain-fill periods were quite favorable for corn yields this year.

The dent stage (R5) takes place 40 days after silking, which varies with weather conditions. Kernels are drying down in the dent stage; grain moisture declines to 55% as the starch content increases. Past experience has shown that when corn is reaching the dent stage, biotic or abiotic stress conditions – such as high temperature stress, drought, pests, hailstorm, etc. -- may exert some impact on final kernel weight by shortening the dry matter accumulation period. From dent to the formation of black layer (maturity), corn will lose moisture and total dry weight will increase until filling ceases (Table 1).

Currently, most of the corn is approaching maturity; thus, the influence of stress conditions on yield would be small. Final kernel weight is determined as the crop reaches full physiological maturity, or maximum dry mass accumulation. This can be identified as the formation of the black layer, the black line formed at the bottom of the grain (Figure 1).

Further details related to changes in growth and development for corn can be found at: <https://www.bookstore.ksre.ksu.edu/pubs/MF3305.pdf>



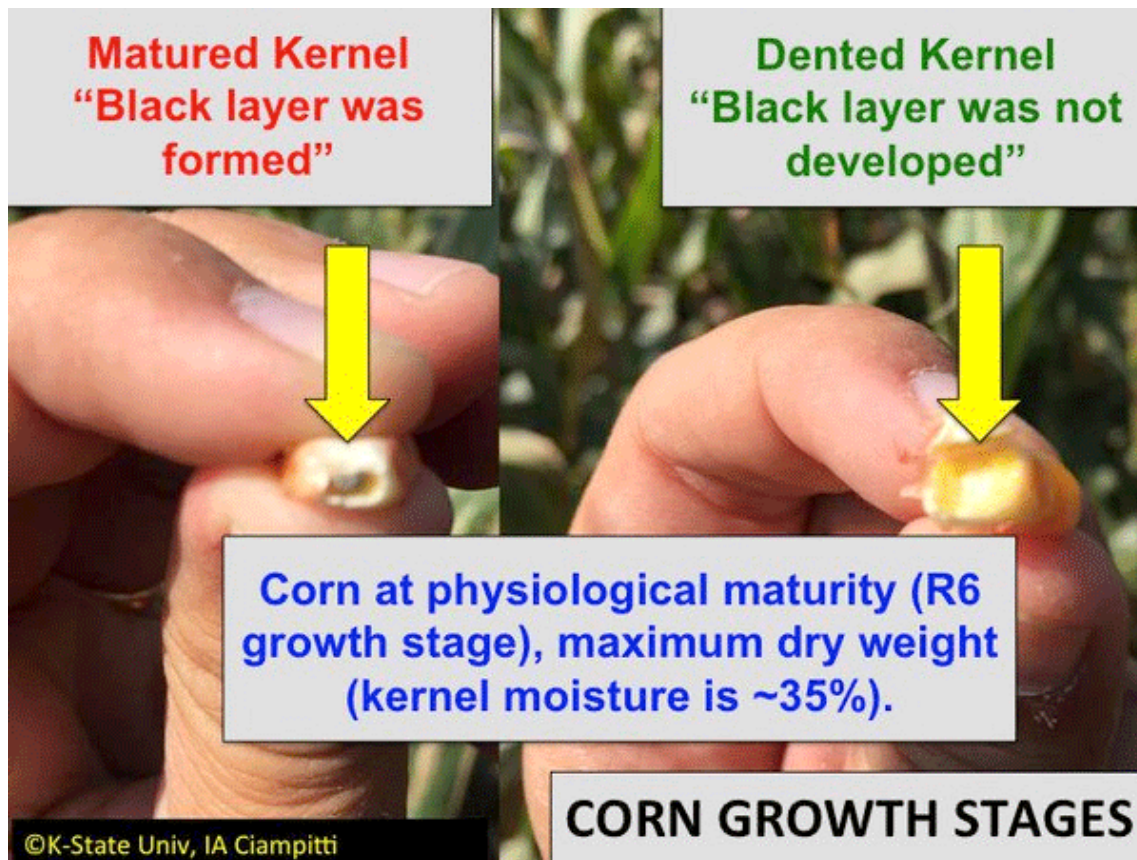


Figure 1. Corn at dent stage and at black layer growth stages. Photo and infographic prepared by Ignacio Ciampitti, K-State Research and Extension.

Table 1. Growth stages, moisture content, and total dry matter progression for corn from late to physiological maturity. Extracted from K-State Research and Extension publication MF3305.

R Stage	Moisture %	Dry Matter (% of Total Dry Weight)	Average per Substage	
			Growing Degree Days, °F	Days
5.0	60	45	75	3
5.25 (¼ milk line)	52	65	120	6
5.5 (½ milk line)	40	90	175	10
5.75 (¾ milk line)	37	97	205	14
6.0 (Physiological maturity)	35	100		

¹Abendroth, L.J., R.W. Elmore, M.J. Boyer, and S. K. Marlay. 2011. *Corn Growth and Development*. PMR 1009. Iowa State Univ. Extension. Ames Iowa.

The most important task from this point on is to scout the fields for the presence of weak stalks and plan the harvesting procedure -- prioritizing cornfields with weak or broken stems.

Soybean

In most of the areas of the state the soybean crop is reaching the final stages of the reproductive phase, ranging from R5 (beginning seed) to R7 (beginning maturity) stages.

The most recent Kansas Agricultural Statistics crop conditions report noted that 19% of the state's soybean crop is dropping leaves, similar to this point in 2014 and 2015. At present, 70% of the soybean crop condition has been rated good or excellent. The senescence process, detected as yellowing in soybean fields, is progressing quickly now with the warm temperatures this week (9/19-9/23).

A considerable portion of the potential soybean yield will be determined in the upcoming weeks, between full seed stage (R6; Figure 2) and the beginning of maturity (R7). The beginning of maturity is recognized when only one pod on the main stem has reached mature color (e.g. brown color). At this point of the season, any biotic or abiotic stress can still impact seed size. As discussed in a previous eUpdate article ("Estimating soybean yields," [eUpdate #585](#)), drought and heat conditions at this point in the season could severely impact seed size. Large changes (e.g. 10-20%) in yield could result from changes in the final seed weight.

Continue to scout your soybean fields for crop production issues. Lodging and severe defoliation (primarily caused by insects) can be an issue for soybeans. Lodging can affect harvesting, as well as the late-season photosynthetic efficiency of soybeans – which can accelerate senescence and cause reductions in seed weight and yield. In addition, green stem syndrome, a condition in which the stem remains green while the seeds are mature, can be an important problem when harvesting. More information on this topic will be in the next issue of the Agronomy eUpdate.

Detailed information about soybean growth and development can be found at: bit.ly/IDBeanStage

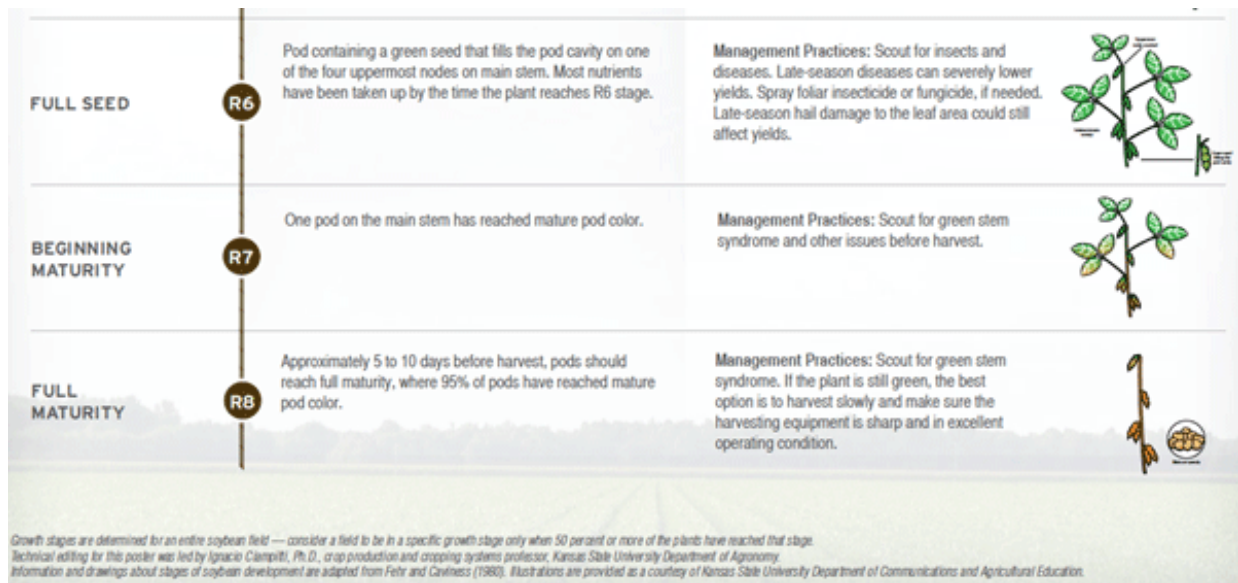
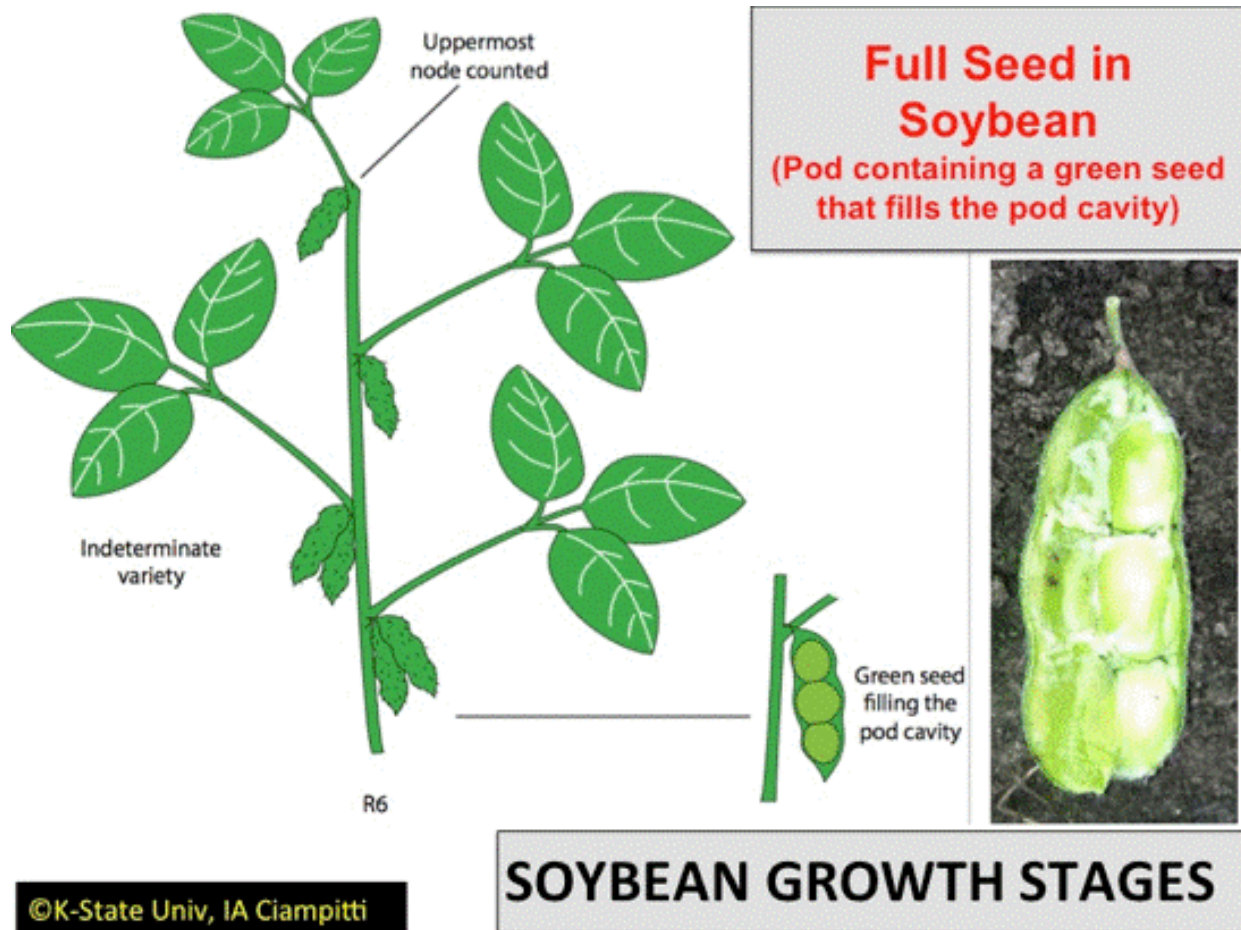


Figure 2. Soybean at full seed stage and final development stages extracted from the Soybean Growth and Development chart (K-State, USB, and Kansas Soybeans). Photo and infographic prepared by Ignacio Ciampitti, K-State Research and Extension.

Grain sorghum

Kansas Agricultural Statistics projected that 92% of the sorghum crop in Kansas is currently at or beyond the coloring stage (Fig. 3), 3% ahead of last year's pace. Close to one third of the entire sorghum acreage in Kansas was reported at full maturity, near the pace of last year. Harvested acreage was 5% based on the report released on Sept. 19, similar to that at this time last season. More than 70% of the sorghum crop was classified as being in good or excellent condition; with a small 4% projected as a very poor or poor. Similar to soybean, a portion of the potential sorghum yield remains to be determined in the next coming weeks.

One of the main late-season factors that can affect sorghum yields in Kansas is the possibility of a killing freeze before maturity. An early freeze will reduce the final seed weight due to a cessation in the dry matter allocation to the grain. The only management practice to avoid this phenomenon is to use shorter-season hybrids and earlier planting dates in environments prone to early freezes. Early planting was difficult to accomplish in the challenging wet spring in 2016.

Another challenge for sorghum farmers is the presence of sugarcane aphids. The occurrence of the aphids across the state continues to expand. Timely scouting for the presence of the aphids and taking appropriate action if the economic threshold is achieved is critical. Update on the current status on sugarcane aphids and other pests can be found at:

https://webapp.agron.ksu.edu/agr_social/eu_article.throck?article_id=1122

Continue to scout your sorghum fields for crop production issues, including lodging or bird feeding. Often the utilization of pre-harvest desiccation will help reduce the moisture content and will promote a more uniform maturation and an earlier harvest time. Utilization of pre-harvest desiccants is recommended when the crop is fully mature (25-35% moisture content), which is the stage at which a desiccant will not affect yields. Applications before maturity could compromise the final yield. More information on this topic can be found in the last week's Agronomy eUpdate:

https://webapp.agron.ksu.edu/agr_social/eu_article.throck?article_id=1124

Information related to different preharvest desiccant products and waiting periods can be found at:

<http://www.bookstore.ksre.ksu.edu/pubs/MF3046.pdf>

Check your crop to see if it is mature before harvest, and for black layer formation. Differences in black layer formation, or maturity, can be present at the same time in different positions of the head. Usually, grain sorghum is mature when grain moisture content is the range of 25-35% (Fig. 3).

Further details related to changes in growth and development for sorghum can be found at:

<https://www.bookstore.ksre.ksu.edu/pubs/MF3234.pdf>

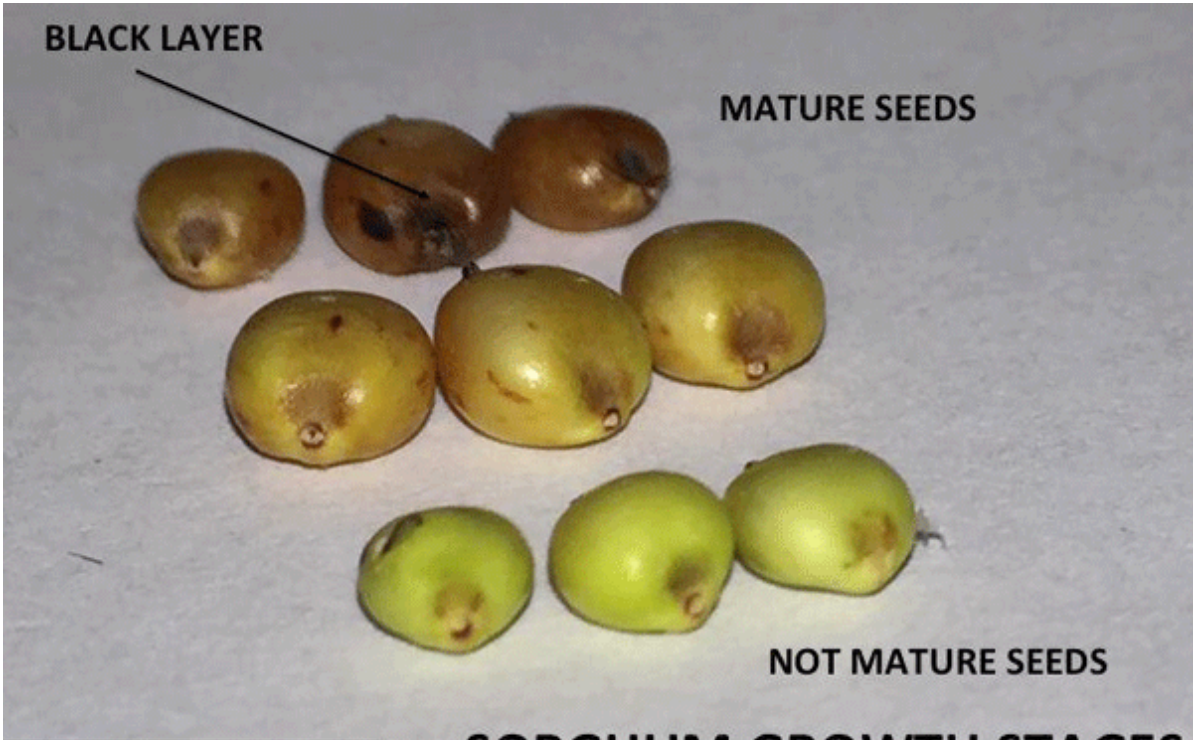


Sorghum at Coloring Stage



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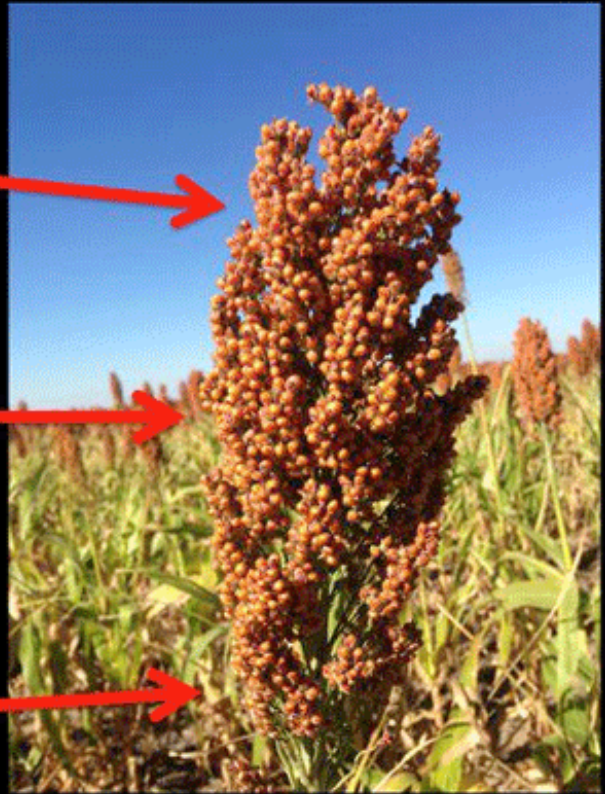
SORGHUM GROWTH STAGES



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SORGHUM GROWTH STAGES

MATURITY differences within the HEAD



SORGHUM MATURITY

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Figure 3. Sorghum at the coloring stage and mature/not mature seeds at different positions in the sorghum head. Photo and infographic prepared by Ignacio Ciampitti, K-State Research and Extension.

Further information on corn, soybean, and sorghum growth and development can be found at:

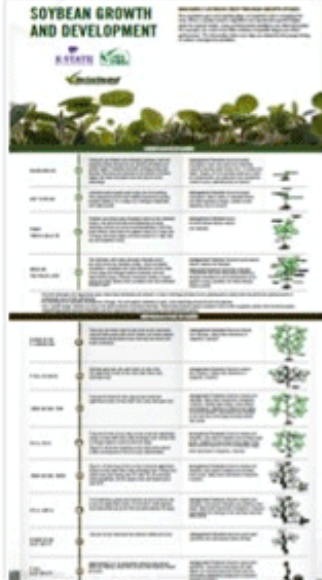
Summer Row Crops – Growth & Development, @KSUCROPS

http://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf

<https://www.bookstore.ksre.ksu.edu/pubs/MF3234.pdf>

<https://www.bookstore.ksre.ksu.edu/pubs/MF3234.pdf>

Soybean Growth & Development



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Sorghum Growth & Development



Corn Growth & Development



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6. Forecasting corn yields: End-of-season outcomes

The Yield Forecast Center has released its final forecast for corn yields across the Corn Belt. Complete details and information related to participants of the center and yield prediction for the rest of the

Corn Belt can be found at:

<http://cropwatch.unl.edu/2016/yield-forecast-center-predicts-corn-yields-well-below-usda-nass-projections>

The final round of end-season corn yield simulations is presented in this article. The corn simulation model Hybrid-Maize Model (<http://hybridmaize.unl.edu>) was utilized in collaboration with faculty and extension educators from 10 universities across the Corn Belt, including K-State.

For the locations evaluated in Kansas, physiological maturity (black layer) has been reached (for more information see corn growth and development:

<https://www.bookstore.ksre.ksu.edu/pubs/MF3305.pdf>)

Similar to the trend observed in many areas across the Corn Belt, in general, the corn crop in Kansas did not experience an interruption of grain filling from drought or heat stresses, resulting in favorable conditions during the last phase of the reproductive stages.

For the locations under irrigation (Scandia, Silver Lake, and Garden City) forecasted yields are near the average (+- 10% as compared with the long-term yield average, 2005-2014, Table 1). Overall for all the irrigated locations in the Corn Belt region, forecasted corn yield averaged 200 bu/acre, which is 8% higher than the long-term trend (2005-2014) and only 6 bu/acre less than the highest average on record for irrigated conditions.

Table 1. Forecasted corn yields for 2016 and average corn yield reported by USDA-NASS for the last 10 years for regime within the state of Kansas.

State	Water regime	Forecasted 2016 yield (bu/acre)*	Average (2006-2015) yield (bu/acre)**	% Deviation***	Pre (bu/acre)
Kansas	Irrigated	200	186	+8	206
	Rainfed	99	93	+6	123

* Based on our median 2016 forecasted actual yield estimated for each location

** State 10-year (2006-2015) average yield reported by USDA-NASS

*** Deviation of forecasted 2016 yield relative to average (2006-2015) yield

**** Highest statewide average yield reported by USDA-NASS during the last 10 years

Forecasted yields for the rainfed locations in Kansas (Scandia, Silver Lake, Rossville, and Hutchinson) are also near average (Table 1). Overall, forecasted corn yield in the Corn Belt averaged 99 bu/acre, 6% higher than the historical average (long-term trend, 2005-2014) (Fig. 1).

Forecasted 2016 end-of-season rainfed corn yield

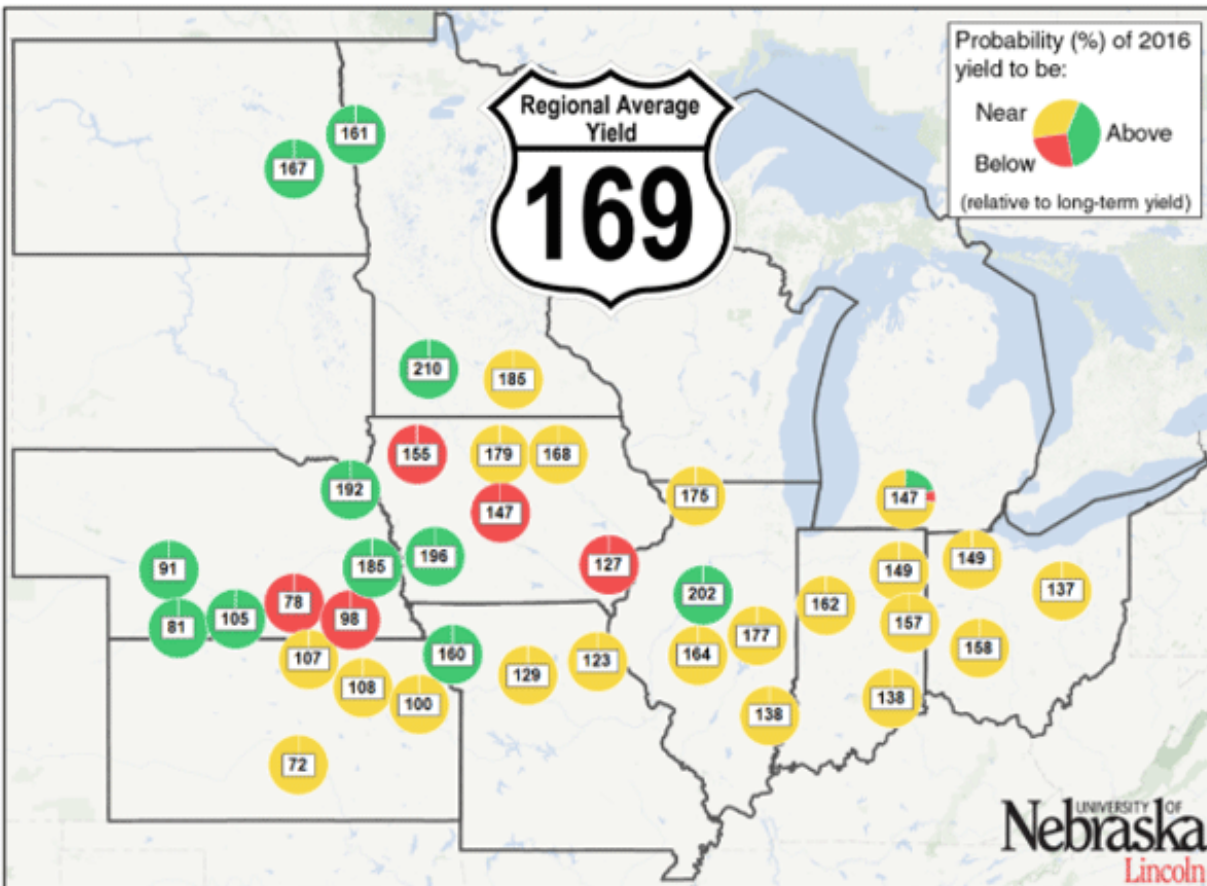


Figure 1. Forecasted end-of-season average rainfed yield at each location (bu/acre). Colors indicate whether the forecasted 2016 yield is below ($\leq 10\%$, red), near ($\pm 10\%$, yellow), or above ($> 10\%$, green color) the long-term (2005-2014) average at each location. Extracted from Nebraska CropWatch article, see below link to the full version.

In conclusion, corn yields across Kansas are forecast by the Yield Forecast Center to be near the long-term average, with a slightly positive deviation (6-8% related to the water scenario). For the Corn Belt region, the overall yield forecast is 169 bu/acre, higher than average but 5 bu/acre lower than the USDA-NASS forecast presented in September. Combines are still rolling and final corn yield numbers will be known after harvest.

To read the full article on the final Yield Forecast Center report, see:

<http://cropwatch.unl.edu/2016/yield-forecast-center-predicts-corn-yields-well-below-usda-nass-projections>

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7. Sept. 27 webinar to focus on improving wheat grazing using Canopeo mobile app

Great Plains Grazing will host a free [webinar](#) Tuesday, Sept. 27 at 1:30 p.m. CDT to introduce the new Canopeo application for mobile devices. The app is designed to better manage cattle grazing in dual purpose wheat systems common in the southern Great Plains. For a description of this app and how it works, see [Agronomy eUpdate, Aug. 12, 2016](#).

[Great Plains Grazing](#) is a coordinated effort by a regional network of researchers and extension specialists to adapt beef cattle grazing strategies to changing conditions. Kansas State University is a collaborator in Great Plains Grazing.

Webinar presenter Andres Patrignani, K-State Assistant Professor of Agronomy in soil water processes, will describe the history, user guidelines, applications, and limitations of Canopeo. He is one of the creators of the Canopeo app.

Romulo Lollato, K-State Wheat and Forages Specialist, will describe management principles of dual purpose wheat pastures and how to optimize pasture grazing using the Canopeo application.

Register for the webinar at:

<https://ksu.zoom.us/meeting/register/9680550a1333e52adc2040ba88984b7b>.

Great Plains Grazing is made possible by a U.S. Department of Agriculture - Agriculture and Food Research Initiative-Coordinated Agricultural Project grant. Its webinar series aims to provide research-based information, and is targeted for producers and extension agents. Previous webinars are archived and available for viewing on the Great Plains Grazing website at www.greatplainsgrazing.org.

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8. Comparative Vegetation Condition Report: September 13 - 19

The weekly Vegetation Condition Report maps below can be a valuable tool for making crop selection and marketing decisions.

The objective of these reports is to provide users with a means of assessing the relative condition of crops and grassland. The maps can be used to assess current plant growth rates, as well as comparisons to the previous year and relative to the 27-year average. The report is used by individual farmers and ranchers, the commodities market, and political leaders for assessing factors such as production potential and drought impact across their state.

The Vegetation Condition Report (VCR) maps were originally developed by Dr. Kevin Price, K-State professor emeritus of agronomy and geography. His pioneering work in this area is gratefully acknowledged.

The maps have recently been revised, using newer technology and enhanced sources of data. Dr. Nan An, Imaging Scientist, collaborated with Dr. Antonio Ray Asebedo, assistant professor and lab director of the Precision Agriculture Lab in the Department of Agronomy at Kansas State University, on the new VCR development. Multiple improvements have been made, such as new image processing algorithms with new remotely sensed data from EROS Data Center.

These improvements increase sensitivity for capturing more variability in plant biomass and photosynthetic capacity. However, the same format as the previous versions of the VCR maps was retained, thus allowing the transition to be as seamless as possible for the end user. For this spring, it was decided not to incorporate the snow cover data, which had been used in past years. However, this feature will be added back at a later date. In addition, production of the Corn Belt maps has been stopped, as the continental U.S. maps will provide the same data for these areas. Dr. Asebedo and Dr. An will continue development and improvement of the VCRs and other advanced maps.

The maps in this issue of the newsletter show the current state of photosynthetic activity in Kansas, and the continental U.S., with comments from Mary Knapp, assistant state climatologist:

Kansas Vegetation Condition

Period 38: 09/13/2016 - 09/19/2016

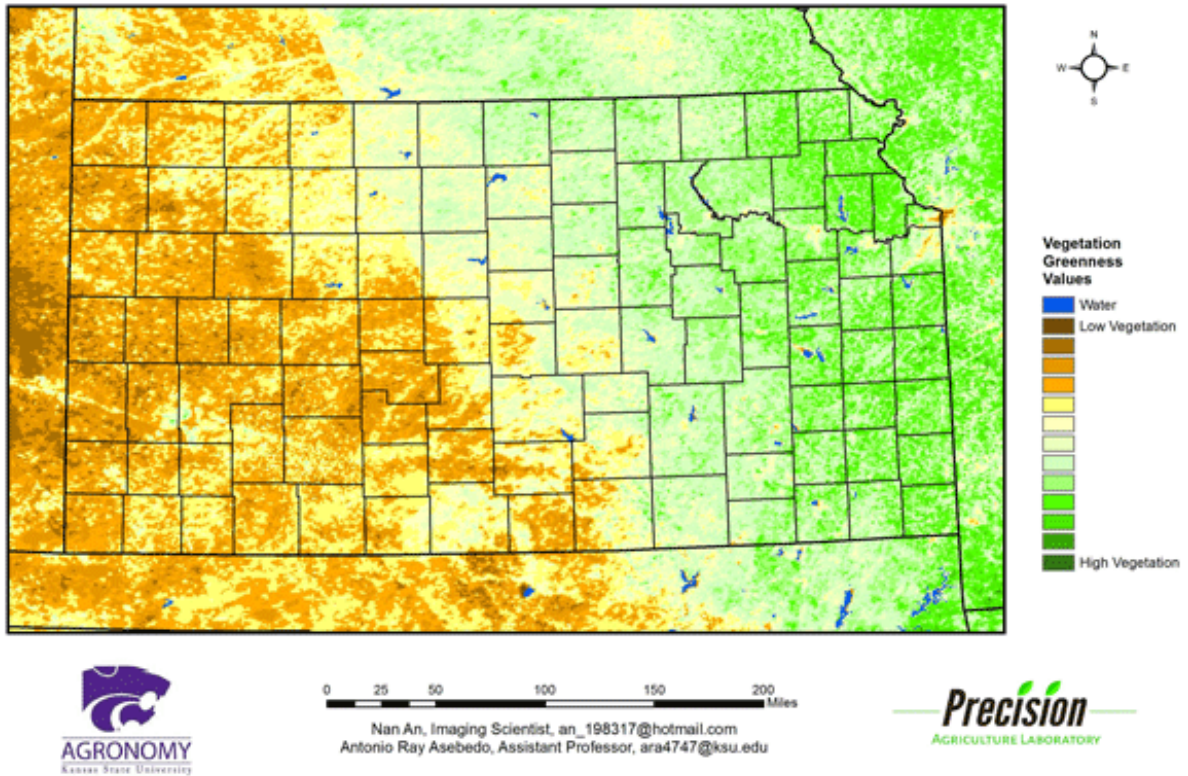


Figure 1. The Vegetation Condition Report for Kansas for September 13 - September 19, 2016 from K-State's Precision Agriculture Laboratory continues to show widespread low NDVI values in the western third of the state. The area of low NDVI values south of the Kansas River in eastern Kansas has shrunk, as more favorable moisture levels are present.

Kansas Vegetation Condition Comparison
Mid-September 2016 compared to the Mid-September 2015

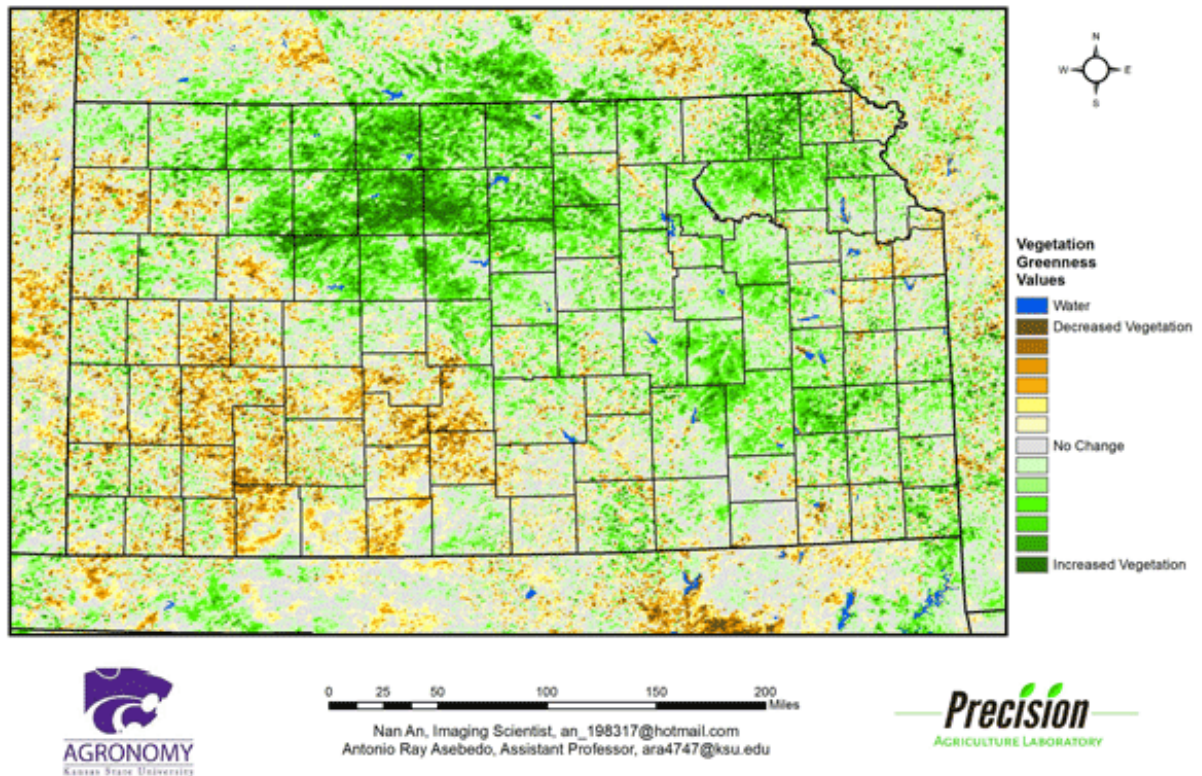


Figure 2. Compared to the previous year at this time for Kansas, the current Vegetation Condition Report for September 13 – September 19, 2016 from K-State’s Precision Agriculture Laboratory shows vegetative production much higher across the northern areas of the state. Heavier rainfall this year has favored vegetative activity.

Kansas Vegetation Condition Comparison
Mid-September 2016 compared to the 27-Year Average for Mid-September

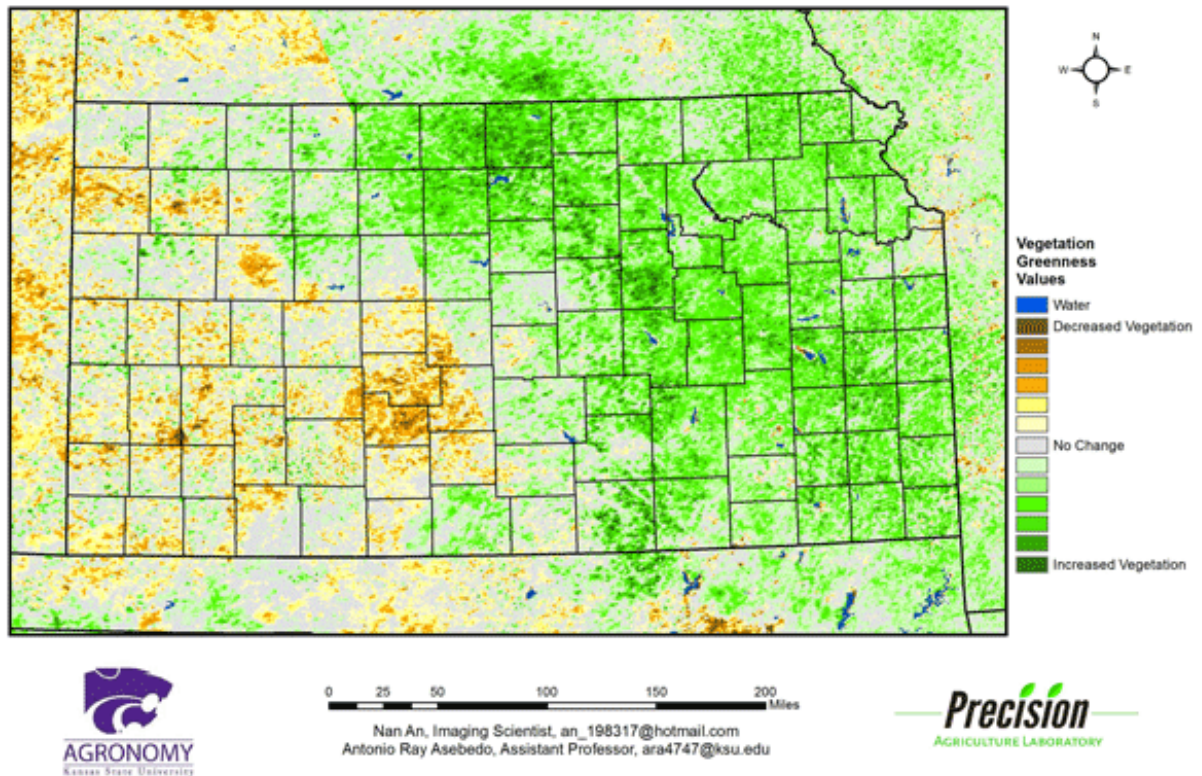


Figure 3. Compared to the 27-year average at this time for Kansas, this year's Vegetation Condition Report for September 13 – September 19, 2016 from K-State's Precision Agriculture Laboratory shows above-average vegetative activity across the eastern half of the state. Below-average activity is most visible in south central Kansas, where winter wheat planting is underway.

Continental U.S. Vegetation Condition

Period 38: 09/13/2016 - 09/19/2016

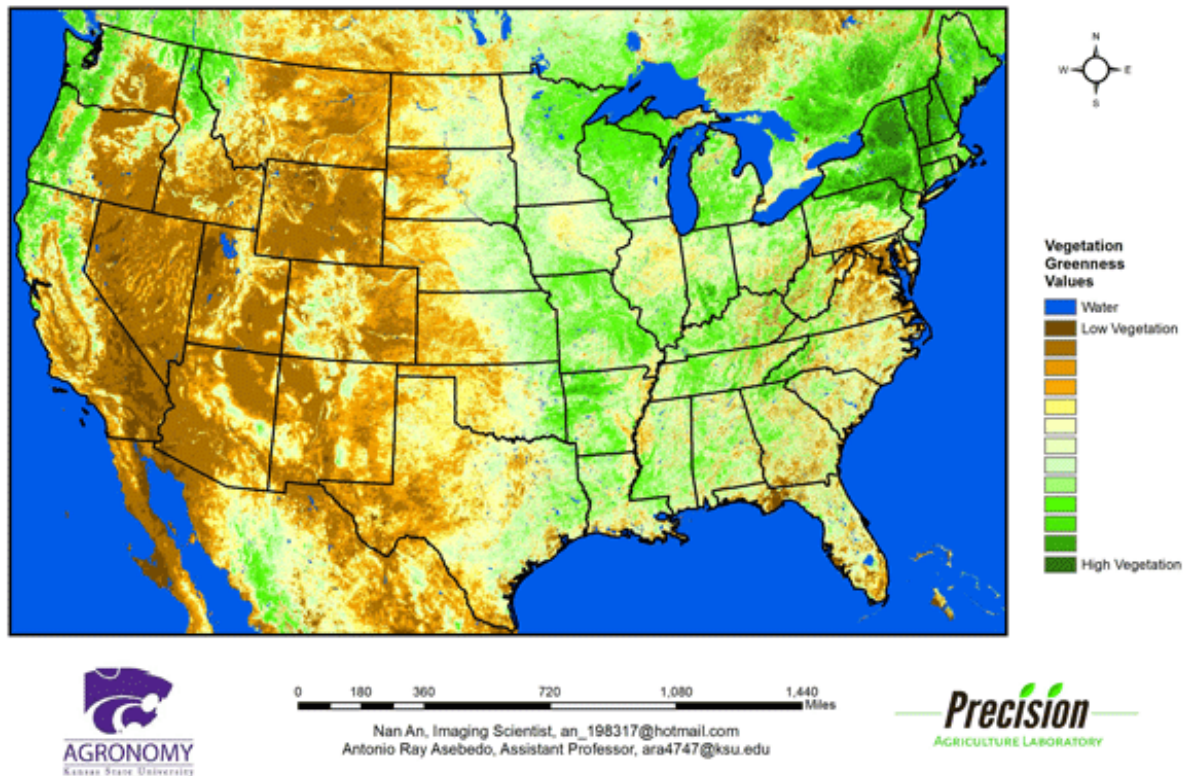


Figure 4. The Vegetation Condition Report for the U.S for September 13 – September 19, 2016 from K-State’s Precision Agriculture Laboratory shows the highest NDVI values are in the upper New England Region. Favorable moisture continues to drive active photosynthesis in these areas. A pocket of much lower photosynthetic activity continues to be visible along the mid-Atlantic, where drought conditions are an issue.

Continental U.S. Vegetation Condition Comparison
Mid-September 2016 Compared to Mid-September 2015

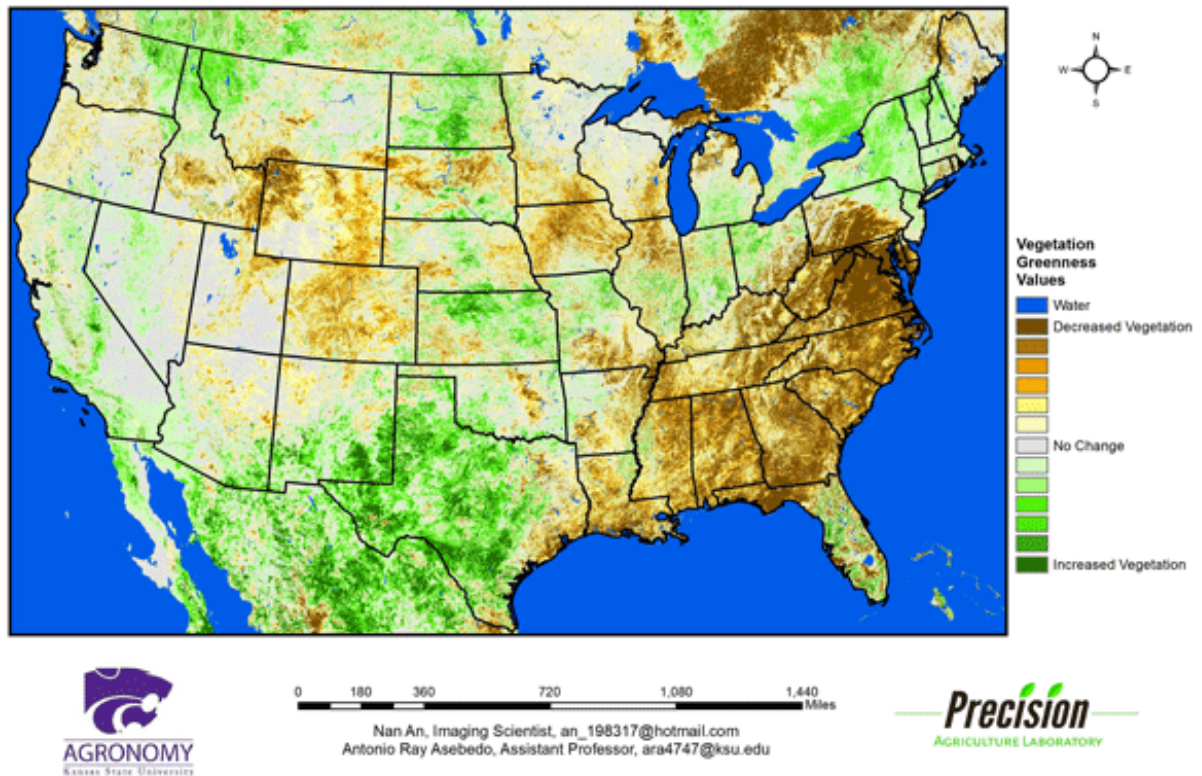


Figure 5. The U.S. comparison to last year at this time for the period September 13 – September 19, 2016 from K-State’s Precision Agriculture Laboratory shows that lower NDVI values are most evident in the South, where both flooding in some areas and drought in other areas continue to be problems. By contrast, much of Texas shows higher vegetative activity than last year at this time.

Continental U.S. Vegetation Condition Comparison
Mid-September 2016 Compared to 27-year Average for Mid-September

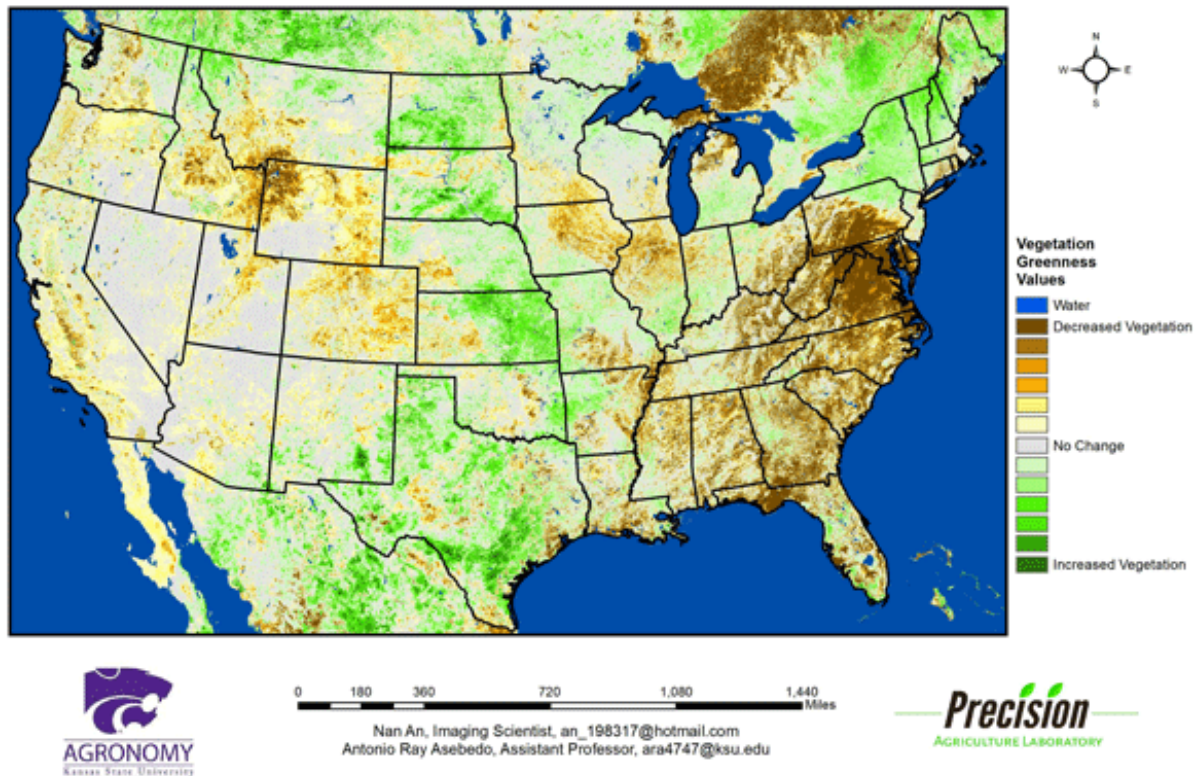


Figure 6. The U.S. comparison to the 27-year average for the period of September 13 – September 19 from K-State’s Precision Agriculture Laboratory shows below-average photosynthetic activity in the mid-Atlantic region. Drought continues to intensify, bringing an early end to the growing season.

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