

Extension Agronomy

eUpdate

08/21/2015

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, Jim Shroyer, Crop Production Specialist 785-532-0397 jshroyer@ksu.edu, or Curtis Thompson, Extension Agronomy State Leader and Weed Management Specialist 785-532-3444 cthompso@ksu.edu.

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1. Controlling tall, thick stands of weeds in wheat stubble

In parts of Kansas, there are many fields that have become overgrown with broadleaf and grassy

weeds this summer.

Some of the broadleaf weeds have flowered and formed seed by now, which will make chemical control more difficult. Another potential problem for chemical control will be getting the spray down through the canopy to reach any weeds or grasses underneath the taller weeds.

The standard treatment over the years to control weeds and volunteer wheat in wheat stubble has been glyphosate plus 2,4-D LVE. If kochia was present, we may have added some dicamba, but it generally wasn't added in the eastern areas of Kansas because of drift concerns to soybeans. Where susceptible crops are nearby, it's especially important to manage spray drift, both droplet drift and vapor drift. If a crop sensitive to 2,4-D is adjacent to the weedy field, 2,4-D amine should be used instead of 2,4-D LVE to minimize the potential for damaging volatility drift.

Glyphosate plus 2,4-D and/or dicamba remain the primary options for weed control in stubble, but with the development of glyphosate-resistant weeds, these options certainly don't work as well or quickly as they used to. Glyphosate used to be fairly fool-proof, even on big weeds, but that is no longer the case. Dicamba and 2,4-D probably weren't contributing as much to the weed control in those tank mixes as we may have thought, so now we are struggling with acceptable control. Timing and weed size is much more critical with almost all other herbicides than it has been with glyphosate. Consequently, it is very important to try and apply those treatments before the weeds exceed 4 to 6 inches tall, but that often doesn't happen.

Higher rates of the 2,4-D and dicamba may improve control, but in most cases we probably don't want to exceed 1 qt/acre of 2,4-D or a pint/acre of dicamba. Sharpen is another herbicide tank-mix partner that may help with control of the pigweeds and provide some residual control. Sharpen works best with the addition of methylated seed oil and can provide some pretty good burndown on smaller weeds, but if the weeds are very big, it tends to burn the tops and plants eventually resume growth. Sharpen requires complete coverage so using 15 to 20 gallons/acre spray solution is important.

One herbicide alternative to glyphosate that has worked pretty well on pigweed and kochia this summer is Gramoxone 2SL (paraquat). Gramoxone is a contact herbicide, so spray coverage is critical. Spray volumes of 20 gallons/acre or higher are preferred, especially on larger and thicker weeds. Gramoxone also needs to be applied with a nonioinic surfactant or oil concentrate to enhance surface coverage of the plant foliage. A tank mix with atrazine will enhance control and provide some residual weed control if planning to plant corn or sorghum next spring. Likewise, metribuzin can be tank-mixed with Gramoxone if rotating to soybean to enhance control and provide some residual. If planting wheat this fall, a tank mix with Sharpen is an option to provide some residual control.

Producers should not expect perfect control of weeds and grasses from any treatments if the stands are unusually tall and thick, or if many of the weeds have flowered or formed seed. Producers should also be prepared for a second flush of weeds, and possibly volunteer wheat, once the main canopy is killed, so follow up treatments may be required.

Producers should be aware that burndown herbicides will not affect the viability of mature seeds in broadleaf weeds.

Using a sulfonylurea herbicide such as Finesse or Rave could improve control of certain broadleaf weeds and provide some residual control if planting wheat this fall, but will limit recropping options to row crops next spring. Many pigweed and kochia populations are ALS resistant and may not be controlled by the ALS herbicides.

Other options for controlling weedy fields include mowing and burning. If the fields are mowed, the vegetative cover left on the fields could help conserve soil moisture. But weed regrowth can be expected, and seedbed preparation this fall may be difficult.

Burning may kill some of the green broadleaf weeds such as pigweeds, but will be ineffective on most of the green grassy weeds and volunteer wheat. If the burn is slow and hot enough, the fire will kill some of the weed seeds present on plants or on the soil surface.

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2. Estimating soybean yield potential: There is a web-based app for this!

Many producers would like to estimate the yield potential of their soybeans well before reaching the end of the season. In contrast with corn, soybean can easily compensate for abiotic or biotic stresses. The final number of pods is not determined with finality until close to the end of the season (R5 stage). In corn, the final kernel number is established during the 2- to 3-week period after flowering. Thus, when estimating soybean yield potential, we have to keep in mind that the estimate could change depending on the growth stage at the time the estimate is made and weather conditions. For example, wet periods toward the end of the reproductive period can extend the seed-set period, promoting greater pod production and retention, with larger seed size and heavier seed weight.

From a physiological perspective, the main yield driving forces are: **1) plants per acre, 2) pods per area, 3) seeds per pod, and 4) seed size**. Estimating final yield in soybean before harvest can be a very tedious task, but a simplified method can be used for just a basic yield estimate. This method is based on an article by Dr. Shaun Casteel (Soybean Specialist, Purdue University). For details, see: http://www.agry.purdue.edu/ext/soybean/News/2012/2012_0814SOYSimplifiedYieldEstimates.pdf

When can I start making soybean yield estimates?

There is not a precise time, but as the crop approaches the end of the season (R6, full seed or R7, beginning of maturity) the yield estimate will be more accurate. Still, you can start making soybean yield estimates as soon as end of the R4 stage, full pod (pods are 3/4 inch long on one of the top four nodes), or at the onset of the R5 stage, beginning seed (seeds are 1/8 inch long on one of the top four nodes), knowing that the yield prediction is less precise at those early stages.

Is plant variability within the field an issue in soybean?

Variability between plants relative to the final number of pods and seed size needs to be considered when trying to get an estimation of soybean yields. In addition, variability between areas within the same field needs also to be properly accounted for (e.g. low vs. high areas in the field). Yield estimations should be made in different areas of the field, at least 6 to 12 different areas. It is important to properly recognize and identify the variation within the field, and then take enough samples from the different areas to fairly represent the entire field. Within each sample section, take consecutive plants within the row so as to have a fairly good representation.

Conventional approach to estimating soybean yields

In the conventional approach, soybean yield estimates are based on the following components:

Total number of pods per acre [number of plants per acre x pods per plant] (1)

Total number of seeds per pod (2)

Number of seeds per pound (3)

Total pounds per bushel, or test weight, which for soybeans is 60 lbs/bu (4)

The final equation for the estimation of the potential soybean yield is:

 $[(1) \times (2) / (3)] / (4) =$ Soybean yield in bushels/acre

Simplified approach to estimating soybean yields

The main difference between the "conventional" and "simplified" approaches is that the conventional approach uses the total number of plants per acre in its calculation; while in the simplified approach, a constant row length is utilized to represent 1/10,000th area of an acre (Figure 1).

For the simplified approach, sample 21 inches of row length in a single row if the soybean plants are spaced in 30-inch rows; in 2 rows if the row spacing is 15 inches; and in 4 rows if the row spacing is 7.5 inches.



Figure 1. In the "simplified" approach to estimating yields, sample 21 inches row length to equal 1/10,000th of an acre. The number of rows to sample will depend on the row spacing. With 30-inch row spacings, sample one row. With 15-inch row spacings, sample two rows. With 7.5-inch row spacings, sample four rows. Photo by Ignacio Ciampitti, K-State Research and Extension.

This procedure should be repeated in different sections of the field to properly account for the natural field variability.

Driving forces of soybean yield

1) Total number of pods per acre:

The total number of pods (Figure 2) within this constant row length should be counted. After counting all the plants within the 21-inch row sections that represent 1/10,000th of an acre, a final pod number per acre can be estimated. A similar procedure should be used in different areas of the field to get a good overall estimate at the field scale. One good criterion is to only consider pod sizes that are larger than ³/₄ or1 inch long. Smaller pods can be aborted from this time on in the growing season until harvest.



Figure 2. Total number of pods per plant (only consider the pod sizes larger than ³/₄ or 1 in). Photo by Ignacio Ciampitti, K-State Research and Extension.

2) Total number of seeds per pod:

Soybean plants will have, on average, 2.5 seeds per pod (ranging from 1 to 4 seeds per pod), primarily regulated by the interaction between the environment and the genotypes (Figure 3). Under severe drought and heat stress, a pessimistic approach would be to consider an average of 1-1.5 seeds per pod. This value is just an approximation of the final number of seeds per pod, and can change from the time the estimate is made until the end of the growing season.



Figure 3. The number of seeds per pod will vary somewhat, depending on the growing environment and genotype. Photo by Ignacio Ciampitti, K-State Research and Extension.

3) Seed Size:

Seed size can range from 2,500 (normal to large seed weight) to 3,500 (small seed size) seeds per pound. This season, conditions are mostly favorable in Kansas for promoting large seed sizes. In more stressful years, such as 2012 and 2011, seed size is normally smaller, meaning a larger number for the seeds per pound (e.g. 3,500 seeds per pound). In the simplified estimation approach published by Dr. Casteel, you do not need to actually measure the number of seeds per pound in order to estimate yields, as is done in the conventional approach. Instead, a seed size conversion factor is used. If the conditions are favorable and large seed size is expected, the conversion is 15 units; while if abiotic or biotic stresses are present during the seed-filling period, a seed size factor of 21 units is used. Further details related to the seed size factor can be found in the link to the Purdue University extension

article listed at the end of this article.

Example of the simplified approach for estimating soybean yields:

Let's say that we have 120,000 plants/acre in a 30-inch rows. Then, we should have around 12 plants in 21 inches of row. In those 12 plants, we have measured on average 22 pods per plant, with a total number of 264 pods (22 x 12).

1) If we assume a "normal" growing season condition, then the final seeds per pod will be around 2.5, and for the seed size factor, we can assume large seeds, and will use a conversion factor of 15 units.

Equation for a "Favorable" Season:

264 pods x 2.5 seeds per pod / 15 = 44 bushels per acre

2) For a "droughty" (late reproductive, from R2 to R6 stages) growing season, the final seed number and size will be dramatically affected. Thus, even if the pod number is the same as in a normal season, the yield calculation could be:

Equation for a "Drought" Season:

264 pods x 1.5 seeds per pod / 21 = 19 bushels per acre

This "simplified approach" basically relates the total number of pods in a "known" unit area (easily extrapolated to the acre unit), and is affected by the total number of seeds in the pod. This is adjusted by the estimated seed weight, which is affected by two main components: duration of seed fill and rate of dry mass allocation to the seeds.

New K-State mobile app for estimating soybean yields

If you have an Android device, there is a "free" mobile Web-App that can help estimate soybean yields before harvest. The app is called "KSUSoyYieldCalc." Complete information can be found at: <u>https://webapp.agron.ksu.edu/agr_social/eu_article.throck?article_id=635</u>

The KSUSoyYieldCalc has only four inputs for predicting the final yield:

1. Plant population (plants/acre). This component can be estimated by counting the number of plants in a 21-inch row length for 30" row spacings (1/10,000th area), and by multiplying that number by 10,000;

2. Pods per plant. If the simplified approach is used, this factor can be obtained by counting all pods per plant in the 21-inch row length (total 10 boxes – 10 plants);

3. Seeds per pod. A good average number is 2.5 seeds per pod, but the range presented in this webbased app is from 1 to 4 seeds per pod;

4. Seed size. Seed size typically ranges from 2,500 (large) to 3,500 (small seeds) seeds/lb, with an average of 3,000 seeds/lb.

Inputs 1, 2, and 3 have been already discussed in the "simplified approach" section earlier in this article. Once all these components are estimated in the field, the numbers can be entered into the KSUSoyYieldCalc app.

The last factor "seed size" is the same as the one presented in the "conventional approach." This factor normally varies from 2,500 to 3,500 seeds/lb. If the conditions until harvest will be favorable, then the "seed size" component should be a lower number (e.g., 2,500 seeds/lb). If conditions are likely to be unfavorable, resulting in a short seed-fill period, then this factor should be higher (e.g., 3,500 seeds/lb). This factor will be ultimately determined as the crop approaches maturity, but an estimation is needed considering the importance of this factor for influencing final soybean yields.

All steps are also highlighted in the following image:



Here is one example of how to use this web-based App:

INPUTS:

1. Plant Population: 12 plants (measured at 12 sites within the field) in 21-inch row length x 10,000 = 120,000 plants/acre

2. Pods per plant: 24 pods per plant (average of 12 plants in 21-inch row length)

3. Seeds per pod: 3 seeds per pod (estimation)

4. Seed size: 2,800 (assuming "normal" conditions during seed-fill period)

OUTPUT:

Final yield estimation: 43 bu/acre

More examples on how to use the App and estimate yields are presented in the below figure:



You can download from the Google Play link: https://play.google.com/store/apps/details?id=com.ksu.tania90.soya1

For more information on how to estimate soybean yields, check the following resources:

"Simplified-Approach" Purdue University <u>http://extension.entm.purdue.edu/pestcrop/2012/issue21/index.html</u>

"Conventional-Approach" University of Kentucky

Ignacio Ciampitti, Crop Production and Cropping Systems Specialist <u>ciampitti@ksu.edu</u>

3. Starter fertilizers and early-season nitrogen for wheat

To save time and cost, some wheat producers may be thinking about adding a little extra nitrogen

(N) as urea or UAN to their phosphorus fertilizer through the drill with the seed. This would either be

in addition to, or instead of, any preplant N applications.

While a minimum preplant N application of 20 to 40 lbs N per acre is often desirable, especially in notill production systems, it is important to avoid placing urea containing fertilizers in direct seed contact. We suggest that <u>NO</u> urea or UAN solution be placed in contact with the seed. However, if the fertilizer N applied at seeding will be separated from the seed by 1 inch or more, urea-containing fertilizers can be used.

Methods of early-season nitrogen applications

If the starter fertilizer can't be "spiked" with urea to add extra N, how can the necessary 20 to 40 pounds of N be applied? One option is to use a polymer coated urea product such as ESN. The coating slows the release of the urea from the pellet and lowers the concentration of ammonia near the germinating seed and initial roots. This approach has been used successfully in Canada with both wheat and canola.

Subsurface banding (knifing) of N as either anhydrous ammonia, liquid UAN, or dry product will result in the greatest N use efficiency by the wheat crop. This is especially true for no-till wheat production. If knifed N applications are not used, the next best application method would be surface banding (dribbling) of UAN solution in streams on 15- to 18-inch centers. Broadcast applications are not generally as efficient as subsurface banding, but they are often the best choice due to equipment, logistics, or weed management considerations. Broadcast applications of N will have a more consistent performance if followed by light incorporation, precipitation, or irrigation.

Direct seed placement of nitrogen

Suggested Maximum Rates of Fertilizer to be Applied Directly With Wheat Seed						
Pounds N + K_2O (No urea or UAN)						
Row Spacing	Medium to Fine	Sandy or Dry				
(inches)	Textured Soils	Soils				
15	16	11				
10	24	17				
6-8	30	21				

When placing starter fertilizer in direct contact with wheat seed, producers should use the following guidelines:

The problem with placing urea-containing fertilizer with the seed is that urea is initially converted to ammonia and may be toxic to plant roots if the wheat seed is placed in direct contact with the fertilizer. Producers may hear of someone who has placed urea in direct seed contact and seemed to

have no problems, but there are also many cases where urea-containing N fertilizers have injured the developing seedling and reduced or delayed emergence significantly. The risk of injury is greater in drier soils, at higher soil pH levels, and at higher N rates. High soil pH favors a higher concentration of ammonia as compared to ammonium as urea hydrolyzes. There is significant risk associated with placing urea-containing fertilizers in direct seed contact.

Air seeders that place the starter fertilizer and seed in a band an inch or two wide, rather than a narrow seed slot, provide some margin of safety because the concentration of the fertilizer and seed is lower in these diffuse bands. In this scenario, adding a little extra urea-containing N fertilizer to the starter is less likely to injure the seed - but it is still a risk.

Blending DAP or MAP with the seed

What about blending dry 18-46-0 (DAP) or 11-52-0 (MAP) directly with the seed in the hopper? Will the N in these products hurt the seed? The N in these fertilizer products is in the ammonium-N form, not the urea-N form, and is much less likely to injure the wheat seed, even though it is in direct seed contact. As for rates, guidelines provided in the table above should be used. If DAP or MAP is mixed with the seed, the mixture can safely be left in the seed hopper overnight without injuring the seed or gumming up the works.

Although the response of wheat to these starter fertilizer products is primarily from the P, the small amount of N that is present in DAP, MAP, or 10-34-0 may also be important in some cases. If no preplant N was applied, and the soil has little or no carryover N from the previous crop, then the N from these fertilizer products could benefit the wheat, in addition to the P.

Dual placement of N and P

Dual-placement of N and P (anhydrous ammonia or UAN plus 10-34-0 applied in the same band below the soil surface) is a fertilizer application method usually used in preplant applications. Ammonium-N has long been known to increase P uptake by crops, and dual-placement can be very effective. Sometimes, producers will use this method at planting time, trying to position the band to the side of each row of wheat seed. Use caution, however.

If adequate separation of fertilizer and seed is accomplished, this is a good method of application that fits into many farmers' overall no-till system. If adequate separation of the ammonia/UAN and seed is not accomplished, wheat germination/stand establishment can be severely affected.

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4. Some basic points on using anhydrous ammonia for wheat production

As producers start thinking about anhydrous application for wheat this fall, there are a few basic points which they should keep in mind, especially regarding safety. Ammonia is a hazardous material and safety should be the highest priority of the operator.

Safety practices

- Always have your personal safety equipment available and use it. The word "anhydrous" means without water. Ammonia reacts rapidly with the water in tissue if it comes into contact with skin, eyes, and mucous membranes. It is extremely important that when working with ammonia farmers and fertilizer plant employees use all the appropriate personal safety equipment. As a minimum this includes wearing tight-fitting chemical goggles to protect your eyes, chemical-resistant gloves, and a long sleeve shirt or jacket. People working with ammonia should also carry a plastic eyewash bottle of water with them at all times, in addition to having access to safety water tanks on both the ammonia tank and the tractor/applicator.
- Check over the equipment carefully before starting work. Make sure all hoses are in good shape, and valves and break-away disconnects are in good operating condition.

Application methods and ammonia retention

When using ammonia as an N source, there are a number of reactions which come into play that will affect ammonia retention in soils, N response and efficiency. These include chemical reactions, physical factors relating to soil conditions, and how deeply the ammonia is applied. One important question many years in Kansas concerns dry soils. Will a dry soil be able to hold anhydrous ammonia or will some or most of the ammonia be lost shortly after application?

- Chemical reactions of ammonia in soil. Ammonia (NH₃) needs to react with water shortly after application in order to convert into ammonium (NH₄⁺), which is the molecule that can adhere to clay and organic matter in the soil. Ammonia is very soluble in water. After it is placed in the soil, NH₃ reacts with water in the soil to form ammonium-N (NH₄⁺), which is retained on the soil cation exchange sites. This process takes a little time it does not occur immediately upon contact with the soil. The main controlling factors in the conversion of NH₃ to ammonium-N are soil temperature, soil moisture, and soil pH. The higher the soil temperature and the wetter the soil, the more rapid the conversion occurs. If the ammonia does not react with water, it will remain as a gas that could escape from the soil. Also, a chemical equilibrium between NH₃ and NH₄⁺ occurs and is affected by soil pH. More NH₃ will remain unconverted in the soil longer at higher application rates and at higher soil pH levels.
- Physical factors that influence sealing and ammonia loss. Dry soils may be cloddy, with large air spaces where the soil has cracked. Getting the soil sealed properly above the injection slot can be a problem in dry soils. This can allow the gas to physically escape into the air before it has a chance to be converted into ammonium. On the other hand wet soils tend to smear, leaving application channels open to the surface and providing a pathway for ammonia loss also. It is very important to make sure at the time of application that the slot created by the shank is sealed shut and that there is adequate soil moisture present for the NH₃ to be retained in the soil. If the soil is too dry to retain NH₃, or is not sealed well, gaseous NH₃ can escape into the atmosphere and be lost for crop use. At today's high N prices, this can quickly become very expensive.

• Importance of application depth. The deeper the ammonia is applied, the more likely it is that the ammonia will have moisture to react with, and the easier the sealing. Anhydrous ammonia can be applied to dry soils, as long as the ammonia is applied deep enough to get it in some moisture and the soil is well sealed above the injection slot. If the soil is either dry and cloddy, or too wet, there may be considerable losses of ammonia within just a few days of application if the soil is not well sealed above the injection slot and/or the injection point is too shallow. A recent study near Topeka found little or no direct ammonia loss in the week after application when ammonia was applied at 5- or 9-inch depths under good soil conditions. However, under wet conditions, losses as high as 15% of the applied N were seen with shallow application.

Application rate and shank spacing will also have a strong influence on sealing and potential loss. Lower N rates and application with narrow spacings reduces the concentration of N at any one delivery point and reduces the risk of loss.

The human nose is a very good ammonia detector. Producers should be able to tell if anhydrous is escaping from the soil during application or if the ammonia isn't being applied deeply enough. If ammonia can be smelled, the producer should either change the equipment setup to get better sealing or deeper injection, or wait until the soil has better moisture conditions.

Shank spacing

What about shank spacing for wheat? A number of studies have been done looking at the spacing of anhydrous application on wheat yields. The results have been somewhat erratic, but in general, yields tend to be reduced at shank spacings wider than 20 inches. The differences seem to be greater at higher yield levels, on sandy soils, and at lower N rates.

Recent studies in Kansas showed a 5% yield difference between 15- and 30-inch spacings over 5 experiments. One general observation is that a wavy appearance will be common in fields fertilized with ammonia, with plants near or directly over an ammonia band being taller, and those between bands shorter. At low N rates, this will likely lead to a small yield reduction. But at rates more than 100 pounds of N, yields will likely not be impacted, especially on silt loam or heavier soils.

Summary

In short, ammonia is an excellent N source for wheat, but producers need to consider some basic issues to be able to apply it safely and to gain good efficiency.

- Make sure the application equipment is in good condition, that water tanks on the nurse tanks and the applicator/tractor are full of clean water, and that they use their personal safety equipment and have a personal eye wash bottle with them at all times.
- Apply anhydrous ammonia at the proper depth to ensure good sealing.
- Where possible use a narrow shank spacing, less than 20 inches.
- Use covering disks behind the knives or sealing wings ("beaver tails") on the knives of conventional applicators.
- Apply anhydrous ammonia at least 1 to 2 weeks before planting. This waiting period should be even longer if soils are dry.

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5. Timing the final irrigation of the season

As the growing season wraps up, producers have an opportunity to further improve their water use efficiency by properly timing their final irrigation application. This is an important decision as an early termination of irrigation can result in reductions in grain yield, primarily through reductions in the kernel weight yield component, while a late termination of irrigation results in unnecessary pumping, energy consumption, the potential for an increased risk of soil compaction at harvest due to increased soil moisture, and the risk of water loss through drainage.

With the goal of matching available water to crop needs while avoiding excess, it's important to understand crop water use requirements late in the growing season. The table below shows anticipated water use from various growth stages until physiological maturity.

Stage of Growth	Approximate number of days to maturity	Water use to maturity (inches)
Corn		
Blister	45	10.5
Dough	34	7.5
Beginning dent	24	5
Full dent	13	2.5
Black layer	0	0
Grain Sorghum		
Mid bloom	34	9
Soft dough	23	5
Hard dough	12	2
Black layer	0	0
Soybeans		
Full pod	37	9
Beginning seed	29	6.5
Full seed	17	3.5
Full maturity	0	0

Adapted from K-State Research and Extension publication MF2174, Rogers and Sothers.

Research in western Kansas has shown the importance of keeping the management allowable depletion limited to 45% during the post-tassel period – or, in other words, maintaining available soil water contents above 55%. By knowing anticipated water use from a given growth stage and the remaining soil water in the profile, producers can add just enough irrigation water to meet that demand and maintain profile available soil water content above 55%.

By closely following the growth and development of the crop one can know when physiological maturity, i.e. black layer in corn, has been reached. At that point water use for the production of grain yield has ceased and additional irrigation is certainly unnecessary.

Termination based on calendar dates

Traditionally many producers have used a fixed calendar date to determine their final irrigation. Longterm studies conducted at the Northwest Research-Extension Center at Colby show the potential danger in this approach. The table below shows silking, maturity, and irrigation termination dates for a long-term study in corn. Over the course of this study, the irrigation termination date for maximum grain yield varied from August 12 to September 21. This is a significant departure from a general rule of using, say, Labor Day as the termination date. The use of a fixed date on the calendar without regard to crop progress, soil water status, or ET demand would have resulted in both forfeited yield and wasteful pumping across this timeframe.

No	Date of	Date of Maturity	Irrigation Season Termination Date For		
Year Ar	Anthesis		80% Max Yield	90% Max Yield	MaxYield
1993	20-Jul	30-Sep	5-Aug	5-Aug	15-Aug
1994	20-Jul	15-Sep	5-Aug	15-Aug	15-Aug
1995	20-Jul	29-Sep	5-Aug	13-Aug	18-Aug
1996	20-Jul	3-Oct	17-Jul	17-Jul	29-Aug
1997	23-Jul	1-Oct	23-Jul	23-Jul	27-Aug
1998	20-Jul	28-Sep	20-Jul	20-Jul	24-Aug
1999	23-Jul	6-Oct	24-Jul	13-Aug	20-Sep
2000	12-Jul	20-Sep	14-Sep	20-Sep	20-Sep
2001	16-Jul	29-Sep	30-Jul	22-Sep	22-Sep
2002	22-Jul	30-Sep	4-Aug	30-Aug	7-Sep
2003	22-Jul	23-Sep	3-Aug	3-Aug	18-Aug
2004	19-Jul	28-Sep	8-Aug	21-Aug	27-Aug
2005	20-Jul	28-Sep	2-Aug	9-Aug	29-Aug
2006	17-Jul	25-Sep	30-Jul	13-Aug	13-Aug
2007	18-Jul	19-Sep	14-Aug	21-Aug	28-Aug
2008	24-Jul	10-Oct	31-Jul	6-Aug	27-Aug
Average	19-Jul	27-Sep	2-Aug	13-Aug	28-Aug
Standard Dev.	3 days	6 days	13 days	19 days	13 days
Earliest	12-Jul	14-Sep	17-Jul	17-Jul	12-Aug
Latest	24-Jul	10-Oct	14-Sep	21-Sep	21-Sep

* Estimated dates are based on the individual irrigation treatment dates from each of the different studies when the specified percentage of yield was exceeded.

Consequences of excess late-season irrigation

In the silt loam soil profiles common in western Kansas, drainage of water out of the soil profile starts to occur when the profile water content rises above 60% available soil water. The rate of drainage loss increases rapidly with increasing water content. Late-season irrigation in excess of crop water use results in increased accumulation of water in the profile, which is subject to drainage losses. A multi-year survey of irrigated corn fields was conducted in 2010 and 2011. Fields were surveyed after corn harvest across three east-west transects in western Kansas.



The line at 9.6" of plant-available soil water (PASW) denotes the approximate water content where drainage losses would start to occur. On average most producer fields were near this level of soil water storage indicating a good management strategy as drainage losses had been minimized while maintaining adequate soil water to complete grain fill.

Producer fields near the minimum observed values likely did not have adequate soil water to ensure maximum grain yields. The most concerning scenario however, are the fields at the upper end of soil

water values such as the maximum observation. The red line at 16" PASW represents field capacity, the point at which free drainage and significant water losses from the profile would be occurring. In the wettest producer fields, in all three regions, significant amounts of free drainage and water loss would have been occurring at the time of crop maturation and harvest.

Timing of the final irrigation:

- 1. Determine crop growth stage and anticipated remaining water use.
- 2. Determine soil water status in the field by probe or calibrated soil sensor technology.
- 3. Determine irrigation strategy necessary to meet remaining crop water use while maintaining soil water content at or above 55% (limit depletion to 45%).
- 4. Be ready to make adjustments based on changes in ET demand, precipitation, etc.

Additional information, including a step by step procedure, can be found in K-State Research and Extension publication MF2174:

http://www.bookstore.ksre.ksu.edu/pubs/MF2174.pdf

Lucas Haag, Northwest Area Crops and Soils Specialist <u>lhaag@ksu.edu</u>

Freddie Lamm, Irrigation Engineer, Northwest Research-Extension Center <u>flamm@ksu.edu</u>

6. South Central Kansas Experiment Field fall field day, August 25

The South Central Kansas Experiment Irrigation Field near Hutchinson will host its fall field day on Tuesday, August 25. The field day begins at 5 p.m. with registration. A complimentary meal will be served after the presentations, courtesy of Agri-Business Committee of the Hutchinson/Reno County Chamber of Commerce and Dow AgroSciences, LLC. Pre-registration to obtain a head count for the meal is requested by Monday, August 24 by contacting Gary Cramer at 620-662-9021 or gcramer@ksu.edu.

Field day topics and presenters include:

- Review of Growing Season Conditions Gary Cramer, Agronomist-in-Charge, South Central Kansas Experiment Field
- El Nino and Extended Weather Expectations Mary Knapp, Weather Data Library
- Performance of Grain Sorghum under Dryland and Limited Irrigation -- Jonathan Broeckleman, Agronomy Graduate Student
- Drought-tolerant Corn under Dryland and Limited Irrigation -- Trent Newell, Agronomy Graduate Student
- Weed Control Program in Enlist Corn Gary Cramer, South Central Kansas Experiment Field
- How to Control Enlist Volunteer Corn Curtis Thompson, Weed Management Specialist
- Enlist Cotton: Demonstration of Enlist Duo Buffer Requirements Gary Cramer, South Central Kansas Experiment Field
- Enlist Weed Control System: An Explanation of the Components Dow AgroSciences, LLC
- Kansas Grain Sorghum Commission Sarah Sexton-Bowser

The field day will be held at the irrigation field, approximately 2 miles south of Partridge on Highway 61, at the intersection of Highway 61 and Red Rock Road, on the east side of the road. The field address is 9314 West 61 Highway.

More information is available by contacting Gary Cramer, Agronomist-in-Charge, South Central Kansas Experiment Field at 620-662-9021 or gcramer@ksu.edu.

7. Canola drill and planter calibration clinics, August 25 and 27

Two Canola Drill and Planter Calibration Clinics will be held in Kansas in late August.

August 25, 9-11 a.m. – Caldwell, Sumner County Fairgrounds (Caldwell Community Building)

August 27, 9-11 a.m. – Stafford County Extension office

Topics at the clinics will include:

- Overview of box grain drills, air seeders, and row planters
- Canola calibration kits and procedure materials
- Hands-on canola calibration exercises

Presenters are Heath Sanders, Great Plains Canola Association Field Specialist, and Josh Bushong, Oklahoma State University Canola Extension Assistant.

Contact your local Extension Office for more information.

Mike Stamm, Canola Breeder mjstamm@ksu.edu

8. Agricultural Research Center-Hays Fall Crop Seminar, August 26

The Agricultural Research Center-Hays is hosting its Fall Crop Seminar Aug. 26 in the auditorium at the center, located at 1232 240th Ave. in Hays.

Registration begins at 8:30 a.m., with presentations by K-State Research and Extension specialists on a variety of key production and economic topics through the morning, capped off by a barbecue lunch at noon.

Presentations and presenters include:

- Sugarcane Aphid: Insecticides, Plant Resistance, and Biocontrol J.P. Michaud, Entomologist, Agricultural Research Center-Hays
- Managing Iron Deficiency Chlorosis in Grain Sorghum Augustine Obour, Soil Scientist, Agricultural Research Center-Hays
- Cover Crops/Fallow Replacement in the Western Great Plains John Holman, Cropping Systems Agronomist, Southwest Research-Extension Center, Garden City
- Managing Glyphosate-Resistant Kochia and Palmer Amaranth Phil Stahlman, Weed Scientist, Agricultural Research Center-Hays
- On-Farm Research Trials: Science at Ground Zero Ignacio Ciampitti, Extension Crop Production Specialist, Manhattan
- Profit Variability Among Farm Operations: What Makes the Differences? Kevin Herbel, Extension Agricultural economist, Kansas Farm Management Association, Manhattan

9. Southwest Research-Extension Center, Garden City fall field day, August 27

The Southwest Research-Extension Center will host its Fall Field Day 2015 on Thursday, Aug. 27. The day starts with registration, coffee and donuts from 8 to 9:15 a.m. and features field tours, seminars, and agricultural product displays.

Field tour presentations by K-State Research and Extension specialists include:

- Summer Annual Forage Evaluation: A Revised Program at Kansas State University John Holman, Cropping Systems Agronomist, Southwest Research-Extension Center, Garden City
- Teff Forage Grass John Holman, SWREC
- Managing Iron Deficiency Chlorosis in Grain Sorghum Augustine Obour, Soil Scientist, Agricultural Research Center-Hays
- Mobile Drip Irrigation for Water-Limited Crop Production Isaya Kisekka, Research Irrigation Engineer, Southwest Research-Extension Center, Garden City
- Comparing Forage Sorghum and Corn Silage Under Full and Limited Irrigation Isaya Kisekka, SWREC
- Weed Control in Irrigated Corn Randall Currie, Weed Scientist, Southwest Research-Irrigation Center, Garden City
- Weed Control in Irrigated Sorghum Randall Currie, SWREC

A complimentary lunch will be served following the morning field tours, to be followed by seminars, including:

- Limited Irrigation Research Update Isaya Kisekka, SWREC
- The Value of Scheduling Jonathan Aguilar, Water Resources Engineer, Southwest Research-Extension Center, Garden City
- Corn and Sorghum Insect Update Sarah Zukoff, Entomologist, Southwest Research-Extension Center, Garden City
- Corn and Sorghum Insect ID Refresher Sarah Zukoff, SWREC

Pesticide applicator credits are available for participants of some of the tours and seminars. More information is available by calling the Southwest Research-Extension Center at 620-276-8286.

10. Comparative Vegetation Condition Report: August 4 - 17

K-State's Ecology and Agriculture Spatial Analysis Laboratory EASAL) produces weekly Vegetation

Condition Report maps. These maps can be a valuable tool for making crop selection and marketing decisions.

Two short videos of Dr. Kevin Price explaining the development of these maps can be viewed on YouTube at:

http://www.youtube.com/watch?v=CRP3Y5NIggw http://www.youtube.com/watch?v=tUdOK94efxc

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 26-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.

NOTE TO READERS: The maps below represent a subset of the maps available from the EASAL group. If you'd like digital copies of the entire map series please contact Nan An at nanan@ksu.edu and we can place you on our email list to receive the entire dataset each week as they are produced. The maps are normally first available on Wednesday of each week, unless there is a delay in the posting of the data by EROS Data Center where we obtain the raw data used to make the maps. These maps are provided for free as a service of the Department of Agronomy and K-State Research and Extension.

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

Kansas Vegetation Condition

Period 33: 08/04/2015 - 08/17/2015



Figure 1. The Vegetation Condition Report for Kansas for August 4 – 17 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that the highest biomass production is, as typical, in eastern Kansas. The high level of photosynthetic activity in the Republican River Valley is clearly visible, while the highest NDVI values are in Brown and Doniphan counties along the Missouri River Valley. Favorable soil moisture and moderate temperatures have favored biomass production in these areas.

Kansas Vegetation Condition Comparison

Early-August 2015 compared to the Early-August 2014



Figure 2. Compared to the previous year at this time for Kansas, the current Vegetation Condition Report for August 4 – 17 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows parts of central and south central Kansas have lower photosynthetic activity. These areas did not have as much moisture in recent weeks as counties farther west. In contrast the North Central Division has had more favorable conditions this year. Moderate temperatures and favorable moisture have resulted in high photosynthetic activity.

Kansas Vegetation Condition Comparison



Early-August 2015 compared to the 26-Year Average for Early-August

Figure 3. Compared to the 26-year average at this time for Kansas, this year's Vegetation Condition Report for August 4 – 17 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that most of the state has at or above-average photosynthetic activity. The North Central and Northeastern Divisions have the greatest level of above-average activity. This continues to be due to a combination of favorable growing conditions and delayed crop development. This delay means more of the vegetation is currently in its most active growth period, rather than the reduced activity that comes as the crop matures.





Figure 4. The Vegetation Condition Report for the Corn Belt for August 4 – 17 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that the greatest level of photosynthetic activity is concentrated from northeastern Nebraska through Iowa, southern Minnesota, and into Illinois. Favorable moisture conditions have resulted in high photosynthetic activity. In Iowa, corn is rated as 83 percent good to excellent, while soybeans are 77 percent good to excellent.



Figure 5. The comparison to last year in the Corn Belt for the period for August 4 – 17 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows much of the region has lower photosynthetic activity this year. Cooler and wetter weather has influenced plant development.



U.S. Corn Belt Vegetation Condition Comparison Early-August 2015 Compared to the 26-Year Average for Early-August

Figure 6. Compared to the 26-year average at this time for the Corn Belt, this year's Vegetation Condition Report for August 4 – 17 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows most of the region has average biomass production. Indiana stands out with lower NDVI values. Warm, dry weather has stressed crops in the state.



Continental U.S. Vegetation Condition Period 33: 08/04/2015 - 08/17/2015

Figure 7. The Vegetation Condition Report for the U.S for August 4 – 17 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that the highest level of photosynthetic activity is centered in the Upper Midwest. Lower NDVI values are noticeable in the Southeastern U.S., particularly in Georgia and South Carolina and the tip of Florida, where drought conditions continue to intensify.



Continental U.S. Vegetation Condition Comparison Early-August 2015 Compared to Early-August 2014

Figure 8. The U.S. comparison to last year at this time for the period August 4 – 17 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that lower NDVI values are most evident from northern Missouri through western Pennsylvania. In the west, higher NDVI values are visible in Northern California, but the values quickly decrease as you move into Oregon. Rains in the early summer were heavier on the California side of the border. This does not mark an end to the intense drought in this region.



Continental U.S. Vegetation Condition Comparison Early-August 2015 Compared to 26-year Average for Early-August

Figure 9. The U.S. comparison to the 26-year average for the period August 4 – 17 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that the West continues to have lower-than-normal photosynthetic activity, while the greatest increase in NDVI values is in the Central Plains. There is also an area of below-normal NDVI values from Indiana along the lower Great Lakes to upstate New York into New England. This marks an area of expanding moisture stress.

Mary Knapp, Weather Data Library mknapp@ksu.edu

Kevin Price, Professor Emeritus, Agronomy and Geography, Remote Sensing, GIS

Nan An, Graduate Research Assistant, Ecology & Agriculture Spatial Analysis Laboratory (EASAL) <u>nanan@ksu.edu</u>