Issue 1025

K-STATE
Research and Extension

Extension Agronomy

eUpdate

10/17/2024

These e-Updates are a regular weekly item from K-State Extension Agronomy and Kathy Gehl, Agronomy eUpdate 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 Kathy Gehl, 785-532-3354 kgehl@ksu.edu, or Dalas Peterson, Extension Agronomy State Leader and Weed Management Specialist 785-532-0405 dpeterso@ksu.edu.

Subscribe to the eUpdate mailing list: https://listserv.ksu.edu/cgi-bin?SUBED1=EUPDATE&A=1

eUpdate Table of Contents | 10/17/2024 | Issue 1025

1. Management adjustments when sowing wheat late

According to the most recent USDA report released on October 13, about 68% of Kansas wheat has been planted this fall, near the 5-year average of 66%. While the planted average is at or slightly above the 5-yr mean, crop emergence is at or slightly below the 5-yr mean at 36% (versus 38%).

From here until the end of the planting season, some producers may have delayed planting for different reasons, including harvesting a summer crop during October or having dry soils and waiting for precipitation before seeding. The slight delay in emergence is also likely due to dry soils. In this context, it is important to remember that even for wheat crops planted at the right time but in the absence of moisture for germination, the effective planting date is delayed since this will be when the crop actually emerges. Planting wheat in late October-early November is within the acceptable range in the southeast and far south-central Kansas. In other areas of the state, this is later than desirable and later than the cutoff date for full crop insurance benefits. Although good yields may still be reached when wheat is planted outside the optimal planting window, late-planted wheat is often subjected to colder fall temperatures. It has less time to tiller before winter dormancy (Figure 1), which can reduce wheat yield potential and increase the risks of winter injury.

Figure 1. Differences in fall growth and development of wheat crops planted in late September (left) versus late October (right) near Hutchinson, in south central Kansas. Photos taken mid-December of the planting year by Romulo Lollato, K-State Wheat and Forage Extension Specialist.

Under these circumstances, some management adjustments can be made to compensate for the consequences of late planting. These adjustments include:

Increase the seeding rate. Late-planted wheat tends to produce fewer tillers during the fall than wheat planted at the optimal time. Fall tillers are generally more productive than spring tillers, contributing more to the crop's yield potential. Therefore, increasing seeding rates is necessary to compensate for the reduced tillering. Wheat seeding rates for Kansas vary depending on the precipitation zone and increase from west to east (Table 1). Likewise, for every week planting is delayed from the end of the range of optimal planting date, seeding rates should be increased by about 150,000 – 225,000 seeds per acre (or 10 to 15 lb/acre) in western Kansas, or 225,000 – 300,000 seeds per acre (15 – 20 lb/acre) in eastern Kansas. Final seeding rate should not be above 90-100 pounds per acre in western Kansas and 120-130 pounds in eastern and central Kansas for grain-only wheat production, as extremely high seeding rates can increase the potential for lodging and increase crop water demand early in the cycle, possibly resulting in more severe drought stress later during reproductive stages (this is referred to as 'haying off', and happened frequently during the 2023-24 season in crops that had high fall biomass production followed by limited spring precipitation). Similarly, planting early in the growing season results in more fall wheat growth and moisture use.

Table 1. Seeding rates for different Kansas regions when planted during optimum planting dates and in grain-only systems. Upwards adjustments to these rates are needed when planting wheat late.

Region within Kansas	**Seeding rate for grain-only wheat production, assuming optimum planting date**			
	seeds/acre*		seeds/sq. ft.**	
	Min.	Max.	Min.	Max.
Western	750,000	900,000	17	21
Central	900,000	1,125,000	21	26
Eastern	1,125,000	1,350,000	26	31
Irrigated	1,200,000	1,500,000	28	34

***To adjust these values to pounds of seed per acre, simply divide them by the number of seeds per pound, which depends on variety and on seed lot. For example, 900,000 seeds/acre equals to 56 lbs/acre for a wheat seed lot with 16,000 seeds/lb, or 82 lbs/acre for a wheat seed lot with 11,000 seeds/lb.**

**To determine the row length needed for one square foot based on row spacing, divide 12 by the row spacing of your field. For example, if row spacing is 7.5 inches, 12/7.5 = 1.6 feet, or 19.2 inches of row are needed to be equivalent to one square foot.

Maintain the optimal planting depth (1 to 1.5 inches deep). Wheat needs at least 4 to 5 leaves and 1 to 2 tillers before winter dormancy for maximum cold tolerance. Late-planted wheat will most likely have fewer tillers and leaves than wheat planted at the optimal timing and, therefore, will be more susceptible to winter kill. It is important to plant wheat at the normal planting depth (1 to 1.5 inches below the soil surface) to ensure good root development and anchorage and crown insulation by the soil during the winter, increasing the chances of winter survival. Shallow-planted wheat is at greater risk of winter injury. If the seed is placed too deeply, it may not have enough vigor in cold soils to emerge well.

Place starter phosphorus (P) fertilizer with the seed. Phosphate-based starter fertilizer promotes early-season wheat growth and tillering, which can help compensate for the delayed sowing date. Additionally, P is less available under colder soil temperatures, which can result in P deficiency under cold weather conditions. When planting late, producers should strongly consider using about 20-30 lbs/acre of P fertilizer (11-52-0 or 18-46-0) directly with the seed, regardless of soil P levels. This placement method is more effective than other application methods at that time of year. The later the planting date, the slower fall root development is. The closer the fertilizer is to the seed, the sooner the plant roots reach it. The four situations when in-furrow P is considered "money in the bank" are (i) late-planted wheat crops, (ii) wheat crops planted for grazing, (iii) wheat planted in acidic soils, and (iv) soils deficient in P.

Use fungicide seed treatment or plant certified seed. Late-planted wheat is sown into colder soils, generally increasing the time needed for germination and emergence. Consequently, there is increased potential for seed and soil-borne diseases that affect seedlings and early-season wheat development. Fungicide seed treatment can protect the seed and seedlings during the extended time they are subjected to potential seedling diseases, improving stand establishment under poor growing conditions. It is important that the seed treatment thoroughly coats the seeds to ensure good protection. For fungicide seed treatment options, please refer to the most current version of the K-State fungicide seed treatment chart available at:
https://www.bookstore.ksre.ksu.edu/pubs/MF2955.pdf

Variety selection. It is probably too late to change which wheat variety to plant this fall. However, a few points to consider when it is known that wheat will be planted late (e.g. when planning to sow wheat following soybeans) are tillering ability and maturity. A variety with good tillering ability may offset some of the consequences of late planting, as it might still produce one or two tillers during the fall, whereas a low-tillering variety may produce none. Some varieties are known for not tillering well in the spring and requiring good fall tiller production (for example, the variety Everest). Avoid planting these varieties in fields that will be planted late. Also, late-planted wheat typically needs to catch up in development going into the winter, which might translate into slower development in the spring. This delay can result in plants being exposed to moisture stress, especially heat stress, during grain filling, reducing the duration of the grain filling period. Thus, selecting an early-maturity variety with good yield potential may offset, to some extent, the consequences of late planting by decreasing the chances of a grain-filling period subjected to warmer temperatures. Many K-State wheat variety trials are planted late after a previous soybean crop in eastern KS. A good way to select a variety to perform under these conditions is to filter through the results of these variety trials and select varieties performing well in your region when planted late.

Romulo Lollato, Wheat and Forages Specialist
lollato@ksu.edu

John Holman, Cropping Systems Agronomist – Garden City
jholman@ksu.edu

Lucas Haag, Area Agronomist – Colby
lhaag@ksu.edu

2. Management considerations before baling corn residue

About 5.5 million acres of corn and 9,800,000 tons of corn residue (stover) are produced yearly in Kansas (Figure 1). Producers might think about baling some of that stover for animal feed or bedding material at feedlots and dairies or as a bioenergy feedstock for lignocellulosic ethanol. Although baling crop residues provides additional income, producers should consider the potential impacts that residue removal may have on soil and crop health as well as long-term sustainability.

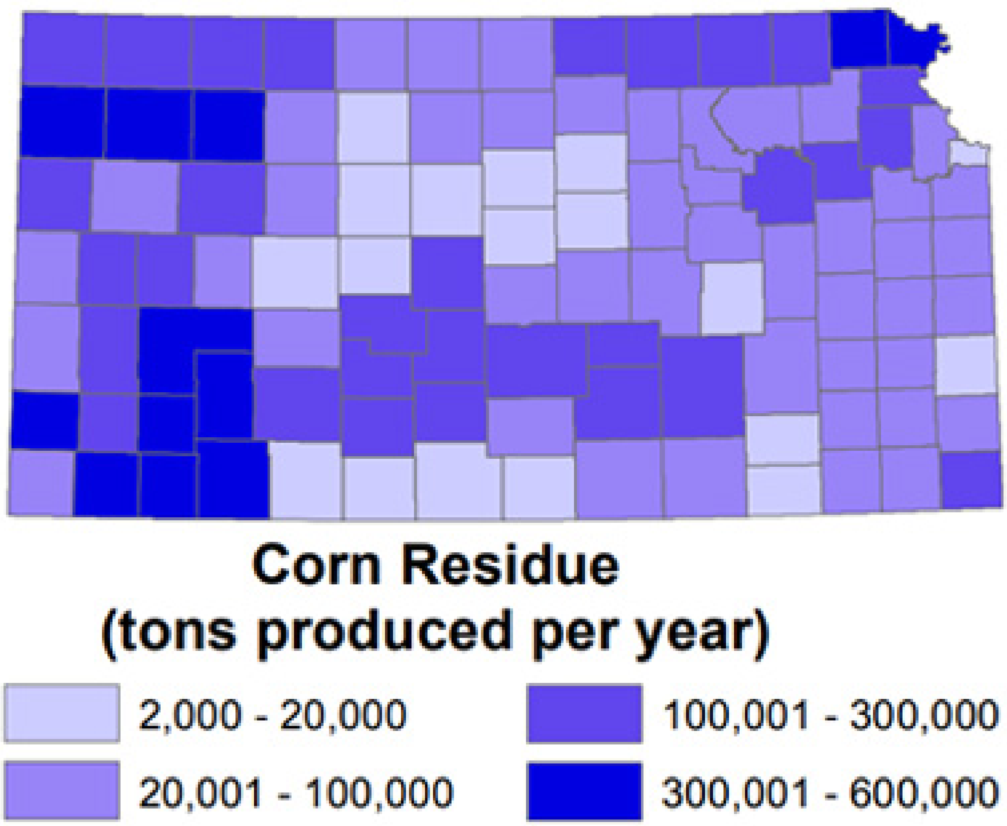

Figure 1. Estimated tons of corn residue produced per year for each Kansas county. Averages from 1999 to 2010 were calculated from crop yields and harvest index from the National Agricultural Statistics Service.

Baling corn residue limits the services that crop residues provide in cropping systems such as conserving soil moisture, protecting from soil erosion, and cycling nutrients.

Soil moisture conservation

Maintaining crop residues on the soil surface enhances soil water storage by increasing infiltration of natural rainfall and irrigation and reducing evaporation with lower soil temperature and reduced wind speed at the soil surface. Crop residue limits the impact of water droplets on the soil surface, which could lead to surface sealing, water ponding, and runoff. Crop residues also block the sun's solar radiation from directly reaching the soil, which keeps the surface cooler. Researchers from Kansas State University measured soil temperature at Hugoton, Colby, and Ottawa in the 2010-2011 seasons. Removing 50 to 100% of the corn residue increased summer soil temperatures but decreased winter soil temperature. Generally, soil temperatures tended to fluctuate more where residue was removed. Removing corn residue reduced surface soil water content by 5 to 8%, especially during the growing season

Soil erosion protection

Soil that is bare of crop residue is more susceptible to wind and water erosion. Crop residues protect the soil from the full impact of water droplets from natural rainfall or irrigation that can cause soil particles to detach and move with runoff. Crop residue also reduces wind speed at the soil surface that can also cause detachment of soil particles. At Hugoton, Colby, and Ottawa, increasing rates of corn residue removal reduced the mean weight diameter of water-stable soil aggregates (Figure 2).

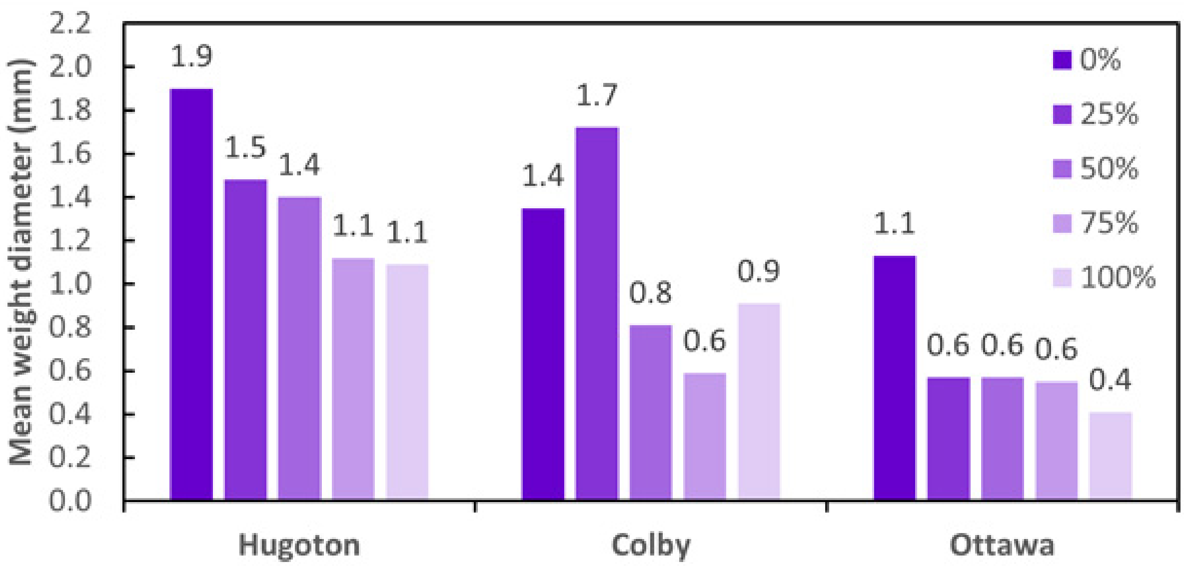

Figure 2. Impact of corn residue removal on mean weight diameter of water stable aggregates near Hugoton, Colby, and Ottawa Kansas in 2012.

Water erosion from croplands increases sedimentation of rivers, lakes, and reservoirs, which threatens aquatic wildlife, increases risks of flooding, and requires high-cost dredging operations for remediation. In addition to water erosion, wind erosion can cause degradation of air quality, which threatens human and animal health alike, especially in individuals with existing respiratory problems. Wind erosion also causes automotive accidents when visibility is reduced during large dust storms (Figure 3) and can damage machinery due to abrasion and clogging as dust accumulates.

Figure 3. Wind erosion event in southwest Kansas. Photo by Jake Thompson, K-State Research and Extension.

Topsoil loss degrades soil productivity, especially in the long term. Most agricultural soils in Kansas have a “T” value (tolerable amount of soil loss) between 4 and 5 tons per acre per year, about equal to a dime's thickness. To prevent water erosion, 30% ground cover or greater may be needed to reduce water erosion to “T” or less, especially in fields without erosion-control structures such as terraces. Although flat stubble is very effective in limiting water erosion, standing stubble is essential for preventing wind erosion. K-State researchers found that wind erosion was effectively prevented when soil was at least 50% covered by crop residue. Even when baling corn stalks, it’s better to leave some standing residue, which helps capture snow and reduce wind erosion (Figure 4).

Figure 4. Field where stalks were baled, but some standing residue was left on the field. Photo by John Holman, K-State Research and Extension.

Nutrient cycling

Crop residue is often considered to be a valuable source of nutrients. Significant amounts of nutrients such as nitrogen, phosphorus, potassium, and sulfur are left in corn residue following harvest (Figure 5), which can be recycled to the soil with residue decomposition. With the rise in price for nitrogen and other fertilizers, the nutrients in crop residues that could be plant available in the future is worth more than in years past.

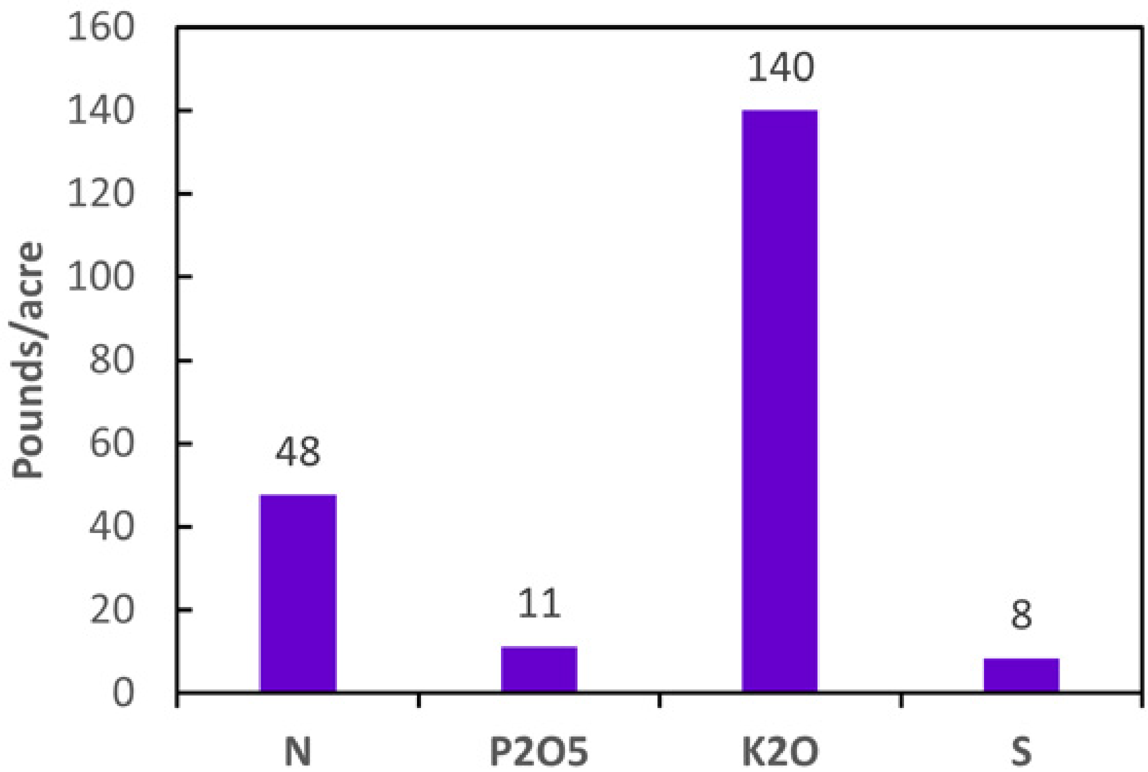

Figure 5. Amounts of nitrogen (N), phosphorus (P_2O_5), potassium (K_2O), and sulfur (S) remaining in the residue following the harvest of a 200 bushel/acre corn crop.

Final considerations

Baling corn residues can provide additional income but may negatively impact soil and crop health and long-term sustainability.

- Maintaining crop residues on the soil surface enhances soil water storage by increasing water infiltration and reducing evaporation.
- Crop residue protects the soil from the full impact of water droplets that can cause soil particles to detach and move with runoff.
- Crop residue reduces wind speed at the soil surface, which can also cause detachment of soil particles.
- Significant amounts of nutrients can be recycled into the soil with the decomposition of corn residue following harvest.
- Crop leaves will be blown off the field into ditches and field edges if not baled or grazed.

For more information on considerations before harvesting crop residue, see the publications:

Crop Residues: Abundance and Considerations for Alternative Uses from the KSRE Bookstore

Soil and Crop Response to Stover Removal from Rainfed and Irrigated Corn from Global Change Biology

Bioenergy

Wind Erosion Potential from Stover Harvest in the Central Plains: Measurements and Simulations from Soil & Tillage Research.

Logan Simon, Southwest Area Agronomy
lsimon@ksu.edu

DeAnn Presley, Soil Management Specialist
deann@ksu.edu

Tina Sullivan, Northeast Area Agronomist
tsullivan@ksu.edu

John Holman, Cropping Systems Agronomist
jholman@ksu.edu

3. Crop residues: Nutritive value and options for grazing

The five-year average of corn acres harvested reported by NASS leads to an estimate of approximately 5.5 million acres of corn and 200,000 tons of residue produced annually in Kansas. In addition, 2.8 million acres of grain sorghum and 70,000 tons of residue were produced. While not all acres are suitable for grazing, this represents a tremendous resource for the state. Residue yield and nutrient contents are dependent on grain yield, fertility, harvest date, and conditions at harvest. The nutrient content of residues is additionally impacted by the duration and timing of grazing initiation.

Figure 1. Cattle grazing crop residue. Photo by Sandy Johnson, K-State Research and Extension.

The amount of grain left in the field has been reduced considerably compared to historical levels through varietal and harvest equipment improvements. However, weather conditions can result in significant ear drop or plant lodging. Before grazing, scout fields to look for piles of grain on the ground. If grain piles are found, steps should be taken to remove these piles before turning out cattle on the field. If there are a lot of downed heads or ears and over 8-10 bushels of estimated grain on the ground, caution should be taken before grazing to avoid acidosis. Directions to estimate grain on the field from ear and head drop can be found here. While sorghum grain is always processed prior to feeding to crack its tough shell coat, cattle can still founder on downed grain sorghum heads.

Nutritive value of corn and sorghum residues

A nutritional evaluation of grazed Kansas corn and sorghum crop residues was conducted with the help of numerous producers and county agents across the state. Table 1 summarizes values from that survey.

Table 1. Range of crude protein (CP), acid detergent fiber (ADF; higher values reflect lower digestibility), neutral detergent fiber (NDF; higher values reflect lower animal intake), and total digestible nutrients (TDN) in corn and sorghum residue from Kansas samples.

	Leaves				Stem			
	CP	ADF	NDF	TDN	CP	ADF	NDF	TDN
Corn (Nov.)	4.6 - 6.0	46.7 - 48.2	75.6 - 81	51 - 52	3.3 - 4.4	55.9 - 60.6	79.0 - 79.7	41 - 45
Corn (Dec.)	4.9 - 5.7	48.4 - 53.5	75.2 - 77.3	47 - 51	3.9 - 4.6	55.3 - 59.1	78.7 - 80.3	42 - 45
Sorghum	8.3 - 11.7	40.3 -46.1	58.5 -65.7	53 - 57	5.3 - 4.9	46.3 - 50.4	66.2 - 73.5	49 - 52

A more detailed look at plant components indicates that any grain available would have the highest CP content, followed by the leaves. The cob has the lowest protein and energy value. The stalk and husks have similar crude protein content, but more energy is available from the husks than the stalks due to the lower lignin content. In general, leaves from sorghum residue have higher CP content than corn leaves. The stalks of corn and sorghum are similar in CP, but digestibility is somewhat higher in sorghum than in corn. More details on nutrient concentrations of crop residues can be viewed in this UNL publication.

Duration of grazing

To ensure adequate residue remains on the field after grazing, we can use animal weight and grain yield to determine the amount of grazing available. Cattle will readily remove approximately 15% of the residue (leaves and husk) but can be forced to remove more if desired. The goal should be to leave at least ½ of the total amount of residue on the field.

If an irrigated corn yield is 180 bu/acre, a rule of thumb is to divide by 3.5 to get grazing days for a 1200-pound cow. In this case, 180 bu/acre corn residue should provide approximately 51 days of grazing (180/3.5 = 51) for a 1200 lb cow. The harvest index (grain production/total biomass) is similar for corn and grain sorghum (1.6%). So, an 85 bu/acre dryland sorghum divided by 3.5 would provide approximately 24 days of grazing (85/3.5 = 24). A lactating cow or a heavier cow will consume more dry matter, and the grazing days need to be adjusted downward. A spreadsheet is available to calculate the stocking rate based on animal body weight and grain yield.

Selective grazing

Cattle will selectively graze the crop residue, eating the highest quality portions first, grain, then leaves and husks. Depending on the stocking rate, amount of grain available, and nutrient demands of the cows, no energy or protein supplementation may be needed early in the grazing period for dry cows with a body condition score of 5 or more and grazing as described above. Weathering and trampling will decrease quality over time, and this loss is greater with moisture and high humidity.

Soil compaction considerations

Cattle will cause soil compaction in paths leading to and around a water source. These compacted areas will only be surface compaction in the top two inches of soil. These compacted areas can be remedied by shallow tillage below the compaction layer. Results on soil compaction from grazing have shown mixed results. A study near Bushland, TX, found surface compaction in a no-till system reduced crop yield after several years of grazing. While grazing studies from Nebraska found no increase in compaction and increased crop yield. Studies from western Kansas found compaction to only occur in the top two inches when grazing occurred on wet soils and shallow tillage removed any compaction. Compaction will be less on frozen, dry, sandy soils. It is best to remove cattle from the field to a nearby perennial pasture if the field is wet and not frozen. Also, the producer should be open to using shallow tillage should compaction occur.

Nutrient removal from grazing

Another common concern about grazing residue is nutrient removal. Nutrient removal will vary by the type of animal, with a growing calf requiring more nitrogen than a mature dry cow. Dry cows will typically be used to graze residue, which will remove between 1 and 2 lbs of N per acre (depending on crop yield) and few other nutrients. Crop residue is low in phosphorus (P); thus, producers will likely supply a free-choice mineral, resulting in an increase in the amount of P and calcium left in the field. Wind will blow leaves and husks off fields, but manure remains in place. Therefore with proper grazing management, grazing can benefit livestock, soils, and economic profit.

John Holman, Cropping Systems Agronomist – Southwest Research and Extension Center
jholman@ksu.edu

Sandy Johnson, Extension Beef Specialist – Northwest Research and Extension Center
sandyj@ksu.edu

4. Forage risk management and PRF insurance

Pasture, Rangeland, and Forage (**PRF**) insurance is a tool for managing rainfall or drought risk. While individual producer experience varies, PRF has made substantial payouts during drought years. In 2023, producers paid an average premium of $5.11 per acre and received an average payout of $10.06 per acre. The deadline to sign up for PRF insurance for the 2025 calendar year with a crop insurance agent is December 1, 2024. Some producers may be concerned about the degree to which PRF will cover actual forage losses on their operation. This article summarizes these concerns and two approaches to considering them.

PRF Summary. PRF makes automatic payouts for a producer when precipitation is less than the historic average in their local area, or USDA-defined *grid* (approximately 17 by 13 miles). Producers using PRF must select which 2-month *intervals* throughout the year to insure and the relative importance (weight) of each *interval*. The basics of PRF insurance have been covered in previous newsletters; see the links below for more details. Producers need to work closely with an insurance agent to make several decisions, including coverage level, interval selection, and productivity factor.

Concern 1. PRF is a type of area insurance. PRF doesn't cover what happens on an individual operation or field, instead it makes payouts when precipitation (rain or snow) during an interval in a producer's grid is lower than the historic average (the exact point at which a payout is made will depend on what coverage level is selected). There are both benefits and drawbacks of PRF being *area insurance*, or not covering individual losses. The benefits include that no loss adjustment or production history is required. Measuring production or yields on pasture or for some forage types can be more difficult than for commodity crops. Drawbacks include that payouts might not be made when rainfall is low for an individual producer but higher for the grid. Likewise, payouts might be made when a producer has adequate moisture but the grid does not.

Concern 2. Not all precipitation in an interval (2-month period) has the same impact on yield. A producer may be concerned that the relative quantity of precipitation in a two-month period may not perfectly predict yield. While precipitation is highly correlated with yield, the timing of precipitation can influence forage yields. Concentrated rainfall may have a low impact on yields, while more spread out rainfall is typically more beneficial.

Concern 3. PRF is single peril, or only covers one type of loss. While low precipitation is strongly correlated with yield losses, other natural and weather-related factors may also matter. Excess rainfall can lead to yield losses or a decline in forage quality. Extreme heat could lead to forage losses as well.

Approach 1. Understand how relevant these concerns are for your operation. Not understanding these PRF characteristics and their implications for an individual operation could lead to disappointment or worse. If a producer is uncertain of whether to use PRF, a good first step is to understand what PRF does and doesn't cover and assess how serious these potential limitations are. Detailed information is available online and insurance agents are a good resource. USDA has a decision support tool that provides information on grid-level historic precipitation and estimated payouts. These can be compared with individual rainfall or production records to analyze the degree to which (1) individual and area (grid) experience are different and (2) precipitation is related to yield or forage/pasture quality. Many agents offer other decision support tools and individualized analysis. Producers can use these resources to better understand how manageable these concerns are for their operation.

Approach 2. Take a long-term perspective. Even if PRF payouts aren't always related to individual forage losses, many producers take a long-term perspective to forage risk management. In other words, producers don't typically produce *just enough* forage to meet their needs and go to the market to purchase hay whenever pasture or hay production is insufficient for their needs. Instead, producers adjust hay stocks, cow numbers, and make other production decisions to manage long-term drought risk. From this perspective, in many cases, a producer may not need a payout immediately to purchase hay when precipitation is lower than the historic average. Instead, PRF payouts can be used to build a "cash inventory" or "PRF savings account". These funds could be used to make investments that mitigate drought risk, cover family expenses, purchase hay during a drought, rebuild hay stocks, restock heifers quickly after a drought, etc. When taking this perspective, it is helpful to remember that the government covers at least half of the cost of the PRF premium. Over time, a producer should receive more in payouts than is paid in premiums. This is not guaranteed but is the typical or average experience.

Conclusion

PRF insurance is one of many tools that can be used to manage drought risk—over 5 million acres in Kansas are currently enrolled. PRF has some unique characteristics that are important for a producer to understand. In addition to providing payouts for forage replacement or hay purchase, PRF can contribute to long-term drought risk management.

Resources

https://public-rma.fpac.usda.gov/apps/PRF

https://www.rma.usda.gov/about-crop-insurance/frequently-asked-questions/pasture-rangeland-forage

https://enewsletters.k-state.edu/beeftips/2021/11/01/ten-things-to-know-about-pasture-rangeland-and-forage-insurance/

https://agtodayksu.libsyn.com/1643-fsa-helping-farmersfarmers-owe-millions

https://agtodayksu.libsyn.com/1557-options-when-burning-landprf-insurance

https://agmanager.info/crop-insurance/livestock-insurance-papers-and-information/protecting-your-forage-supply-pasture

https://agmanager.info/events/risk-and-profit-conference/previous-conference-proceedings/2021-risk-and-profit-conference-15

This material is based upon work supported by USDA/NIFA under Award Number 2021-70027-34694.

NORTH CENTRAL EXTENSION RISK MANAGEMENT EDUCATION
USDA National Institute of Food and Agriculture
U.S. DEPARTMENT OF AGRICULTURE

Jenny Ifft, Flinchbaugh Agricultural Policy Chair – Kansas State Univ. Dept. of Agricultural Economics
jifft@ksu.edu