Issue 831

K-STATE Research and Extension

Extension Agronomy

eUpdate

12/11/2020

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.

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eUpdate Table of Contents | 12/11/2020 | Issue 831

1. Nutrient availability in poultry manure

Poultry litter can provide a significant and important supply of nutrients for crop production in areas of Kansas where a supply of litter is available (Figure 1). Although Kansas is not a major producer of poultry, there is an abundant supply of litter from the nearby states of Arkansas, Missouri, and Oklahoma, which rank among the largest producers of poultry in the U.S. The acreage available to receive poultry litter has been declining in Arkansas, Missouri, and Oklahoma in recent years because of environmental concerns and nutrient management regulations, thus the availability of litter to areas such as southeast Kansas has been on the rise.

Figure 1. Stockpiled poultry litter on an improved poultry litter storage site in Bourbon County, KS. Photo by Dan Donnert, K-State Research and Extension.

Poultry litter should serve as an excellent complement to commercial nitrogen (N) fertilizers. Phosphorus content in poultry litter is usually high, and applications rates should be based on P levels to avoid potential surface water contamination.

Moisture content and nutrient concentration in poultry litter can be highly variable and depends mainly upon production conditions, storage, and handling methods. Therefore, laboratory analysis is the best way to determine the level of N and P in the material to be applied. Average values for the

different types of poultry manure collected over a period of time are shown in Table 1. Actual laboratory analysis of 213 poultry manure samples from southeast Kansas are shown in Figure 2. There is a large range in nutrient values, likely due to the source of the litter. However, a good sample average to expect would be a 56-53-46.

Table 1. Types and nutrient content of poultry litter

Litter Source	Typical moisture content	Typical nutrient content (lbs/ton)		
		N	P_2O_5	K_2O
Layer	High	35	40	20
Pullet	Low	40	45	40
Breeder	High	40	60	40
Turkey	Low	60	60	55
Broiler	Low	60	60	55

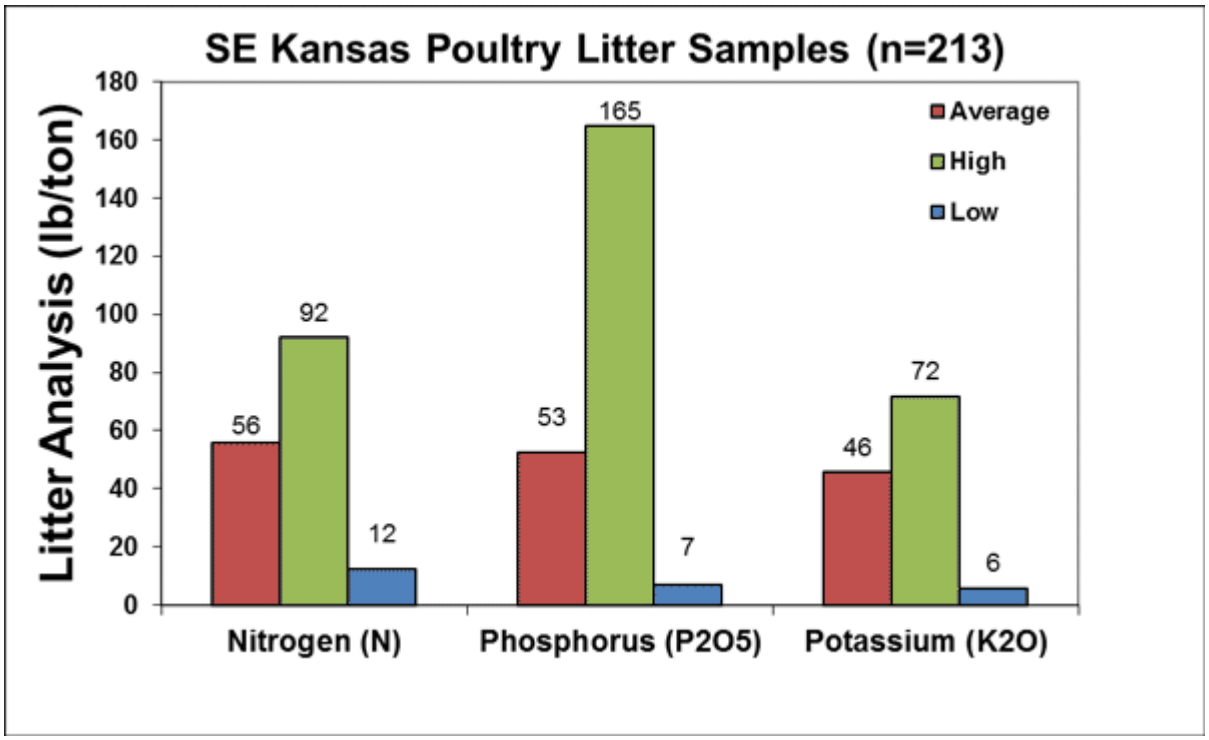

Figure 2. Results of analysis of 213 samples of poultry manure from southeast Kansas. Sources: Keith Martin, K-State Research and Extension, Wildcat Extension District and Doug Shoup, K-State Research and Extension.

For maximum efficiency of manure use, it is essential to know the nutrient content of the manure. A

laboratory analysis should be done on the poultry litter before applying it to land. A laboratory analyses provides information regarding nutrient levels, as well as the chemical forms of these nutrients. This information is necessary for an adequate estimation of nutrient availability and application rates.

For more information, see K State Extension publication MF-2562, "Estimating Manure Nutrient Availability," at: http://www.ksre.ksu.edu/bookstore/pubs/MF2562.pdf

Nitrogen availability

What is the crop availability of N shortly following poultry litter application?

In the case of N, it is important to consider that this nutrient is primarily in the organic form in poultry litter (up to 75-80% organic N). Organic N needs to mineralize before becoming available to crops. A fraction of this organic N may become part of the soil organic matter pool and unavailable to crops in the short term.

Field and laboratory studies suggest the fraction of total nitrogen that becomes plant available the first year of application is approximately 45-55%, which includes both the inorganic N in the manure and a percentage of the organic N. This value varies depending upon components in the litter, and the method of handling and application. For example, poultry litter that contains a large fraction of bedding material will tend to have lower N availability the year of application. Reduction in N availability may also occur when litter is aged, and has undergone some level of composting. Nitrogen lost from the volatile ammonium fraction at the time of application on the soil surface can also reduce plant available N. Ammonium volatilization is typically higher during windy and warm days. Incorporation of litter immediately after application will reduce volatilization and potential nutrient loss by water runoff in case of a rainfall event, in addition to reducing the odor of the litter.

If the manure is applied to pastures, the percentage of N utilized by the forage the first year will depend on whether the pasture consists of cool-season or warm-season grasses. For cool-season grasses, such as fescue pasture, N utilization will likely be less than 50% the first year. Most of the growth in cool-season pasture occurs early in the year. The microbial community will not mineralize as much N early in the spring as they will later in the summer. Fall applications may result in better N utilization for fescue than winter or spring applications. For warm-season grasses, such as bermudagrass pasture, nitrogen utilization from manure will likely be close to 50%. In both cases, producers should base application rates on the P and K needs of the grass, and supplement additional N fertilizer to meet the N needs of the grass.

Phosphorus and potassium availability

When manure is applied to the soil, what percentage of this phosphorus and potassium is available to the crop during the first year?

A large fraction of the P in manure is considered to be plant available immediately after application. The fraction that is not plant available shortly after application will become available over time.

Estimated values of P availability are from 50 to 100%. This range accounts for variation in sampling and analysis, and for P requirements with different soil test levels. Use the lower end of the range of P availability values (50%) for soils testing "Very Low" and "Low" (below 20 ppm). In these situations,

large yield loss could occur if insufficient P is applied and soil P buildup is desirable.

On the other hand, use 100% availability when manure is applied to maintain soil test P in the "Optimum" soil test category, and when the probability of a yield response is small.

Several studies have shown that manure P is a valuable resource, comparable to inorganic fertilizer P for crop production. These two P sources are similarly effective when the manure P concentration is known and the manure is applied properly. Nevertheless, excessive application of manure P (e.g., applying manure at rates sufficient to meet the crop's N needs) often results in excessive soil P buildup over time, resulting in higher risk of surface water contamination.

This problem of excessive P buildup in the long-term can be minimized by:

- Applying manure to meet the P needs of the crop and using inorganic sources of fertilizer to complement nitrogen needs,
- Constantly monitoring soil test P levels, and
- Using the P-index to assess potential impact of P buildup on water quality.

Producers should think in terms of actual P application rates and not just tons per acre of manure being applied. Uniform application of manure at precise rates can also be difficult. Careful calibration of manure applicators is needed. If these aspects are not considered, the efficiency of manure P compared with inorganic fertilizer P may be reduced. Careful management pays off.

Availability of potassium (K) is usually near 100% with proper application. Poultry litter can also provide significant amounts of secondary and micronutrients.

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2. Stay connected to K-State Agronomy with social media and digital resources

With in-person interactions across the state severely limited due to the continuing pandemic, staying connected can be quite challenging. The K-State Agronomy department has several social media accounts and other digital resources available, including the Extension Agronomy eUpdate, Twitter, Instagram, Facebook, and YouTube, in addition to our departmental website, www.agronomy.k-state.edu

The Department of Agronomy is doing outstanding work in teaching, research, and extension. Our goal is to keep you up-to-date on all things K-State Agronomy including: faculty and student activities, our best recommendations for crop, forage, and soil management in Kansas, and current crop conditions. Our social media and electronic forums emphasize efficient agronomic practices, current research, student accomplishments within the department, new faculty hires and retirements, and much more.

Extension Agronomy eUpdate

The article you're reading now is part of a regular weekly electronic publication called the Extension Agronomy eUpdate. The national award-winning Agronomy eUpdate provides timely information across a wide range of agricultural topics and agronomic issues. Contributors to the eUpdate include not only extension specialists and researchers in the Agronomy department, but also plant pathology, entomology, agricultural economics, and animal science.

"The Extension Agronomy eUpdate is an extremely valuable resource that targets a wide range of end users associated with Kansas agriculture. It represents a collaborative outreach effort between our outstanding agronomy specialists and other departments to provide up-to-date information on current agronomic issues affecting Kansas and the surrounding region and it's free!" – Kathy Gehl, eUpdate editor.

The eUpdate is offered as a free resource to all individuals. You can subscribe to the eUpdate by visiting the homepage at https://eupdate.agronomy.ksu.edu/.

The eUpdate homepage features the current eUpdate as well as access to detailed archives going back to 2013. Each week, the eUpdate is emailed to subscribers as soon as it is published. The reach of the eUpdate goes well beyond Kansas and the Midwest. Just in 2020 alone, the eUpdate website has had over 48,000 users that span dozens of countries around the globe (Figure 1).

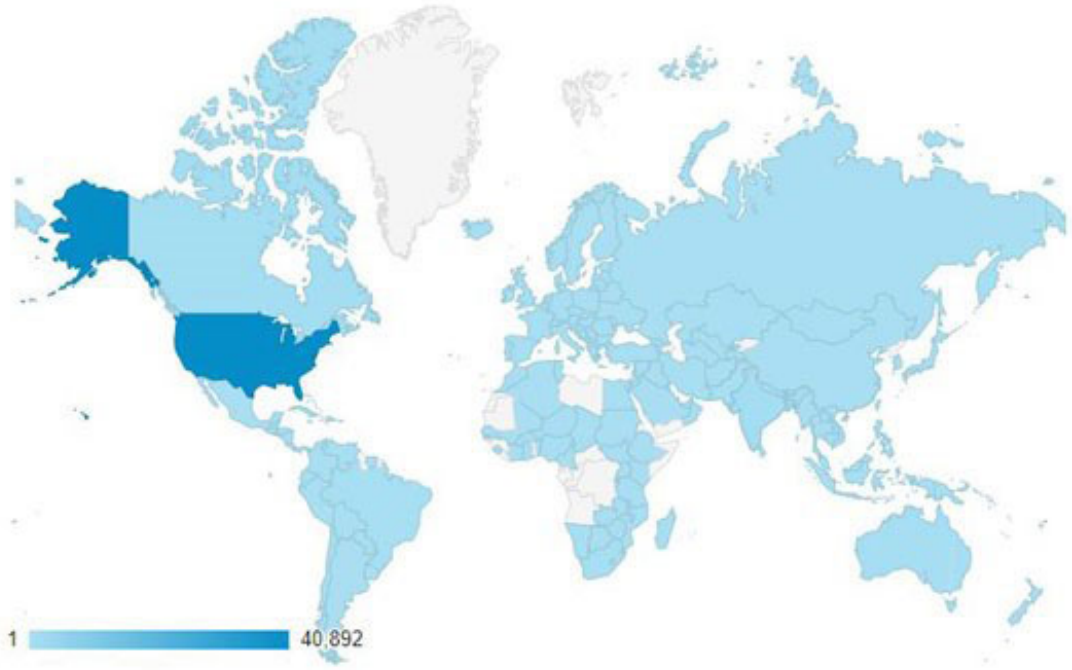

Figure 1. Geographical location of web traffic associated with the eUpdate website from January 1, 2020 to November 30, 2020. Countries shaded in blue represent at least 1 visitor to the eUpdate website. Map provided by Google Analytics.

Twitter (@KStateAgron)

K-State Agronomy became active on Twitter in 2013 with the goal of reaching practicing professionals in agriculture with the latest crop and forage production practices and crop condition updates. Our Twitter postings have since gained a large base of followers, with almost 8,000 Twitter followers and an average of over 70,000 tweet impressions each month.

You can follow the Agronomy department on Twitter at @KStateAgron.

Instagram (@ksuagronomy)

The Department of Agronomy uses Instagram to reach potential and current students, as well as alumni. Our Instagram posts provide a flow of images highlighting student activities, current research projects, and other various happenings in the department (Figure 2). With this new target audience in mind, the department hopes to attract future K-State students to Agronomy and keep interested Alumni members informed on what the department is doing - in picture form!

You can follow us on Instagram at @ksuagronomy.

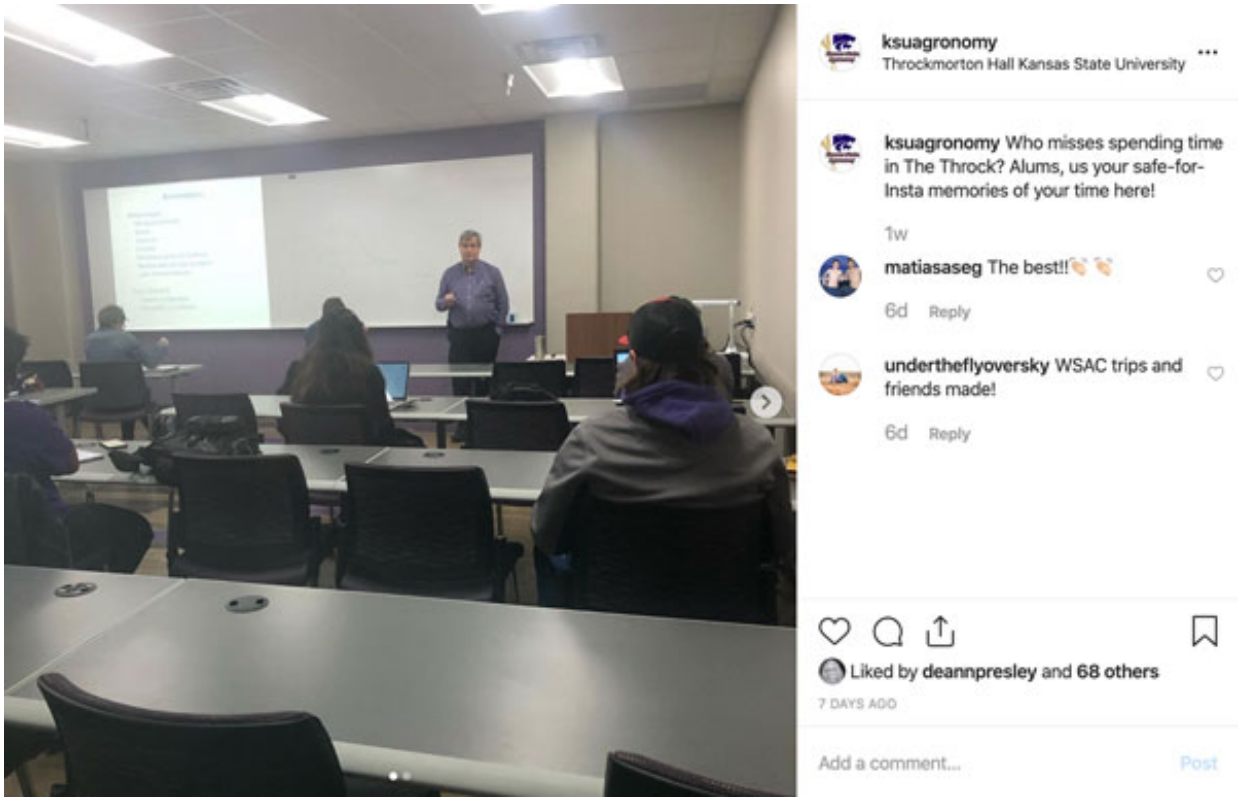

Figure 2. Instagram post highlighting an updated classroom in Throckmorton Hall.

Facebook (@kstate.agronomy)

Our Facebook page has been providing current updates on the department since 2012. Facebook recognizes student and faculty accomplishments, as well as events hosted by the department (Figure 3). You can access our Facebook page at @kstate.agronomy

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Figure 3. Example of a past Facebook post highlighting one of the many accomplishments in the Agronomy Department from the Crops Team.

YouTube (KStateAgronomy)

Last but not least, the K-State Agronomy hosts a YouTube channel to reach producers, practicing agronomists, and other agronomy professionals. This is our newest platform and we are trying to grow our subscribers. In the last 6 months, 15 new videos have been added that have been viewed almost 2,000 times collectively. These videos vary in scope and topic, ranging from research spotlights to recaps from the 2020 Wheat Field Days.

Be sure to check out this resource and get subscribed (it's also free!). Simply go to https://www.youtube.com/user/KStateAgronomy.

Additional online resources

Stay tuned to the eUpdate in the coming weeks as we highlight other valuable resources that can be accessed online. There's a wealth of agronomic information out there if you know where to look!

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3. Kansas Ag-Climate Update for November 2020

The Kansas Ag-Climate Update is a joint effort between our climate and extension specialists. Every month the update includes a brief summary of that month, agronomic impacts, relevant maps and graphs, 1-month temperature and precipitation outlooks, monthly extremes, and notable highlights.

November 2020: Warming winter season started with a band of heavy precipitation

November was on the dry side of the distribution for precipitation. It ranked as the 72nd driest November since 1895. There was a significant split in moisture across the state. Statewide average precipitation for the month was 1.23 inches, 88 percent of normal (Figure 1). The Northwest Division was the driest, with an average of 0.05 inches, 6 percent of normal. In contrast, the Northeast Division averaged the most precipitation, at 2.48 inches, 142 percent of normal.

Temperatures were above normal (Figure 1). The statewide average for November was 5.3 degrees warmer than normal. The thermal heat unit was driven by warm minimum temperatures. There were 52 daily record high maximum temperatures and 126 daily record warm minimum temperatures.

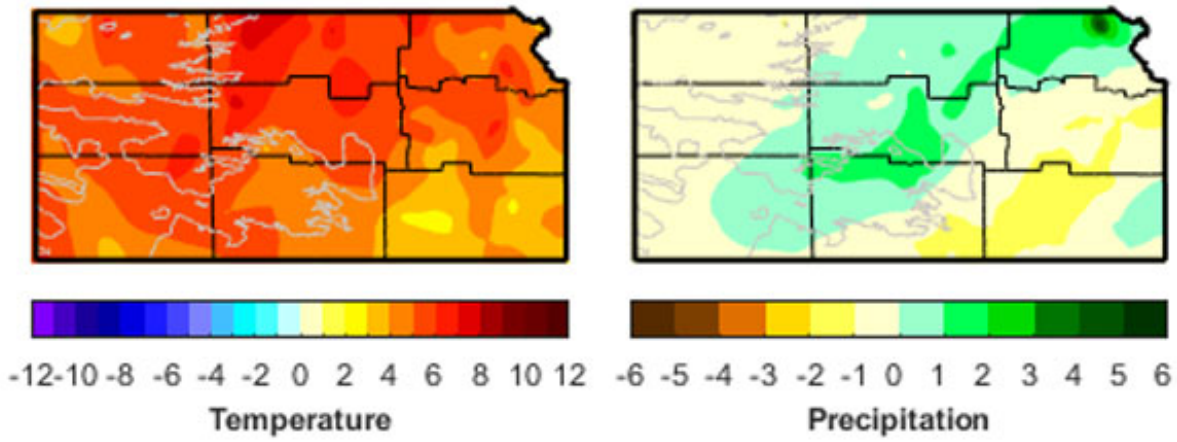

Figure 1. Departures from normal temperature (°F) and precipitation (inches).

View the entire November Ag-Climate Summary, including the accompanying maps and graphics (not shown in this summary), at http://climate.k-state.edu/ag/updates/.