MARCH 17, 2021
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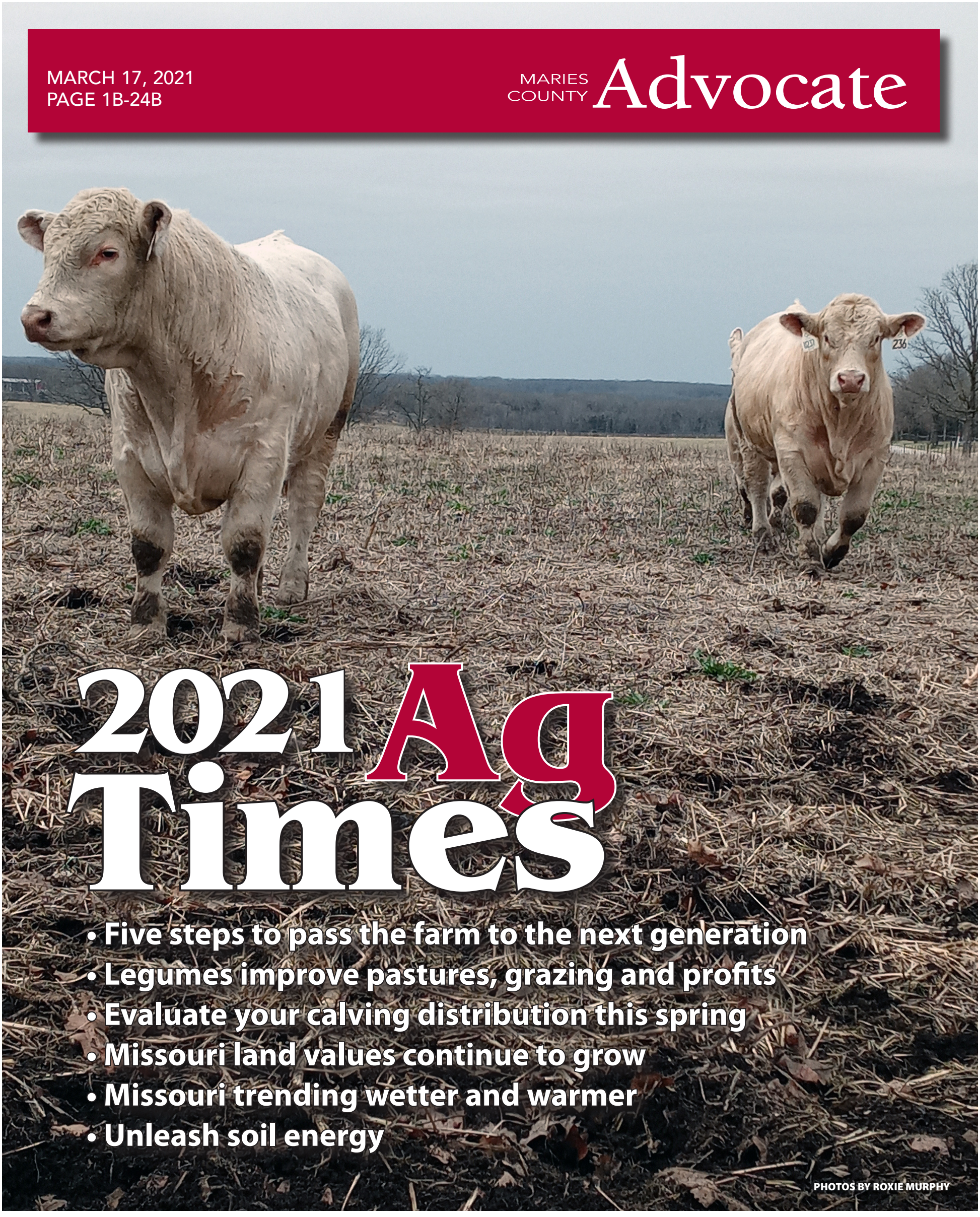
MARIES COUNTY Advocate

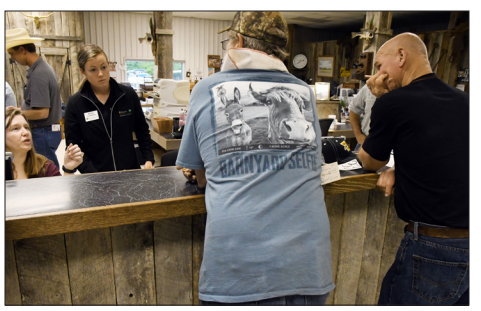


2021 Ag Times

- Five steps to pass the farm to the next generation
- Legumes improve pastures, grazing and profits
- Evaluate your calving distribution this spring
- Missouri land values continue to grow
- Missouri trending wetter and warmer
- Unleash soil energy

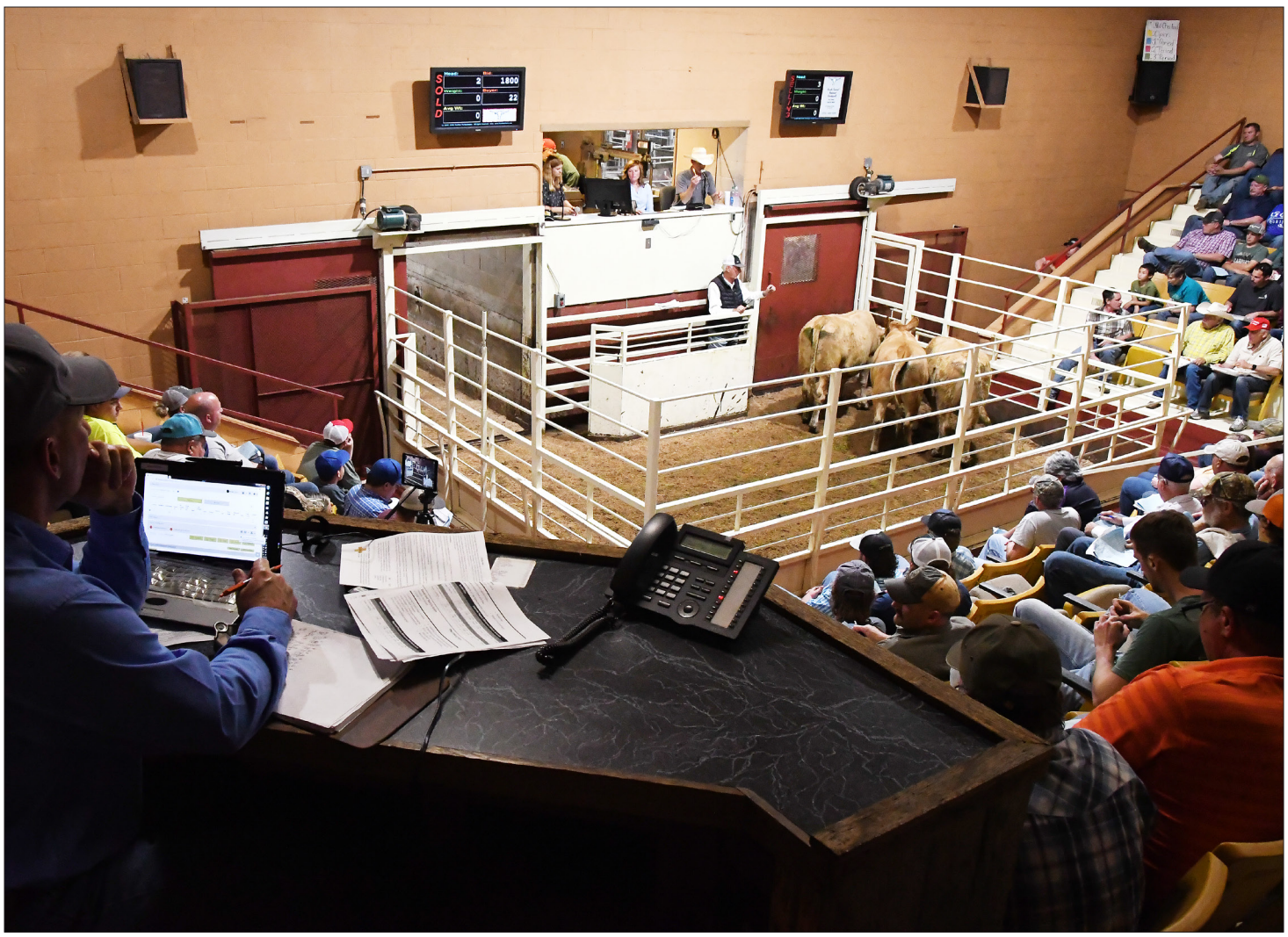
PHOTOS BY ROXIE MURPHY

PHOTOS BY DAVE MARNER



SOUTH CENTRAL Regional Stockyard co-owner and ring boss Dave Patton picks a bid for auctioneer Bill Patton during the 2020 sale in Vienna. Anita Ellis with University Extension is on the left and Ashley Tabor of Iberia was the sales clerk. **A BIDDER** tracks sale prices (top). **A BUYER** settling up his tab for the night had a t-shirt with the words "Barnyard Selfies" showing livestock on the back.

PHOTOS BY DAVE MARNER



NOTES FROM the sale ring: results from May, 22, 2020, Show-Me-Select Bred Heifer Sale at Vienna's South Central Regional Stockyards:

- The May 22 sales was the first SMS event in central Missouri since 2003.
- large turnout and active bidding, reported by University of Missouri Extension livestock specialist Anita Ellis, coordinator of the sale.
- Sale receipts topped $251,575, and Ellis reported online bidding was a popular option.
- There was a 75 percent increase in online producer participation in this area in just one year.
- SOLD: 145 heifers averaged $1,735.
- Heifers carrying AI pregnancies brought a nice premium, averaging $1,805, compared to an average of $1,703 for heifers carrying natural service pregnancies.

— Source, Linda Geist, University of Missouri Extension

The sun sets following the May 22, 2020, Show-Me Select Heifer Sale held at South Central Regional Stock-yard in Vienna. Try the strawberry pie at The Market Cafe when the 2021 SMS sale returns to Maries County. Dates of Spring 2021 sales and contacts for coordinators include:

- SEMO Livestock Sales LLC, Fruitland, 7 p.m. Friday, May 7; Erin Larimore, 660-281-5518, larimoreE@missouri.edu.
- Farmington Regional Stockyards LLC, Farmington, 7 p.m. Friday, May 14; Kendra Graham, 573-756-4539, grahamKK@missouri.edu.
- Kingsville Livestock Auction, Kingsville, 11 a.m. Saturday, May 15; David Hoffman, 816-380-8460, HoffmanD@missouri.edu.
- Joplin Regional Stockyards, Carthage, 7 p.m. Friday, May 21; Eldon Cole, 417-466-3102, ColeE@missouri.edu.
- **South Central Regional Stockyards, Vienna, 6 p.m. Friday, May 21; Anita Ellis, 573-642-0755, snella@missouri.edu.**
- F&T Livestock Market, Palmyra, 6 p.m. Saturday, June 5; Daniel Mallory, 573-985-3911, MalloryD@missouri.edu.

For past sales results and catalogs, go to extension.missouri.edu/programs/show-me-select-replacement-heifer-program.

PHOTO BY DAVE MARNER

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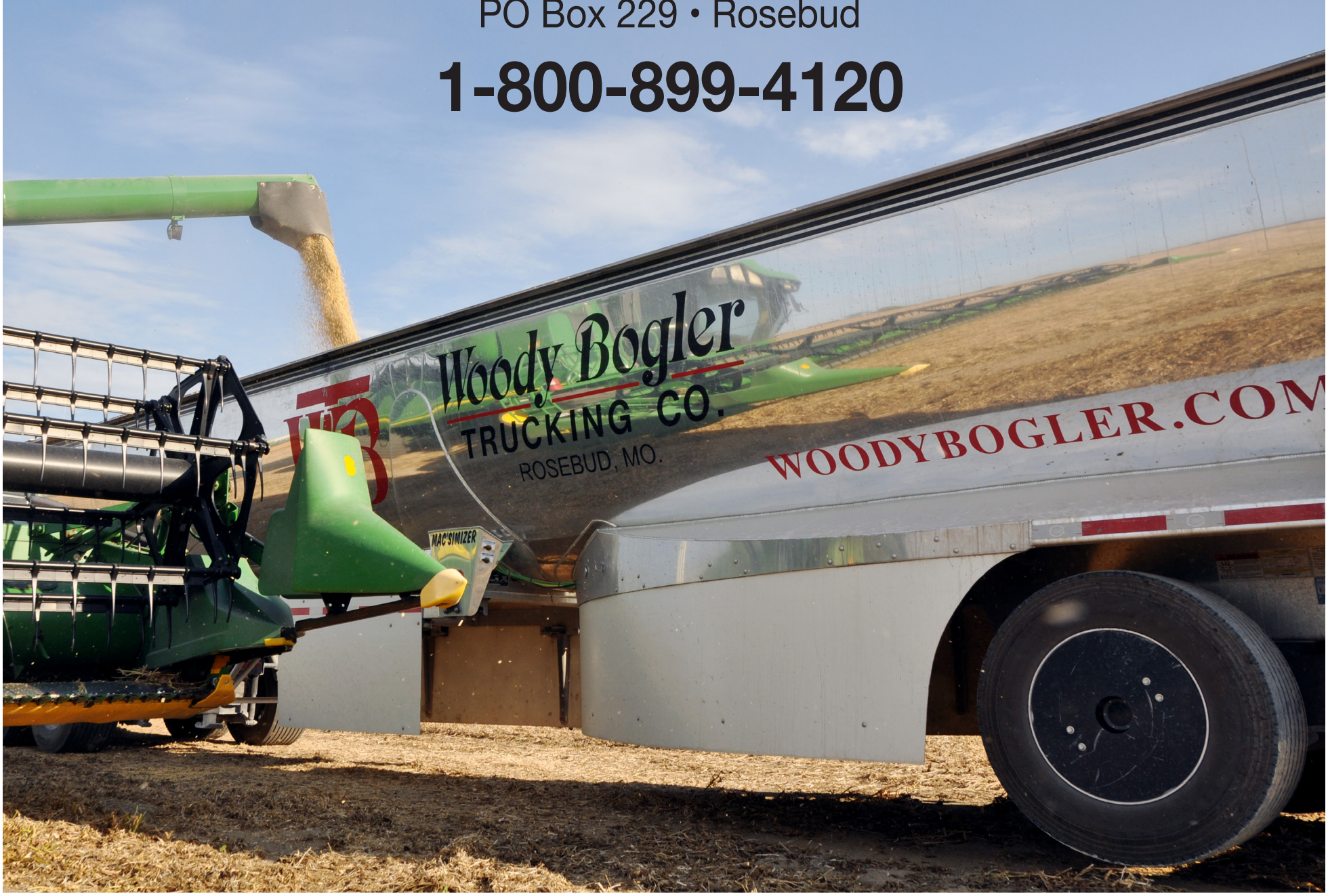

PHOTO BY DAVE MARNER

A WHITETAIL deer turns its head in a freshly mowed Gasconade County hay field during the summer of 2020 after a passing motorist stopped to photograph the scene.

Without forage test, hay by any other name is just hay

PHOTO BY DAVE MARNER

RON LANG bales hay during the summer of 2020 on ground overlooking the Owensville Walmart store.

BY LINDA GEIST
MU Extension

COLUMBIA — Mature hay is hay. It may be brome hay, prairie hay or any other type of hay. But in the end, it's just hay until it's been tested.

Forage tests tell the tale of whether hay is of good quality and nutrient-rich, says University of Missouri Extension livestock specialist Gene Schmitz.

Nutrient content of hay, haylage or silage directly relates to its stage of maturity at harvest. As plants mature, they lose digestibility and nutrients. "This is true across all plant species," Schmitz says.

A hay test sifts the good from the bad and tells the buyer what the eye cannot. At a minimum, forage tests measure moisture, crude protein and acid detergent fiber. With this information, the energy value or TDN (total digestible nutrient) value can be determined.

Forage tests run about $20 to $30. Schmitz says they are worth the cost.

"For many years, I've summarized forage quality values from the forage tests I receive in my office," Schmitz says. "Extreme variation is always present."

Schmitz points to hay test data from 2018 to illustrate this point. "For cool-season grass hay samples, the average crude protein content was 11.5 percent That is really good, but the range was 6.5 percent to 19.9 percent. For TDN, the average was 54 percent, but the range was from 47 to 67 percent. With those extremes, average or even book values really become meaningless numbers."

Hay tests help producers develop cost-effective feeding programs to meet animal production and performance goals. A minimal investment in hay testing allows producers to manage feed costs that directly affect the bottom line.

Visit the NRCS + MU Grasslands Project website at extension.missouri.edu/programs/nrcs-mu-grasslands-project.a

Adopting Nature's Pattern

BY JON FRANK

Dr. Carey Reams strongly admonished his students to "see what you look at." This is valuable advice I try to follow – especially when I am out in nature. I live on an 8-acre plot that was a cornfield as recently as 2003. The next year the land was developed and all the perimeters were planted with rows of shrubs, hybrid poplars, and ash trees. About half the land was left open.

One day while walking the property, I observed the grass in the open land away from the trees had very sparse growth. The grass growing between the rows of trees had at least 3 times the growth and many more legume plants. Neither area was being fertilized, soil moisture was fine, and both areas were getting mowed with clippings left on the ground. Soil tests showed the exact same pattern and yet the grass between the trees was clearly much more productive, even with less sunlight. Why? We will come back to this later.

Have you noticed the global movement toward agroforestry? It is small but growing rapidly. I highly recommend J. Russel Smith's classic book called Tree Crops. What an inspiring man and book. Trees are being used to reclaim deserts, stabilize erosion on steep land, revitalize rural economies, enhance pasture, and efficiently farm the tropics. Trees are an integral part of how nature builds soil.

Last month I presented the work of professor Gillies Lemieux using Ramial Chipped Wood (RCW). We looked at how twigs and small branches have lignin with a much higher proportion of monomers and oligomers and far less complexed polymers. We also looked at how hardwoods (angiosperms) produce a lignin structure that promotes biodiversity above and below ground, while conifers (gymnosperms) have a lignin structure that hinders biodiversity. Ultimately RCW provides a steady source of endogenous soil energy that powers the microbial system. And it all starts with depolymerization of oligomers carried out by a group of white rot fungal organisms called Basidiomycetes.

What is the composition of wood? The varies by species and the difference between stem wood vs. twigs and small branches. Here are some general ranges, excluding moisture:

Cellulose	38-50%
Hemicellulose	23-32%
Lignin	15-30%
Nitrogen	1-2%
Minerals	1%
Other Carbons	<1%

When the fungal decomposers depolymerize the lignin two things happen: first, the carbohydrates, cellulose and hemicellulose, are freed up and serve as a food source for soil microbes. This results in a tremendous growth in the size, vigor and diversity of the fungal species unlock the energy, all the species in the trophic web are benefited and, of course, so are the plants.

The second thing that happens is that humic and fulvic acid precursors are created and released into the soil solution. This helps regulate nutrient flow to plants and has many benefits, including stimulating plant growth.

The enzymatic depolymerization of lignin via Basidiomycetes does not destroy the lignin; it just gets it ready for further processing. It is this remaining lignin that deserves our careful scrutiny.

But first it is important to acknowledge and contrast another major biome that has built up fertile soil: grasslands. Grasslands account for about a quarter of the world's land area. They occupy a unique position. When rainfall is regular, plentiful forests thrive. When rainfall is too little and inconsistent, deserts are the result. Grasslands occupy the middle region between forests and deserts.

Grasses have a unique lignin structure different from conifers or hardwoods in their underlying lignols. When these lignins decompose, grasslands can build up a deep, fertile soil. But it is fragile and subject to erosion. Even though the soil may be black and have high levels of organic matter the actual humus content is usually quite low. A lot of what is being measured as organic matter is the accumulated char from grassfires going back thousands of years and not true humus.

The soil developed under hardwood forests is much more stable and resistant to erosion, and this has everything to do with the lignin structure. Lignin from wood is a very complex molecule. It is very high in energy and is quite resistant to breakdown. Chemically, lignin are cross-linked phenolic polymers.

It is lignin and the great variety of polyphenols that are the source material for the creation of humus, humin, humates, humic acid and fulvic acid. This transformation of organic compounds occurs though synthesis

See **Nature's Pattern**, Page 9B

Nature's Pattern • *from page 8B*

and retrosynthesis via the work of soil biology. Retrosynthesis is the fracturing of complex molecules to produce new ones that are at least as complex using enzymatic systems. This happens when soil has a well-fed and broad community of microbial life. Microbes facilitate enzymatic pathways that create brand-new soil if they have enough energy.

The beauty of using Ramial Chipped Wood is that it contains the source materials needed to make brand new soil (lignin and polyphenols) and the energy needed to power the biology. This is why ramial chips should never be composed. Composting is a process where energy is removed from the carbon structures and minerals are consolidated. Compost is actually an organic fertilizer.

Speaking of energy, the highest storage of energy is in the core of the phenols. Can you guess what it is? Aromatic hydrocarbons! That's right – the same six carbon ring structures found in crude oil, also called benzene.

Dr. Reams used to teach his students to mix used motor oil with sawdust and spread it on the land in the fall. He said the carbon and energy will make plants grow like crazy. As proof he pointed out how junkyards with oil spills would cause weeds to grow 6-12 feet high. I was always a little leery of following this because I wasn't sure if the used oil had heavy metals from the engine or other chemicals from the refinement process that could be detrimental to the soil. I have long thought that unrefined crude oil would be an awesome input for agriculture. And it is natural and organic.

This was later confirmed when I talked to my brother, who works in the oil fields. When crude oil is spilled on land, the oil and the "contaminated" soil is removed to a waste area and allowed to sit for a period of time. After this it is auctioned off for disposal. Farmers jump at the chance to buy the soil and spread it out on their fields. The result? Plants grow like mad. The same energy of aromatic hydrocarbons is in ramial chips without any concerns of a visit by the EPA.

Let's review. Nature's pattern is to build soil through lignin decomposition. The best soils are built under hardwood forests. Pedogenesis is essentially a forestry process.

The decomposition of woody lignins provides energy to the microbial system and the building blocks to create brand new soil. I saw the early stages of this occurring when I compared the grass growing on open land versus the grass growing between rows of tree. The use of Ramial Chipped Wood copies nature's pattern from forestry and can be used to empower agriculture.

Jon Frank is the founder of growyourownnutrition.com and can be reached for consultation at growyourownnutrition@gmail.com.

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Cover crop acres increase due to financial assistance programs available

BY KAYLA BERGMAN
Senior policy associate, Center for Rural Affairs

In recent years, there has been an increase in cover crop implementation across the U.S. due, in part, to federal and state programs offering financial and technical assistance.

Cover crops are seeded in the fall to protect the soil from erosion through the winter and early spring. They also serve the important function of building soil health through increasing the soil organic matter, especially when partnered with no-till and other conservation measures.

According to the recent USDA report, "Cover Crop Trends, Programs, and Practices in the United States," cover crop acres increased by 50% between 2012 and 2017. The increase took cover crop acres established nationally in 2017 to 15.4 million acres.

The growth was spurred, in part, by financial and technical assistance programs producers are using to implement this conservation practice, along with others. Through the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS), there are two programs offering help — the Conservation Stewardship Program and Environmental Quality Incentives Program.

The Conservation Operations account, which funds conservation planning and implementation assistance on those agricultural lands at the federal level, is currently under review as part of the annual appropriations process. As lawmakers review the funding, we ask them to keep in mind our nation's farmers and landowners who rely on these programs.

To maintain the cover crops acres and continue increasing the implementation of this practice and others, we need to ensure these important financial and technical assistance programs continue to be available.

Missouri trending wetter and warmer

BY LINDA GEIST
MU Extension

COLUMBIA — Missouri's seasons are getting warmer and wetter, especially winter and spring.

For farmers, this means a longer growing season, wetter fields and potential for more plant diseases and insects.

Four of the five warmest winters in Missouri on record have occurred since the early 1990s, says University of Missouri Extension climatologist Pat Guinan. The five warmest springs on record have taken place since 1977.

Guinan says Missouri has witnessed a trend of "unprecedented" annual warming over the past couple decades.

"There have been only five years since 1998 that were cooler than average," he says. "We've also seen a trend of higher nighttime temperatures in all four seasons."

Missouri's five warmest years, in descending order, are 2012, 1921, 2016, 1938 and 1931/1998 (tie).

Missouri has broken seven all-time monthly high temperature records during the past 22 years. Of these, most occurred during the cold season. In 19 of the past 22 years, the annual minimum temperature in Missouri has been above average, according to the National Oceanic and Atmospheric Administration.

However, summer days with extreme heat are less common, Guinan says. There are fewer 90-degree days, but summer nights are warmer and more uncomfortable, with more days when temperatures do not fall below 70 degrees.

PHOTOS BY DAVE MARNER

LILLIES BLOOM on a pond west of Owensville during the summer of 2020. This cow walked around the pond and went into the water to cool off and to get a drink.

These trends are due in part to water vapor content, which has been increasing in Missouri over the past several decades, he says.

One way to express atmospheric moisture is through dew point, the temperature at which the air becomes saturated. Higher dew points elevate minimum air temperatures and

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Trending • *from page 10B*

suppress maximum temperatures, a phenomenon that has become most pronounced during the growing season. These higher nighttime temperatures create a humid environment ripe for plant diseases.

Another change with significant consequences for agriculture: Compared to the long-term average, over the past 20 years the median date of the last spring frost is about six days earlier and the first fall frost is generally five days later. That extends the growing season by 11 days.

Missouri is also experiencing an unprecedented wet period, Guinan says. Twenty-four of the last 39 years have had above-normal precipitation. Missouri saw its seventh-wettest year on record in 2019.

While long-term (1895-2010) average annual precipitation in the state is 40.86 inches, since 1973 annual precipitation has exceeded 50 inches nine times, with fewer dry periods compared to the first seven decades of the 20th century.

Not only is there more rain, heavy rain is happening more often, leading to more flooding and wetter cropland. Missouri has seen a 35 percent increase in 3-inch daily rain events over the past couple decades compared to the long-term average. Missouri has also broken four all-time monthly records since 2015.

But weather can change quickly, as shown by the drought of 2012, Guinan says. Missouri has had multiyear droughts and extreme summer heat, particularly in the 1930s and 1950s. In 1936 there were more than 60 days of triple-digit temperatures in Lamar, peaking at a brutal 118 degrees on July 19, 1936. The following month saw 21 consecutive days with temperatures of 100 degrees or higher. Since 2013, Lamar has recorded no triple-digit temperatures.

Conversely, the last time an all-time monthly average low temperature record was broken in Missouri was December 1983, when a weather observer near Hamilton recorded 13 days with subzero temperatures. The coldest day was Dec. 22, when it was minus 23. A high temperature of minus 12 was reported on Christmas Day.

Through the years, Missouri farmers have learned to adapt and be resilient when weather changes quickly, Guinan says.

Department announces new retail promotion grant funding opportunity

Up to $1,000 available to Missouri retail locations that carry Missouri Grown products

JEFFERSON CITY – Today, the Missouri Department of Agriculture's Missouri Grown program announced funding for a new opportunity: the Missouri Grown Retail Promotion Matching Grant. The grant awards up to $1,000 per retail location for reimbursement of expenses associated with promoting Missouri Grown member products at retail locations in Missouri.

This competitive grant program will provide advertising funds to Missouri retail locations that sell products from a minimum of five Missouri Grown member companies. The grant raises awareness to communities about the products grown, raised and produced by members of the Missouri Grown program. The grant also improves understanding of raising food and promotes agriculture in those communities.

Examples of qualifying expenses may include permanent signage, billboards, radio spots or print advertisement. Awardees must include the Missouri Grown logo on promotional material and be prepared to submit receipts for dispersed funds, scripts of radio advertisements and copies of artwork created.

Ineligible expenses include food, employee payroll, donations, infrastructure, equipment, clothing and reprinting of existing promotional material.

Applications are due April 2, 2021. To apply, visit the Missouri Grown Retail Promotion Matching Grant page for a full list of program requirements, timeline and printable application. Projects must be matched on at least a dollar-for-dollar basis to meet eligibility.

For more information on the Department and its programs, visit Agriculture.Mo.Gov.

Unleash soil energy

Learn to Tap Into the Power of Ramial Chips

BY JON FRANK

Soil degradation is all around us, almost everywhere we look. It is happening in the tropics, in the deserts, and even on productive land.

Numerous practices have been listed as the cause of soil degradation, including lack of carbon, destructive fertilizers such as anhydrous ammonia and potassium chloride, using soluble fertilizers that damage biology and humus, toxic pesticides, improper management, and many more.

But have you considered that a primary cause is a loss of energy? Specifically, endogenous energy. Say what? A way to look at energy is by source. Exogenous energy is energy from the outside, such as sunlight and ambient heat. Endogenous energy is energy from within the soil system.

Let's take a dive into how to provide and increase endogenous soil energy in order to build soil. But first let's give credit to the early pioneer. Most of this article comes from the work and research of professor Gilles Lemieux and his associates,who documented the value of chipped hardwood branches, i.e. ramial chips.

I have confirmed many amazing benefits when using chipped hardwood branches including softer soil, higher Brix, less need for nutrient drenches, and better plant growth. Let's dig into the amazing value these ramial chips provide and the science behind their effectiveness at building soil.

As a definition, ramial chips are finely chipped and shredded twigs and branches less than 3 inches in diameter derived from deciduous trees and shrubs.

Some of the best soils are created on the floor of hardwood forests that do not have excessive precipitation. Eastern and tropical soils, because of their high rainfall, have a leaching problem. This creates a calcium deficiency in the upper soil layers, that hinders microbial life, resulting in a suboptimum soil.

But when precipitation is somewhere around 30 inches per year deciduous hardwood forests create topsoil with beautiful texture and structure. Soils beneath conifers are notoriously poor and deficient. Throughout history we find this same pattern. Land originally taken from hardwood forests has been the placenta that raised up the great civilization of the past. While land taken from conifer forests has proven so unproductive that civilizations do not thrive and the land reverts back to... that's right... conifers. Why such a big difference?

Do an experiment sometime: Take a walk through a hardwood forest and count all the plant species you encounter. Now do the same through a thick conifer forest. What is the difference? You literally couldn't count all the species in a hardwood forest while species under a blanket of conifer needles are few and far between. Why do hardwoods promote biodiversity while conifers vigorously

suppress it? And what does that have to do with building soil? Keep reading.

See **Soil**, Page 13B

Soil • *from page 12B*

Let's go back to the hardwood forest. What do we see? Understory shrubs and taller trees. On the floor is a layer of leaves from last fall along with twigs and fallen branches everywhere. As these decompose brand new soil is formed.

A deer comes along. Does it eat only the leaves or does it also eat some of the green twigs? It eats leaves and twigs. Goats will do the same thing. Why? Because twigs and leaves are the growing point of trees and shrubs. They are biochemically active and contain a whole host of phytonutrients including protein, minerals, phenols, essential oils, terpenes and amino acids. They also contain simple sugars, carbohydrates, cellulose, hemicellulose and lignin.

Lignin is what confers strength to cell walls. It starts out as monolignols, which are then chained together to make lignin. Monomer lignin can bind to identical lignin chains to make polymer lignins. When only a few monomers are joined together it is referred to as oligomer lignins. When many monomer lignins are joined together it becomes highly polymerized. Think of lignin in three cases:

Monomer: The stiffness of a fresh blade of grass

Oligomer: The stiffness of a slender green twig

Polymer: The stiffness of a 2 x 4 board

Deer and goats eat tender twigs because they are digestible to the microbial system in their rumen. Why? Because lignin is only slightly polymerized. The energy supporting the rumen bacteria is undoubtedly coming from the cellulose and other sugars but access to that energy is determined by the degree of polymerization. In order words, just because there is energy in wood doesn't mean we feed our goats sawdust from a lumber mill. The energy is there, but the lignin locks the door.

But what if we took these twigs and branches and processed them into ramial chips and worked it into the soil? Certain fungal organisms will begin breaking down the cross-linked lignin through their internal system of enzymatic reactions. This process is called depolymerization. As the wood chips are depolymerized it frees up the cellulose and other carbons that were bound by the lignin.

The sugars, carbohydrates, cellulose and hemicellulose freed up from the lignin matrix now feeds the microbial system in the soil. Not all at once, but rather a slow unwinding of stored energy. As one life form feeds on another it transfers energy, minerals, moisture, etc. This eventually reaches the plant resulting in the benefits I listed at the beginning of this article.

Depolymerization of oligomer lignin from hardwood twigs and small branches is the starting point that leads to a steady supply of endogenous soil energy. This process happens automatically in hardwood forest soils but in commercial fields this energy source has been exhausted a long time ago. Without an endogenous source of energy, we must rely on exogenous inputs such as nitrogen, soluble nutrients, and hopefully some added carbohydrates.

Ramial chips are the perfect food supply to the microbial system in soils. It is very much like an all-you-can-eat buffet for soil life. Most soils don't have this energy source and consequently do not support a healthy microbial community. Instead they must rely on plant root exudate and sloughed off root hairs for the needed carbohydrates, and that is typically a boom/bust affair.

A great benefit of using an endogenous source of energy from depolymerized lignin is that nitrogen transfers through the trophic chain to the plant as amino acids/proteins. When soil biology is given a source of energy, they always find a way to get the nitrogen they need to live and reproduce.

Earlier I mentioned the conifer branches should be avoided when making ramial chips. The reason is because pines and conifers create a monolignol that is very suppressive of other life forms except for the conifers themselves. In my opinion, conifers are best used to make lumber and biochar.

So how do we establish an endogenous energy source within soil? Copy what nature does in the forest with fallen twigs and branches. Use about 1/4 to 1/2 inch of ramial chips for a 1-3 year energy supply.

Jon Frank is the founder of growyourownnutrition.com and can be reached for consultation at growyourownnutrition@gmail.com.

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Legumes improve pastures, grazing and profits

Right mix reduces cattle bloat, toxicosis.

BY PATRICK DAVIS

STOCKTON, Mo.- Add legumes to grazing pastures to improve cattle performance and forage production, says University of Missouri Extension regional livestock specialist Patrick Davis.

Frost-seed clovers and lespedeza now, Davis says. They grow well with cool-season grasses in Missouri and improve spring and summer pastures.

"Proper establishment is important to incorporation and persistence of these legumes," he says. He urges producers to work with their local MU Extension agronomist when seeding legumes. The MU Extension publication "Seeding Rates, Dates and Depths for Common Missouri Forages" is available at extension.missouri.edu/g4652.

Clovers and lespedeza can be seeded by drill or broadcast. Davis prefers drilling because it improves seed-to-soil contact for better establishment.

"If you broadcast seed, use cattle hoof action as well as the freezing and thawing process to work the seed into the soil," Davis says.

"Legumes improve year-round cattle grazing opportunities when added to cool-season grass pastures," he says. Clovers enhance grazing in the spring while lespedeza improves grazing during late spring and summer.

Proper grazing management of legumes improves persistence and cattle performance. Davis recommends rotational grazing to prevent overgrazing.

Graze pastures to 4-inch stubble height and then rest pastures three to four weeks to maintain mixtures of white clover, fescue and orchardgrass.

"The best time to graze red clover is when about half the plants are blooming," Davis says. "At this point, the forage will yield a feeding value similar to alfalfa."

Cattle bloat can result from grazing high-protein, highly digestible legumes. To reduce bloat, incorporate white clover in a mixed grass stand or slowly adapt cattle to very thick stands of clover. Another way to reduce cattle bloat is to provide supplemental poloxalene or bloat blocks to cattle, he says.

Lespedeza is a non-bloating legume that improves grazing in summer months, Davis says. Lespedeza is a drought-tolerant, warm-season legume that provides summer grazing in cool-season mixed pastures.

Do not overfertilize pastures with lespedeza. Most fertilizer applications of more than 30 pounds of nitrogen per acre will reduce stands of lespedeza. Lespedeza is an annual but will come back each year if it reseeds.

Clovers and lespedeza also help to reduce fescue toxicosis in cattle by diluting fescue pastures, Davis says. Adding legumes results in better-quality forages, improved cattle production and higher profits.

To learn more about fescue toxicosis in cattle, see the MU Extension publication "Tall Fescue Toxicosis" at extension.missouri.edu/g4669.

For more information, contact your local MU Extension agronomy or livestock specialist. Find more resources on improving grasslands from the NRCS + MU Grasslands Project at extension.missouri.edu/programs/nrcs-mu-grasslands-project.

Fescue renovation school scheduled for March 23

BY LINDA GEIST
MU Extension

MOUNT VERNON – Forage producers can learn to improve pastures, beef herds and profits at upcoming schools hosted by University of Missouri Extension.

MU Extension specialists will join other experts from across the country to tell how to renovate Kentucky 31 toxic tall fescue pastures at an in-person school in Mount Vernon. The one-day school is 8:45 a.m.-4:30 p.m. Tuesday, March 23, at the MU Southwest Research Center at Mount Vernon.

MU Extension state forage specialist Craig Roberts bills the Mount Vernon workshop as a "must attend" for Missouri beef and forage producers who are serious about ending losses in cows and calves.

"Beef and forage producers will learn how to renovate pastures for healthier and more profitable herds," says Roberts. "Renovation pays."

Participants will leave with an understanding of why they should renovate K-31 pastures and the knowledge to do it, he says.

The event is sponsored by the Alliance for Grassland Renewal, whose partners include universities, government, industries and nonprofit groups.

Sessions focus on toxic fescue, management of novel tall fescue, establishment techniques and a panel discussion on the economics of converting toxic tall fescue fields to nontoxic tall fescue. In addition to classroom training, there will be sessions on drill calibration and tours of Southwest Center's research plots.

Speakers include leading forage and beef experts from MU, Virginia Tech, Noble Research Institute, North Carolina State University, Clemson University, USDA Natural Resources Conservation Service and private industry.

Participants will receive lunch and a notebook with information from presentations. Space is limited due to social distancing measures.

For those who cannot attend,there also will be an in-person workshop March 25 in Lexington, Kentucky.

Register for the workshop in at TallFescueMO2021.eventbrite.com by March 21.

Understanding inputs

BY JON FRANK

Imagine you started a business as a licensed fitness guru specializing in Olympic training. You spent four years getting a degree in human physiology. Then you earned an advanced degree studying the circadian rhythms of hormones, exertion, rest and recovery. Finally, you spent several years working with a firm specializing in nutrition and the biomechanics of movement to increase athletic performance, and you saw great success before moving on to start your own company.

In your first month in business you get a call from a young man looking to train for the Olympics next year. You assure him that you have the skills needed to hone him into an Olympic athlete and ask him to stop by your gym later in the day. He does, but to your shock and horror he is a 500-pound guy who can barely walk. "I'm ready to start training!" he sounds off with joy. After a moment of awkward silence, you finally mumble "That's great – but first we have some remedial work to tackle."

I paint this picture because this is exactly what I see with some soils. Soils generally fall into two basic patterns. The first consists of those that have had way too many inputs applied and have become overloaded like our fat guy wanting to become an Olympic athlete. This usually occurs in smaller garden plots and with organic growers. The other pattern occurs when only a meager amount of inputs were applied and the soil is thus severely depleted. This is the default pattern on most large-scale farming acres and a lot of native soils – especially those in regions of high rainfall or the tropics. Both overloaded and depleted soils yield poor quality.

Agriculture is all about culturing life in order to produce outputs. These outputs become the inputs of higher life forms. Biology must have the building blocks needed to produce the outputs, especially minerals and carbon compounds. Minerals are important because they become charged up with electromagnetic energy. Carbon compounds are important because they are charged up with heat energy. Food or animal feed contain both energy sources ready to use.

Food or animal feed is in fact a carrier or conduit of energy. Let's take the example of alfalfa. When the Brix is high, say 17, you will see outstanding milk yield and animal performance without any grain needed in the diet. Why? Because it is delivering a larger amount of heat and electromagnetic energy. This is easily translated into a gain of 10 pounds of milk per cow per day. If the cows are fed low-quality alfalfa, say 6 Brix, yield will drop precipitously and the cows will lose flesh on their ribs. Now you have to feed concentrates at high rates just to maintain body condition.

The difference between these two scenarios is determined by the type and amount of inputs applied over time on the alfalfa field. If you want quality, you have to meet nature's requirements to get it.

As stewards of the soil, it is our job to provide the right amount of inputs in order to optimize the delivery of energy to the consumers. When done correctly, this leads to profits for the farmer and health for consumers.

Agribusinesses selling toxins, poisons and GMOs don't like this model because they want to sell rescue chemistry – not nutrition. It is more profitable to sell these expensive products. Why? Because they have a captive audience. Farmers don't want to lose their crop. Conventional agronomy promotes poor and unbalanced nutrition in order to later sell highly profitable crop rescue "solutions." Of course, this type of crop does not deliver good nutrition to people or animals.

Instead of spending money on crop rescue products, farmers actually need to double their budget for nutritional inputs. But how much inputs should be applied? This is a very important question.

There are several approaches, most of which are promoted by various authors in the pages of AcresUSA Magazine. Just remember that a single acre will yield thousands of pounds of outputs, which equates to hundreds of pounds of actual minerals removed from the land.

One approach is to use no inputs, or almost none. In my opinion, this is a recipe for failure in high-output crops. Technically, no-input can provide some yield with certain tree crops, and low-input can work for pasture when hay is not removed. But this strategy does not deliver quality to the consumers over

See **Inputs**, Page 17B

Inputs • *from page 16B*

time.

Another approach is to calculate total soil needs based off a soil test and put it on all at once. What is wrong with this? First, it can be very expensive. More importantly, the application rates are not matched to the digestive capacity of the microbial system. The nutrients in rock powders and soil amendments must first undergo microbial digestion before they become plant available.

Another method of applying inputs is by guessing or listening to popular culture. The classic example is the overuse of compost on backyard gardens. When compost is applied at commonly suggested rates year after year, the phosphorous and potassium build to sky-high levels. This extreme nutrient buildup in soil guarantees that high quality is simply unattainable. It is sad when I have to tell gardeners that it would be best to abandon garden and start over with unamended soil.

The last approach, and the one I suggest, is to apply the full amount possible based on soil testing and digestive capacity. But only apply nutrients if they are needed. This is the approach that gets us to high-Brix, nutrient-dense crops the fastest. The key is to avoid the two extremes: an overloaded soil or a depleted soil.

Jon Frank is the founder of growyourownnutrition.com and can be reached for consultation at growyourownnutrition@gmail.com.

Missouri land values continue to grow

COLUMBIA, Mo. – All classes of Missouri land values grew steadily in the past year, according to the University of Missouri Extension's annual survey of farmers, rural appraisers and agricultural lenders.

Ray Massey, MU Extension agricultural economics professor, heads the survey efforts.

No governmental or public agencies in Missouri require the reporting of land values, said Massey. Despite the limited number of responses, the survey gives the best available estimates for tracts larger than 40 acres in Missouri.

Low-interest rates and nonfarm recreational purchases pushed values upward in 2020. A couple of other factors brought new investors to the table.

Buyers of farmland near metropolitan areas said that expansion of broadband internet made these properties more attractive to investors.

COVID-19 also nudged some city dwellers to buy property in rural areas to build a house. Massey said this likely is a short-term phenomenon and should not factor into long-term land values in these areas.

Respondents gave estimates of land values as of July 2020 for three classes of cropland and pasture (good, average and poor), irrigated cropland, timberland and hunting/recreational land.

This year's respondents reported the statewide average value of good non-irrigated cropland at $5,555 per acre, $134 or 2 percent above the 2019 value.

The average statewide value for irrigated cropland came in at $6,335, up $186 from the year before.

The greatest increases in average values were in pastureland and timber/hunting/recreation land. However, values varied greatly throughout the state, Massey said. "This underscores the need to use caution when valuing any one parcel of land or using individual districts."

Most respondents indicated that 60% of farmland buyers intend to farm the land themselves and 25% plan to rent the land to others. The remaining 12% bought the land for nonfarming purposes.

USDA estimates of cropland value are $999 per acre lower than the MU Extension survey's estimate for average cropland. For pastureland, the USDA estimate is $833 less than the survey's estimate.

Missouri farmland and building values have steadily appreciated 6% per year since 1950, Massey said. USDA reported Missouri land values have been slightly under trend for the past two years.

Missouri timberland was up $251 to $2,561 per acre. Hunting/recreation land was up $125 to $2,581 per acre.

"Missouri Farm Land Values Opinion Survey" (MU Extension publication G401) is available online and as a free PDF download at extension.missouri.edu/G401.

For additional copies of the Ag Times section or to be contacted for advertising in 2022 call 573-437-2323.

SDS appearing in Missouri soybean fields

BY LINDA GEIST
MU Extension

COLUMBIA, Mo. – University of Missouri Extension agronomists reported during their weekly teleconference that sudden death syndrome (SDS) is showing up in soybean fields across the state.

MU Extension plant pathologist Kaitlyn Bissonnette says she is not surprised that the yield-robbing disease has reared its ugly head.

Fields showing symptoms now have had root infection for months, she says. SDS begins in wet springs like last year's, when the soilborne pathogen Fusarium virguliforme infects soybean roots. Rain during the reproductive growth stages allows the pathogen's toxins to move from the roots to the leaves. SDS appears in both upland and river bottom fields.

Because SDS is soilborne, it is important to monitor fields with a history of the disease. Foliar symptoms include yellow blotches between leaf veins that turn brown in the center. As the disease progresses, the leaves curl upward and may fall from the plant. Stem canker and brown stem rot cause similar foliar symptoms, so it is important to scout and properly diagnose disease to form effective management strategies.

Damage ranges from trace losses up to 80 percent, depending on variety and when symptoms first appear. Yield losses of 5 to 15 percent are most common.

While there is no rescue treatment once SDS appears, producers can take preventive measures.

Keep a record of fields where SDS occurs. Consider planting resistant varieties and using seed treatments during the next season, Bissonnette says.

Foliar symptoms of SDS are sometimes worsened in fields infested with soybean cyst nematode (SCN). If you have never tested a field for SCN or it has been several years since your last SCN test, consider soil sampling this fall after harvest, she says.

Management options include variety selection, improving drainage, avoiding continuous soybeans and managing SCN. Seed treatments labeled for SDS may provide additional early season protection.

For more information, the MU Extension publication "Soybean Diseases" (IPM1002) is available for free download at extension.missouri.edu/ipm1002.

Day of calving season	2020 spring (142 calves)
1-21	66%
22-42	28%
43-63	6%
> 63	-

Day of calving season	2019 fall (44 calves)	2020 spring (66 calves)
1-21	45%	74%
22-42	34%	24%
43-63	16%	2%
> 63	5%	-

Evaluate your calving distribution this spring

BY LINDA GEIST
MU Extension

COLUMBIA, Mo. – Record calf birthdates this calving season to track calving distribution.

"Evaluating a calving distribution takes very little time but can provide valuable insight into reproductive performance and productivity of the herd," says University of Missouri Extension veterinarian Craig Payne.

Calving distribution is often expressed as the percentage of calves born at 21-day intervals, since 21 days is the average length of the estrous cycle in cattle.

Payne tracks calving distributions as part of a three-year project to help beef producers improve whole-herd record-keeping. This is important for two reasons, he says.

First, dams of early-born calves have more time to recover before the next breeding season. They will likely be cycling at the beginning of the breeding season and have a better chance of becoming pregnant.

Second, early-born calves have longer to gain weight. This gives the owner more pounds of calf to sell and bigger profits at marketing time.

Payne says weaning weights collected from a northwestern Missouri operation in the fall of 2020 show that steer calves born in the first 21 days of the calving season averaged 47 pounds heavier at weaning than calves born during days 22-42 (537 pounds vs. 490 pounds).

While the number of calves in this group is relatively small (47 steers born in the first 21 days and 12 born during days 22-42), Payne says other studies report similar weight differences.

Begin tracking calving distribution by establishing the date of the initial counting period. One option is to start the first period 283 days from bull turn-in or AI. If this information is not available, begin the first 21-day period when the third calf is born. Both methods work, says Payne, but use the same method to be consistent.

Once you have the start date, count the number of calves born in the first 21 days of the calving season and divide that number by the total number of calves born, says Payne.

Repeat the process for days 22-42, days 43– 63 and after day 63. Count all full-term calves born, dead or alive. Also include calves born before the beginning of the first 21-day period.

Finally, evaluate the calving distribution of first-calf heifers (2-year-old cows) separately from the mature herd. Their breeding season is often earlier or managed differently.

Once you know your herd's distribution, compare it to the industry standard. Benchmarks for the first, second and third 21-day periods are 65%, 23% and 7%, respectively. The remaining 5% of calves are born later than 63 days.

The following is the calving distribution of 142 calves from a 2020 spring calving herd in northwestern Missouri (also see table 1 at left):

Day of calving season and percentage: days 1-21, 66%; days 22-42, 28%; days 43-63, 6%; >63, none. Based on the calving distribution, this herd performed better than the industry standard.

To achieve the targets, all cows must cycle at the beginning of the breeding season and bulls must be fertile.

"If your distribution is unfavorable, meaning a higher percentage of calves are born later in the calving season, it could indicate one or more problems and will require more investigation," says Payne.

Factors to consider are nutrition, bull power or fertility, disease or conditions that cause early embryonic loss or infertility, or a mismatch between herd genetics and environment. Also, look at the calving distribution by age category, pasture and other groupings to see if a specific group is

See **Calving**, Page 21B

Prairie soil health

Understanding the microbial diversity and functional capabilities of soil in prairie ecosystems can be used to guide and monitor prairie reconstruction efforts and assess the health of agricultural land.

BY ROBERT J. KREMER

Native prairies are natural ecosystems on landscapes dominated by perennial grasses and broad-leaved herbaceous plants (forbs). Nelson (2005) reveals the tremendous native plant diversity of a prairie by describing a high-quality upland tract in Missouri as typically supporting at least 200 native vascular plant species.

Of the total living biomass constituting the prairie ecosystem, nearly two-thirds is located beneath the soil surface, occupied by the extensive root systems of the plant community (see Figure 1). These root systems support the most diverse soil microbial communities found in any terrestrial ecosystem on earth, largely due to continuous inputs of organic substances. These substances originate from fixation of carbon dioxide by photosynthesis and are released through roots into soil, a process known as rhizodeposition. Rhizodeposition supports metabolic and functional activities of the various soil microorganisms.

Understanding the microbial diversity and functional capabilities of soil in prairie ecosystems can be used to guide and monitor prairie reconstruction efforts. Further, such information is important for developing land management practices effective in restoring key ecosystem functions of sustainable nutrient cycling, which reduces the need for synthetic chemical inputs, improves soil structure, and increases soil carbon sequestration, all of which are strongly controlled by soil microbial communities.

Also, characterizing the soil microbial community structure of prairies, which represent a pre-agricultural system, could be used to quantify the extent of degradation incurred on prairie soils during and after conversion to cultivated agro-ecosystems. A means of accumulating information on soil functioning within prairie and other terrestrial ecosystems is the use of soil quality or soil health assessment.

The concept of soil quality was introduced in the late 1970s as a means to improve land use based on the functional capacity of soil to meet defined human needs; thus, soil quality assessment focused primarily on management of agricultural ecosystems with an emphasis on agronomic productivity goals. Soil quality assessment evolved over time to soil health, which considered the soil as a vital and dynamic living system for sustaining biological productivity, maintaining the quality of air and water, and promoting plant, animal, and human health.

The soil health concept may be applied inclusively to all terrestrial ecosystems including prairies and grasslands to illustrate how soils in natural settings function under conditions when all processes—chemical, physical, and biological—are in balance

See **Prairie Soil**, Page 21B

THE EXPANSIVE ROOT system of prairie grass growing on Mexico silt loam in mid-Missouri extending past 60-cm (24 inches) depth into the profile.

When price is right, wheat middlings are good cattle feed

BY LINDA GEIST
MU Extension

COLUMBIA, Mo. – At the right price, wheat middlings are a good source of protein, fiber and phosphorus for livestock, says University of Missouri Extension livestock specialist Kendra Graham.

Wheat middlings, or midds, are lightweight feeds used in mixes. The middlings are a byproduct of the wheat milling industry that is not flour. Flaky and loose, they are inconvenient to store and transport. They are best suited to being made into pellets, which are denser and less prone to spoilage, bridging and absorbing moisture.

Rich in protein, wheat middlings also offer high levels of energy. Cattle find midds easy to digest, and weaning calves do well with them. They are high in fiber, low in starch and they produce little bloat or acidosis when fed in the right amount. On the other hand, wheat middlings are low in calcium.

Wheat midds serve as a good high-protein, high-fiber calf creep and beef cow supplement during drought. Price depends on seasonal demand and may be lower in April, May and June, Graham says.

Northwestern Missouri producers may find it to be an inexpensive feed due to lower transportation costs from Kansas, the nation's largest producer of wheat. Barges also deliver them at St. Louis docks on the Mississippi River.

Prairie Soil • *from page 20B*

within a given landscape. Often, when agricultural sites are assessed for soil health, an adjacent natural area, if available, is also assessed to provide a proper baseline or reference point to document effects of management practices on the function of soils over time.

Organic Matter Content of Soil (SOM)

One of the most important indicators of soil health is the organic matter content of soil (SOM), generally measured as the concentration of soil organic carbon (SOC), which comprises about 50 percent of the SOM. Increases in SOM, particularly in biologically-available forms of SOM, are intimately linked to the activity and composition (diversity) of the soil microbial community, effective cycling and retention of nutrients, improved aggregation, and increased water-holding capacity.

Under the continuous vegetative growth in a prairie ecosystem, the balanced interactions of a diverse microbial community in SOM mediate two ecological processes: mineralization of carbon (C), nitrogen (N), phosphorus (P), and sulfur (S) in SOM for uptake by plants essential for growth and vigor; and sequestration of C and N in SOM pools for long-term maintenance of soil health, including structure and fertility.

Unlike agro-ecosystems that are often subject to tillage and other imposed management practices, natural ecosystems are relatively free of extensive human disturbance, thereby allowing formation of and processes mediated by SOM to function properly. However, the historical contribution to overall soil health by herds of bison and other grazers as integral components of the prairie ecosystem must be acknowledged. Herding behavior is believed to significantly impact SOM formation and accumulation due to stimulated release of C from roots of growing plants due to grazing, trampling of vegetative residues causing intimate contact with soil and the microbial decomposers, and deposits of digested materials at the grazing site before moving on to new areas.

Calving • *from page 19B*

responsible for differences.

The following distributions are from two groups of cows owned and managed by the same beef producer (also see table 2 previous page):

Day of calving and percentage for the 2019 fall calving group (44 calves): 1-22, 45%; 22-42, 34%; 43-63, 16%; >63, 5%.

Day of calving and percentage for the 2020 spring calving group (66 calves): 1-21, 74%; 22-42, 24%; 43-63, 2%; >63, none.

Notice the 2019 fall calving herd had an unfavorable distribution while the 2020 spring calving herd exceeded the benchmark. According to the producer, this difference can be explained by management intensity. The spring herd is intensely managed for reproductive success. The fall herd, however, is a mixture of purchased cows of unknown origin, late fall calving cows bought from another producer and cows carried over from the spring herd.

For more information on the record-keeping project, contact Payne at 573-882-8236, livestock specialist Shawn Deering at 660-726-5610, livestock specialist Jim Humphrey at 816-324-3147 or state beef nutritionist Eric Bailey at 573-884-7873.

Five steps to pass the farm to the next generation

BY LINDA GEIST
MU Extension

COLUMBIA — Farm succession planning should not begin when the head of the family dies, says Wesley Tucker, University of Missouri Extension agricultural economist and succession planning coordinator.

Too often, planning starts the day after the funeral, Tucker says. In addition to straining family relationships, this also increases the likelihood that the next generation will fail.

U.S. Small Business Administration data shows that transitions of existing businesses to family members succeed only 30 percent of the time, compared to 70 percent for transitions to people outside the family. Third-generation success rates are even more dismal — about 15 percent.

USDA data shows that two-thirds of U.S. farmland is owned or leased by someone over 55. Control of a third of that land will change hands in the next 10 to 15 years.

Since 1974, younger people have owned less and less farmland and fewer small businesses, the fabric that holds rural communities together. This emphasizes the need for succession planning, Tucker says.

Successful transfer of farm ownership and management begins with open communication and good documentation, Tucker says. Tell both on- and off-farm family members how the farm will pass to the next generation.

"The biggest mistake in succession planning is keeping secrets," he says. "Family members can accept difficult decisions when clear and open communication exists and they understand the 'why' behind the decisions."

Sometimes the older generation holds onto ownership and management of the farm until their deaths or when the next generation is also aged. This too reduces the chance of future success. Family members who work on the farm may do so for decades with no clear plan for transfer.

One common pitfall of generational farming is that compensation ties loosely to contributions made by younger family members. With ambiguous verbal promises such as, "You'll be taken care of when we're gone," younger family members may step into roles without clear assurances of future pay or inheritance.

In partnership with the Missouri Small Business Development Centers, one-on-one, personalized assistance is available to help owners make confident decisions to plan and prepare for their farm succession.

Assistance from MU Extension

MU uses these core guidelines when providing assistance with succession planning:

1. Encourage the successor to gain experience and education off-farm. Expose that person to other farms or businesses and memberships in professional groups.

2. Have a trial work period. At the end, do an honest evaluation of all parties. Keep family and business relationships separate. "Being flesh and blood does not guarantee success," Tucker says.

3. Begin the path to management and ownership early. Those who come back to the farm should not sign up for a life of servitude without clear expectations of future rewards.

4. Involve the younger generation in financial decision-making. Finances are usually the last part of the business transferred and often does not happen until the day after the funeral, when the checkbook is seen for the first time, Tucker says.

5. Plan for the next generation to become the majority owner and manager. Let the senior family member pass the reins to the next generation and bring in the next generation.

Finally, if you are the owner, pat yourself on the back for preparing to pass on the farm and its legacy in a timely fashion to ensure its continued success, Tucker says.

Ready to make a plan?

Succession planning assistance is available from MU Extension. To schedule a free consultation, contact Tucker at tuckerw@missouri.edu or 417-326-4916.

For additional copies of the Ag Times section or to be contacted for advertising in 2022 call 573-437-2323.

Crops face danger of BMSB damage

BY LINDA GEIST
MU Extension

COLUMBIA, Mo. – A flurry of calls and emails from homeowners about the brown marmorated stink bug to University of Missouri Extension specialists sounds a warning of what is to come in in the next two years.

MU Extension field crop entomologist Kevin Rice says BMSB is infiltrating homes, looking for warm quarters in winter. If it follows the pattern of other states, it will become a major pest in field, fruit and vegetable crops, reducing yields and causing economic losses.

"BMSB adults typically overwinter in deciduous woods but are also attracted to human-made shelters such as homes and sheds," Rice says. "They have a strong dispersal from crop systems towards overwintering sites after the fall equinox."

This invasive insect species established populations in Missouri several years ago and is now present throughout the state, he says. As the name indicates, it is brown and stinks. It can be distinguished from native stink bugs by white bands on their antennae.

In soybean, BMSB scars seeds and flattens pods. In large numbers, it delays senescence in soybean, resulting in "stay green syndrome," causing additional losses at harvest. In corn, it reduces kernel quality and increases disease susceptibility.

BMSB is an "edge species," with higher populations along field borders. Rice says those with questions about chemical control in field, fruit and vegetable crops should contact their county MU Extension center.

For homeowners, Rice recommends a video from Vir- ginia Tech researchers on managing BMSB without toxic chemicals. The brief video shows how to make inexpensive stink bug traps from simple household items at youtu.be/DNjzdH45XT4.

A new MU Extension publication, "Brown Marmorated Stink Bug in Midwest Field Crops," is available for free download at extension.missouri.edu/g7413.

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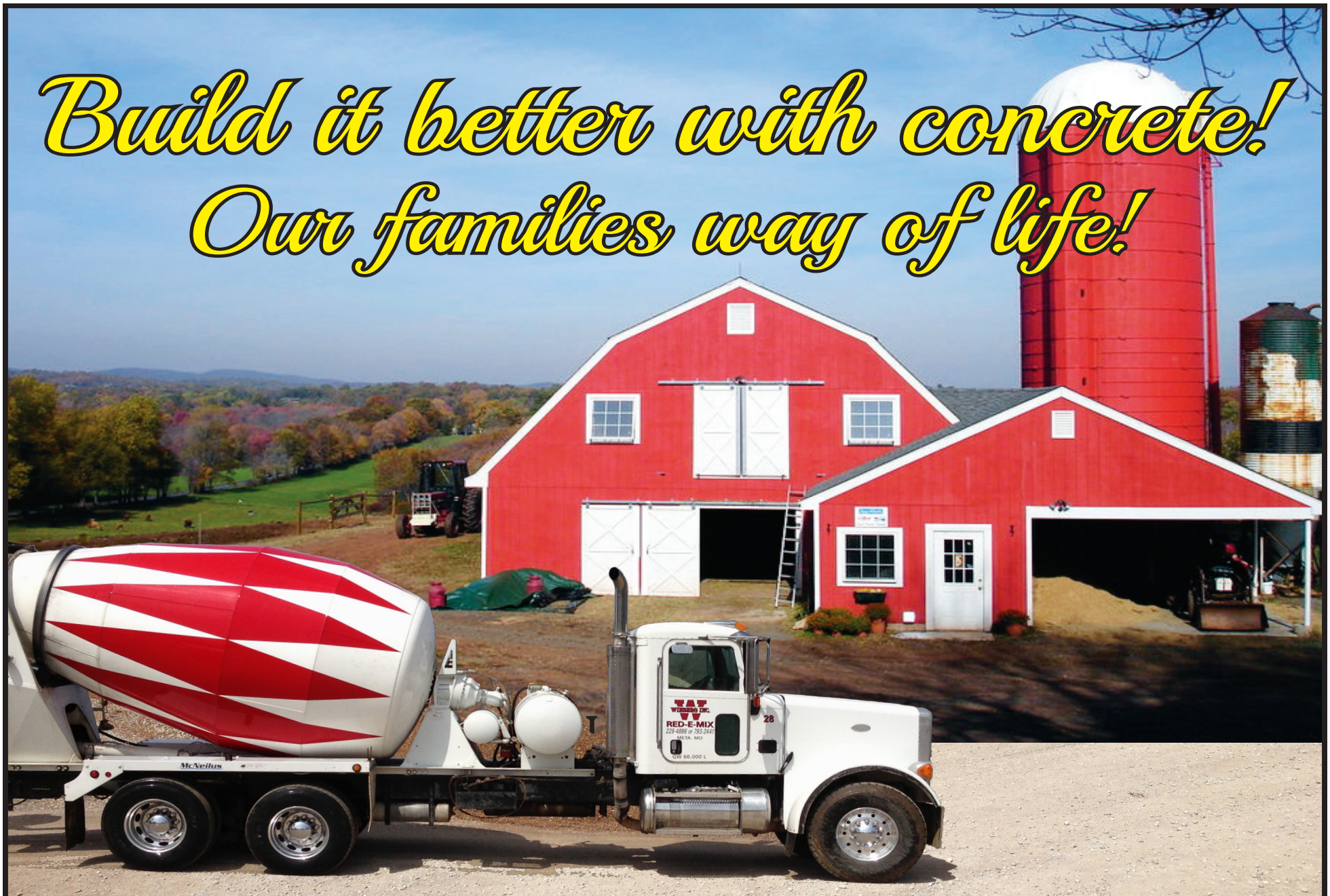

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