

# 2019 Ag Times

High-nitrate hay killing beef cows

Sea salt nutrients benefit soil

Cow water beds make for sweet dreams and more milk

Suggestions for the cattle farmer

**CORN IS** loaded into grain bins off of Route ZZ west of Drake during Jason Kopp's fall 2018 harvest.

PHOTO BY DAVE MARNER

GASCONADE  
COUNTY

Republican

MARCH 6, 2019 PAGE 1B-32B





# High-nitrate hay killing beef cows

BY DUANE DAILEY  
University Extension

COLUMBIA, Mo. – Two years of abnormal weather changed plant growth which changes livestock digestion. In the end cows die.

The words “It’s very complex” kept popping up in a University of Missouri emergency teleconference between state and regional MU Extension specialists in counties across the state.

This winter farmers find groups of cows dead, often falling on newly unrolled baled hay. In worst cases, half a herd dies. Often the first sign of trouble is 10 dead cows.

See **Hay**, Page 4B

**RAY WACKER** (driving) and his son, Michael (stacking) put up square bales of bromegrass hay in July 2018 at their farm on Highway 19 north of Owensville. “I wish I had some more of it,” the elder Wacker said last week noting the high price and availability of quality hay this winter. Wacker’s hay as not affected with high-nitrates. **PHOTO BY DAVE MARNER**

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# Suggestions for the cattle farmer

BY RALPH VOSS

If you are a typical cow/calf producer in this area, there's a good chance the past 12 to 18 months has already been a challenge.

The winter of 2017-18 lasted what seemed like an eternity. A great deal more hay was fed last winter than farmers expected. Then came the spring/summer of 2018 and hay yields were well below normal. Very few people anticipated how high hay would go.

I had a man call me in January and he had hay for sale. He explained that the hay was available because last summer he realized he would have to buy as much as \$75,000 worth of hay to get his cows through the winter and he decided the wise course of action was to sell cows and that's what he did.

That gentleman not only got forced out of the cattle business, I suspect he'll be sending Uncle Sam a mighty big check for the 2018 tax year. In spite of everything, he

really didn't have a choice.

It wasn't hay alone that was in short supply last year. Pastures did not grow well because the moisture was so spotty. By May, I knew I would be in big trouble if I didn't get rid of some animals, so we sold well over 100 head, counting adults, calves, yearlings and bulls. I didn't like it at the time, but that turned out to be one of the best things we've done in the cattle business.

The question now becomes what do we do going forward?

For us, come May or June, we plan to take a close look at our numbers. We will likely try to find a home for 10% of our herd, and even more if 2019 looks like a repeat of 2018.

But primarily we are going to try to improve on the things that have worked for us in the recent past. We like the moderate-size

See **Suggestions**, Page 5B



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## Hay • from page 2B

The MU Veterinary Medical Diagnostic Lab in Columbia diagnosed over 200 deaths from nitrate poisoning in the last month. Their toxicology section head, Dr. Tim Evans said it first: "It's very complex."

A bit later, MU Extension beef nutritionist, Eric Bailey told of first aid to help nitrate-stricken cattle. Feed shelled corn to cows normally fed hay. "It's very complex," he adds.

Unusual weather the last couple of years set up this problem. Too much rain turned to too much drought. Hot weather turned very cold. Such extremes affect the biology of plant growth. Also, lots of pastures didn't grow. That led to the hay shortages.

Fertilizer and poultry litter makes grass grow. Nitrogen enters the plant as nitrate. That adds growth and protein for hay fed to cattle. Nitrogen fuels a cow's rumen, the first stomach in digestion. In the end, nitrogen creates protein making meat. Normally more nitrogen on hay fields helps. More protein-rich hay grows healthy cattle.

Plants need enough water and heat to grow. When rains turn to drought, biology stops working. When plant juices stop flow-

ing from roots to leaves the raw nitrate stays in grass stems. When farmers bale nitrate-rich grass, the hay turns toxic.

What is normally a good practice of fertilizing grass becomes a bad practice. Who knew? As specialists said: "It's very complex." Many variables come into play.

The cow rumen needs nitrates to digest hay and make protein, which makes animals grow. Too much nitrate in hay stems overwhelms the digestive system. With too much toxic hay, toxin spill over into the blood.

This is where it gets more complex. An oversupply of nitrate ends up as nitrite, a poison. That's one molecule of nitrogen and two molecules of oxygen.

Here's a huge problem. Nitrites prevent oxygen from binding with red blood cells. Without oxygen, animals die. That's how nitrate-rich hay kills cows, quickly.

All a farmer sees of that complexity are dead cows beside hay just unrolled.

Nutritionist Eric Bailey spoke up with a fix. Adding starch to the cow's diet absorbs much of that extra nitrate in the rumen. Normally, farmers are advised to go slow adding corn to a rumen on a hay diet. At first, starch upsets rumen microbes.

In this unusual year plain corn gives an

answer. But, adding a protein-rich supplement worsens the problem. Protein adds unneeded nitrogen. At first sign of trouble take away any protein supplement.

Corn, a starch, speeds up digestion in the rumen. That moves toxic hay right on down the digestive tract.

At first sign of nitrate poisoning, which often can be death, remove bad hay.

Craig Roberts, MU forage specialist, says farmers as a first step should test suspect hay for nitrates.

"Know your hay," Roberts said. Know where it came from and whether fertilizer or poultry manure was used. Risks rise in hay made in drought. Hay detective work doesn't come easy.

Farmers face a serious problem now. After two years of drought not much hay was baled. Buying good hay becomes almost impossible. It's hard to find.

County Extension office may have quick-test kits that still work left from last-summer droughts. A few drops of the acid turn dark blue on test on split stems of high nitrate grass.

Blue indicates a quantitative test is needed.

Dr. Evans says quantitative nitrate tests

report parts per million. Under 2,500 ppm seems safe. Over 5,000 ppm means danger. At 10,000, watch out!

Regional MU agronomists and livestock specialists gear up to help farmers sort complex issues.

Added problems come, Dr. Evans says, when cold fronts descend from the Arctic. Cattle sense in advance weather changes, and then they overeat filling the rumen with forage for the frigid cold spell. Even borderline toxic hay not causing trouble becomes potentially toxic in an overloaded rumen,

Pregnant cows near calving are vulnerable. Unborn calves die of nitrate poison. They lack oxygen.

Cows in poor condition suffer most. With low hay supplies and bad weather, cows started winter in lower body condition. Thin cows with less fat reserves, are more vulnerable.

Roberts says toxin management includes watching each cows. Some may show early signs of poisoning by their weakness. That alerts to complex problems ahead.

Ask for help from veterinarians or Extension specialists early rather than later.

MU Guide on nitrate at <https://extension2.missouri.edu/g9800>

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## Suggestions • from page 3B

cow. We think a cow should weigh 1,000 pounds or less. The real strength of the moderate-size cow is her fertility. Twenty-five years ago, when the 1,500-pound cow was common in our herd, it was also common to ship 15 cows in the fall of the year because they were open.

Today we have four cows that weigh in excess of 1,300, five between 1,200 and 1,300 and 15 between 1,100 and 1,200. Everything else weighs under 1,100. The big cows are the older cows. They are first- or second-generation South Polls. A first-generation animal is almost always a product of a Barzona-Hereford female and a Senepol-Angus male – lots of heterosis and as a result lots of size. The second-generation animal still has considerable heterosis, but there is normally a reduction in size.

Three, four or five generations down the road and we usually have the 1,000-pound cow that will give us a calf every year. Part of the size of our cowherd is dependent on genetics, but we feel fescue also plays a role. If our cows were standing knee-deep in non-fescue pastures, we are convinced they would be bigger.

I got hooked on the moderate-size cow by listening to Teddy Gentry, the founder of the South Poll breed. He's been preaching this since we met him in 2003.

Another big fan of the moderate-size cow in Alan Newport. Alan is the editor of BeefProducer, which is actually a magazine within a magazine. BeefProducer is a special section dealing with beef and appears in the many magazines published by the Farm Progress group. Missouri Ruralist is one of the magazines put out by Farm Progress. Most of us get Missouri Ruralist and have ample opportunity to read what Alan thinks about a number of subjects. I urge you to google "Alan Newport moderate-size cow" and read one or more of the many articles Alan has written on the subject.

We started rotational grazing 20 years ago. We usually move our cows once or twice a day, depending on how energetic we feel. If you give a group of cows half an acre of grass four times a day, they will eat almost anything, even cockleburs and giant ragweed. Give that same herd two acres a day and they will cherry-pick the good stuff and simply not consume as much. Over time, the rotational grazing will improve pastures and increase organic matter.

Moving a group of animals daily might seem like a lot of work. If that thought keeps you from moving your cows, then divide your operation into four sections and move your herd weekly. It's easy to do and you will see the results almost immediately.

Organic matter is crucial. It releases nutrients to the plants, but possibly even more important, organic matter holds moisture. As a nation, we have farmed much of the

organic matter out of our soils. The land we've farmed the longest, states along the east coast and to the southeast have the most depleted soil. Most of our soil – row crop and grassland – has two percent organic matter or less. Under these conditions as little as only two-tenths of an inch of rainfall goes into the soil per hour. With rain at the rate of one inch an hour, 80 percent of the rain can run off. Does it come as a surprise that we have flooding?

The real payoff to rotational grazing is that you can end up feeding much less hay. Doesn't that sound like a real winner this year?

Two of the leading grass guys in the country are Greg Judy, who lives just 20 miles north of Columbia, and Jim Gerrish, who now lives in Idaho after being in charge of grazing at the University of Missouri's test farm at Linneus for 20 years.

Both men have a wealth of knowledge about grazing and both have written books that are extremely popular. If you google their names, you'll find not only their books but also information about grazing schools they offer and videos in which they explain their ideas.

It takes a major weather event before Greg has to feed hay to get his cattle through the winter. Jim has written a book entitled, "Kick the Hay Habit," in which he explains how to stockpile enough grass to greatly reduce the need to feed hay.

If the price you might have been forced to pay for hay these past two winters is not enough to convince you that you need to reduce your dependence on hay, then you should read Alan Newport's article entitled "How to Hate Hay." The article appears in this special section on Page 23B.

When you see the nutrient removal in putting up hay and compare this to grazing, you will have even more incentive to reduce hay use. Maybe this article will not provide the same incentive as \$100 - \$125 a bale hay, but it sure is an eye-opener.

There has never been a better time for the moderate-size cow, rotational grazing, stockpiling and reduced dependence on hay.

Very few people that I talk to still have grass. One local man that does have grass for his cattle is Roy Libbert of Meta. Imagine how much money Roy has saved this winter.

Jeremia Markway manages two of Lincoln University's test farms in Cole County. In that capacity he comes in contact with many farmers from throughout the area. I asked him this week for his opinion: How many cattle farmers in the county will have fed little or no hay by March 1? His response: "You can probably count them on one hand and have 3-4 fingers left for something else."

*Ralph Voss is a breeder of South Poll cattle in Osage County. He writes for various publications.*

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## Just like old times

Back in the day, according to steam tractor enthusiast Larry Keeven, farmers spending long days on threshing crews would use the front compartments of their boilers to serve as their field ovens for preparing meals. Keeven and his family own a tractor and he feeds them and friends during their weekends at antique tractor shows like the Gasconade County Threshers Association's event in Rosebud. Keeven removes a finished piece of beef from the Dutch oven before adding potatoes and carrots to complete a hearty stew during the July 2018 show in Rosebud.

PHOTOS BY DAVE MARNER



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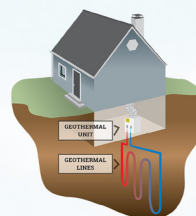
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PHOTO BY DAVE MARNER

**APRIL ADKISON** of Owensville shares her cast iron skillet and Dutch oven cooking and cleaning tips with participants in the 2019 Osage Maries Gasconade Women in Agriculture conference held at White Mule Winery. This year's event is scheduled for Thursday, Sept. 5, at White Mule. Registration details and a list of presenters will be announced when they are finalized. The program last summer was attended by 385 participants from the three counties and surrounding area.



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**KOTTWITZ GERLEMANN** Farm family members (above) accepting their Century Farm award last November from University Extension were Michelle, Josie and Jaden Gerlemann (in front, from left) and (in back) Mike Gerlemann and Wayne Kottwitz. Their farm, established by Michelle's great, great, great, great-grandfather Heinrich Doermann in 1846, is along Little Bay Road near Drake.

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Applicants certified as owners of a 2019 Missouri Century Farm will be recognized by the MU Extension center in the county where the farm is located. Applicants are presented with a sign and a certificate.

Details and a downloadable application are available at [extension.missouri.edu/centuryfarm](http://extension.missouri.edu/centuryfarm) (opens in new window). All applications must be postmarked by May 15.

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# Test in spring for SCN, soybean's silent killer



**BY LINDA GEIST**  
University Extension

COLUMBIA, Mo. – Test for soybean cyst nematode (SCN) in the spring before planting, says University of Missouri Extension plant pathologist Kaitlyn Bissonette.

Data from MU researchers shows SCN field populations are becoming more virulent on commercial soybean cultivars, Bissonette says.

SCN quickly began spreading in Missouri in the 1970s and gained a strong foothold in most of the state's soybean-growing counties by the 1990s. Easily transported by nature, cysts and eggs can be spread within a field or to new fields by soil, equipment, water or wind. Today it is the No. 1 soybean disease in the U.S. and Canada.

Yields drop by as much as 14 bushels per acre in infected fields when SCN reproduction is high, according to the SCN Coalition, a public-private partnership

See **Silent killer**, Page 11B

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**Silent killer • from page 10B**

of researchers, extension specialists and industry representatives. Populations can increase exponentially, with 100 females capable of producing 39,062 eggs after four generations in one growing season, assuming each female produces 250 eggs, only half become female and only 1 percent of eggs will survive.

SCN is difficult to detect without testing because damage occurs to the root system before it can be seen. Symptoms include stunted plants, yellowing and yield loss. Yield loss can occur even when there are no visual symptoms, Bissonnette says.

Nematodes are becoming increasingly

resistant to PI 88788, the genetic source of SCN resistance used in about 95 percent of all SCN-resistant soybean varieties.

Bissonnette suggests two ways to test for SCN: Dig a month-old soybean plant, gently shake the soil from the roots and look for white females, or collect soil samples for testing.

Collect 15-20 core samples for every 20 acres. Cores should be 6-8 inches deep and an inch in diameter. Collect in a zigzag pattern and divide each field into management zones. Include high-risk areas such as the field entry, flooded areas, low spots and historically low-yielding areas.

For each collection zone, mix the core samples together. Moisture content is important. "It's difficult to get an egg count out of concrete or sludge," Bissonnette says. Ideally, cores will stay intact during collection, but will easily fall apart upon mixing. When in doubt, err on the side of dry.

Put samples in a bag and label. If possible, mark down the GPS coordinates of the field where samples were collected. Send to a testing facility.

Know your baseline SCN egg count and test every three to five years, Bissonnette says. Comparing SCN egg counts tells you if your management plan is working

long-term.

Work with crop advisers and extension agronomists in your area to develop a management plan.

Bissonnette recommends: 1. Test fields to know SCN egg count, 2. rotate to resistant varieties, 3. rotate to non-host crops, and 4. consider using a nematode-protectant seed treatment.

For more information on SCN, visit [www.TheSCNCoalition.com](http://www.TheSCNCoalition.com) (opens in new window).

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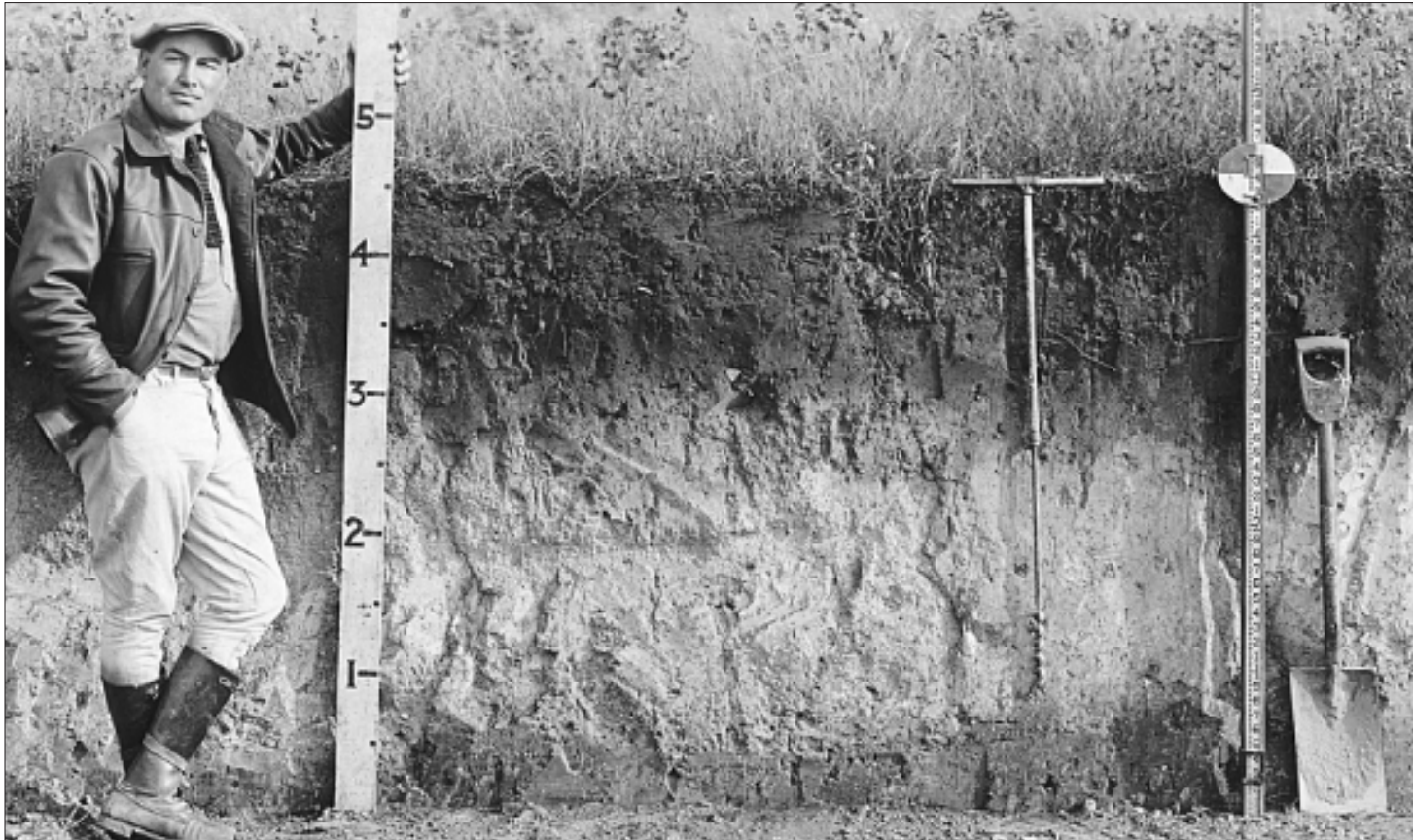
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# Sea salt nutrients benefit soil



BY RALPH VOSS

The photo at left is frequently referred to as the “Prairie Cutaway” photo showing a 4-1/2 foot slice of prairie soil with its 18 inches of magnificent topsoil that undoubtedly contained large amounts of organic matter, along with the nutrients necessary to grow fabulous crops.

A soil expert could take topsoil such as this and probably give you a good idea as to the organic matter of the soil. What that expert could not tell you is the nutrients contained in that soil. That can be determined only by a soil test.

No one knows much about the photo – not even the folks at Acres USA, who are the owners. When and where it was taken is a mystery. We do know, however, that much soil just like this is now gone...blown into the eastern U.S. during the Dust Bowl days or washed down the Missouri and Mississippi rivers to the Gulf of Mexico. Sea water around the world contains the very nutrients our soils need to be able to

See **Sea salt**, Page 13B

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**Sea salt • from page 12B**

produce in abundance the nutritious grass and grain crops that in turn will not only feed the creatures that consume them, but bring them good health.

The vast, vast majority of people are hard-wired to believe that sea salt and sea water will harm soil. This is simply not true in most parts of the country. It may be true in Utah, where 10 inches of annual rainfall has resulted in very little leaching, but the eastern half of the nation desperately needs the nutrients sea salt has to offer. Dr. Maynard Murray, the medical doctor credited with discovering the benefits of sea salt, used up to 3,000 pounds of sea salt per acre to fertil-

***I've both broadcast sea salt in dry form and sprayed it on our pastures and I'm pleased with the results.***

ize Illinois farmland and finally concluded 2,200 pounds per acre was the optimum. The farmer who grew those crops is deceased, but his son Ed, who was a young college student in the 1950s when Murray was conducting his studies, is very much alive. Ed helped plant those crops and spent hours talking to Murray, especially on Sunday afternoons when Murray would come to their farm to check on the progress of the crops. Ed vividly remembers those conversations.

Are you convinced I've consumed so much sea salt I've warped my mind? In fact I'm crazy, I've got some company, including the folks at USA Today.

Almost all of us remember the giant tsunami that struck many nations around the Pacific Ocean Dec. 26, 2004. When a wall of salt water swept ashore in Indonesia, most feared it would be years before the soil would produce crops. Instead, in the fall of 2005, when Indonesia's rice farmers — we're talking here about farmers whose lands were not put under four feet of sand, but merely had a wall of sea water come across their fields — harvested their crop, they had record yields.

Please don't take my word for this. Check it out yourself in the USA Today story from Sept. 25, 2005:

[http://www.usatoday.com/news/world/2005-09-25-tsunami-crops\\_x.htm](http://www.usatoday.com/news/world/2005-09-25-tsunami-crops_x.htm)

For a number of years, I've been a believer in the benefits of sea salt. I've both broadcast sea salt in dry form and sprayed it on our pastures and I'm pleased with the results. But I took these actions only after I read Murrays' book — Sea Energy Agriculture. It's a phenomenal book. It's only 100 pages. If you don't want to call the people at Acres and spend \$16 for the book, you can get it at the library here in Linn. I've given them several copies.

*Ralph is a breeder of South Poll cattle in Osage County. He writes for various publications.*

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PHOTOS BY DAVE MARNER

## ***Perfect weather for fall harvest in the French Bottoms***

Kyle Nolting dumps corn at bins near Mt. Sterling (right) which was harvested in October 2018 by brothers Clyde and Nolan Hesemann in the French Bottoms (above) along the Gasconade River in Osage County.



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## Farming high and dry on the prairie

The Douglass Prairie north of Owensville has long contained some of the larger tracts of relatively flat and tillable ground in the immediate area. Cody Sassmann harvests corn from a plot of land along Highway 19 during the fall 2018 season. The region is dotted with several large named prairie areas along with the numerous tracts of ground through creek and river bottoms which drain the upland watersheds leading to the Missouri, the Gasconade, and the Bourbeuse rivers which border or cut through portions of Gasconade County. Farmers of bottomlands along the larger rivers across Missouri and the Midwest are being advised that excessive snowmelt in the northern United States could lead to high water levels throughout the spring and summer along the Missouri and Mississippi rivers. Farmers along the Gasconade River can be impacted by higher levels on the Missouri when heavy rains hit locally. Water from the Missouri can cause the Gasconade to back up especially if locally heavy rainfall occurs.

PHOTO BY DAVE MARNER

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**JAMIE DECKER** off-loads wheat under threatening skies during his June 2018 harvest near Owensville. While the storm brought hail and rain to the Drake community north of Owensville that afternoon, he finished his harvest dry despite the threatening front which passed north of town.

PHOTO BY DAVE MARNER

A photograph of a construction worker from behind, wearing blue jeans and black rubber boots. The worker is using a long, yellow-handled metal screed to level a surface of wet concrete. The background is a blurred outdoor setting with a fence and greenery.

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## The genius of William Albrecht

BY RALPH VOSS

Dr. William A. Albrecht, the long-time head of the Soils Department at the University of Missouri, was truly a genius. He not only associated and communicated with Dr. Francis Pottenger of Pottenger's Cats fame and Dr. Weston A. Price, who wrote the landmark book Nutrition and Physical Degeneration, but he frequently communicated with Albert Einstein.

It is often difficult to understand the writings of brilliant people and Albrecht at times fell into this category. One subject he covered that was not hard to pick up on was soil organic matter.

Organic matter is dead and decaying plant and animal material that we need to have in our soils. Organic matter consists of roots from plants that have died, leaves, crop and pasture residue, manure and other materials that have been incorporated into the soil by microbes, earthworms, dung beetles and various farming practices.

Organic matter is nature's best way to protect the earth and the creatures living on this planet. Organic matter serves as a sponge to absorb and hold the nutrients that plants need, not only to survive, but to flourish. One relatively little-known fact is that for each 1% of soil organic matter, there is a release of from 25 to 40 pounds of nitrogen per acre. That may not mean much to a non-farmer, but for soil with 10% organic matter, that's enough nitrogen to produce a bumper crop. Many grass farmers strive to reach 4%, which is enough organic matter to grow wonderful grass.

Much of the land in the Midwest had 10% organic matter several centuries ago, but most of this organic matter is now gone and our soils to a great degree are depleted because there is no organic matter left to retain soil nutrients.

Organic matter serves not only as a sponge for soil nutrients, but for moisture. Soil with high organic matter can do a better job of handling a drought. But the moisture-holding benefits of organic matter go beyond helping the farmer. Soil that can readily absorb large amounts of moisture goes a long way toward reducing the impact of heavy rains, thereby cutting down on flood damage. The moisture absorbed by the organic matter is then released slowly over time, replenishing our creeks and aquifers. Creeks running through land with high organic matter have water in them most of the year.

In addition to organic matter, Albrecht emphasized the importance of soil that leaches its nutrients because of large amounts of rainfall. Land along the 98th degree of longitude (roughly Wichita, Kan.) receives an average of 25 inches of rainfall per year. West of this and the average declines, while to the east and especially the southeast, average rainfall increases. Less rainfall means the soil retains more of its nutrients, while more rainfall means the soil suffers more leaching of its nutrients.

Dr. Weston Price observed that the greatest soil depletion took place in those areas that had been settled the longest. When we consider the southeast part of this country has seen more than two centuries of cotton and tobacco production — both of which are hard on soils — it should be no surprise the Southeast has experienced great soil depletion.

If you accept the views of both Price and Albrecht, then the southeast has suffered the double-whammy of having been farmed for centuries and also having experienced heavier rainfall than the rest of the country.

If you believe there is a direct connection between poor soil and poor health of animals and humans, it should also come as no surprise that during World War II the Southeast led the nation in rejections for military service. In Missouri that dubious honor went to the golden triangle that runs from basically Jefferson City southeast and southwest to the Bootheel and Joplin areas.

Francis Pottenger, Weston Price and William Albrecht continue to speak to us. What they are saying is that we need to heal our poor soils. Our federal budget deficit is absolutely unsustainable. Our soil quality

deficit is equally unsustainable.

*Ralph Voss is a breeder of South Poll cattle in Osage County. He writes for various publications.*

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## The basics of raising pigs

Many people subscribe to the notion that “everything is better with bacon.” Imagine being able to control the quality and flavor of pork products, and knowing just what went into producing delicious bacon?

In an era of growing uncertainty about commercially produced food, many agriculturally inclined people are raising livestock right on their properties, and small-scale pig farms can be a successful venture.

Despite pigs’ reputation as dirty animals, the animal resource PetHelpful indicates they are actually one of the cleanest farm animals. Pigs tend to wallow in mud only if they do not have proper shade and a clean, steady water supply to regulate their body temperature. Furthermore, giving pigs plenty of space to roam will enable them to keep dry, clean and cool.

Pens should be large enough so pigs can sleep and eat on one end and use the other end for soiling. Pigs also are intelligent animals that will adapt to routine. This means it may be easier to care for pigs than some other farm animals.

Even though pigs can grow to be quite large, they do not need to live on an expan-

sive farm. Many pigs can live quite well on an acre if their pen and foraging areas are rotated periodically. Data from the past 50 years shows that today’s pig farms use less land and other resources to produce one pound of pork, according to the National Pork Board. Therefore, raising pigs can be a sustainable undertaking.

According to Mother Earth News, when selecting pig breeds for a pig farm startup, these are popular as lean-meat producers and shouldn’t be hard to find: Yorkshire, Duroc-Jersey, Berkshire, Hampshire, Poland-China, Chester White and Tamworth. Choose sows (females) or barrows (castrated males) for the best-tasting meat. Also, keep in mind that pigs are social animals, and even though the average family will do just fine with one pig’s worth of meat, pigs do better if raised in pairs or more.

Pigs need a varied diet to thrive. Diets should include grain, milk, fruits, vegetables, and greens from pasture. Experts suggest novices ask a veterinarian or another pig farmer about feeding. A family garden or bartering with other families nearby for food materials can keep feeding costs minimal.



Many pigs can be butchered by the age of six or seven months. After pigs reach that age, they begin to grow quite large and become a much larger investment of time and money.

Pig farming can be a worthwhile venture. More in-depth information on raising pigs is available at <http://porkgateway.org/resource/introduction-to-raising-pigs/>.

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# Fescue toxin cuts livestock gains, new book tells ways to fix problem

**BY DUANE DAILEY**  
University Extension

COLUMBIA, Mo. – Everything needed to manage toxic fescue comes in a new edition of an old booklet, says Craig Roberts, University of Missouri Extension specialist.

First copies of “Fescue Toxicosis and Management,” second edition, have arrived.

The 20 pages go beyond a guide sheet. It tells everything a farmer needs to manage tall fescue, Roberts says. All who enroll in multistate fescue schools in 2019 receive a free copy. It provides the agenda for the one-day schools.

Roberts, an MU forage specialist, joined with co-author John Andrae of Clemson University to re-do a publication they wrote in 2010. Much more is known now.

“In our original book, we just mention novel endophyte fescue. Now five seed companies offer different nontoxic fescue varieties,” Roberts says.

“We tell many ways to manage fescue toxicosis,” he adds. “But the best way to solve the problem is to kill old fescue then plant a novel variety.”

The widespread K-31 fescue grows an internal fungus that makes a toxin that protects the grass from droughts, pests and grazing livestock.

Researchers discovered other internal fungi, or endophytes, that protect fescue but do not poison grazing livestock.

Tall fescue fits in many farm grazing plans. Its toxicity allows it to survive largely unmanaged. The downside is severe losses, including fescue foot. Toxin restricts blood flow in animals, resulting in frozen feet. Those often cause loss of hooves and death.

The book cover photo shows three Missouri feeder calves on toxic fescue. Instead of grazing, one stands in a watering tank. The others stand in wet mud. All are cooling their heels.

The unshed winter coats, still worn in

summer, are another sign of the toxicosis impact.

Cattle standing in ponds are not grazing or gaining weight.

Many studies cited tell of novel endophyte varieties that improve gains, reproduction and milking. Most losses are not visible, nor as dramatic as hoof loss.

Replacing fescue is long and complicated. But payoffs are large and lasting.

The report tells eight management strategies for toxicosis. Those range from dilution with clover to managed grazing or diet supplements.

All suggestions are based on research. Roberts doesn’t expect farmers to read all the literature cites, but citations increased to 73 from 47 in the first book.

The booklet comes from a prime source: The American Society of Agronomy.

As he described the new data, Roberts held one of the first copies off the press. He’ll have information later on how to get them. The best way will be to attend one of the fescue grazing schools starting in March. Those will be free with enrollment.

The Fescue Belt includes states from Missouri southeast to South Carolina and Georgia.

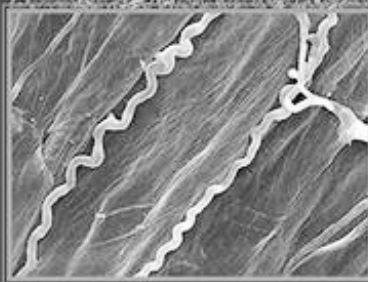
In March, the fescue schools will start in Missouri and travel on to six states across the Fescue Belt. Georgia has joined the network since last year. That was where fescue toxicosis was first described.

The organizing sponsor is the Alliance for Grassland Renewal. That brings together seed companies, testing labs, farmers, USDA agencies and universities.

All work together to tell the same story across the states, Roberts says. “The group came a long way in unifying grass management.” Livestock benefits. Farmers pocket profits.

For more, go to [grasslandrenewal.org/education.htm](http://grasslandrenewal.org/education.htm)(opens in new window).

## Fescue Toxicosis and Management, 2nd Edition



Craig Roberts  
and John Andrae

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## How to hate hay

BY ALAN NEWPORT  
The Missouri Ruralist

One of the worst practices we do, from a soil-health and productivity standpoint, is haying.

Haying generally removes significantly more nutrients from the soil than do grain crops, in addition to the damage it causes to soil life and the lack of biological stimulation.

Examples from an Oklahoma State University publication generally match the data from other states. These are pounds of nutrient per ton of hay, so you can extrapolate this to a per-acre basis using your hay yields.

Oklahoma State University	# Ca	#P	#K	#S
Bermudagrass hay, early bloom:	27.4	4.4	31.2	5.6
Alfalfa hay, mid-bloom:	27.4	4.4	31.2	5.6
Fescue hay, early bloom:	9.0	7.4	50.0	4.2
Prairie hay:	8.0	3.0	22.0	1.2
Wheat grain:	1.0	8.8	8.0	2.8
Corn grain:	0.4	6.0	8.0	2.4

Note these are only mineral content. Nitrogen is not counted in this chart, nor are trace minerals, which also are carried off in significant numbers. One could pretty easily calculate the economic values based on local fertilizer prices and cost of application.



Also for the record, Nebraska data says prairie hay has a higher cost in phosphorus, potassium and sulphur. Nebraska also says prairie hay removes about 28 pounds of nitrogen per ton of forage.

According to the Ohio Agronomy Guide each ton of cool-season grass hay removes an average of 40 pounds of nitrogen, 13 pounds of phosphate (P2 O5) and 50 pounds of potash (K2 O).

Recently, Dennis Hancock from the University of Georgia estimated the true value of nutrients carried away by bermudagrass hay at \$51-\$52 per ton. He estimated fescue hay carries off \$67-68 of nutrients per ton, orchard grass hay hauls away \$70 per ton and alfalfa takes with it \$78 per ton.

With haying you're also bypassing the biological activity provided by cattle, especially if they are in a managed, time-controlled grazing operation wherein urine and dung is well distributed across the land. It is not well researched, but the value is significant. Also, case studies repeatedly show increases in hayfield productivity from well-managed grazing.

Further, the hormonal effects of the saliva from cattle biting the

plants, compared with a machine cutting them off, can provide up to a 30% increase in productivity.

Some of this can be explained from a soil-health standpoint. If we use a list we've published before from a chart in the book, The Nature and Properties of Soils, it can help. We carried a story on this in May 2017.

### Good things from good grazing and not haying are presented in the list of 11 things that build up soils.

1. Return of plant residues
2. Low temperatures and shading
3. Controlled grazing
4. Surface mulches
5. Application of compost and manure
6. High plant productivity

### Bad things from haying and not properly grazing are listed in the list of 11 things that tear down soils.

1. Whole plant removal
2. High temperatures and exposures to sun
3. Application of only inorganic materials
4. Excessive mineral nitrogen

These lists as I've presented them include some things that apply to all hay meadows, and a few things that only apply to introduced-grass hay meadows. For example, in the "bad things" list, items 3 and 4 only apply to introduced-forage meadows.

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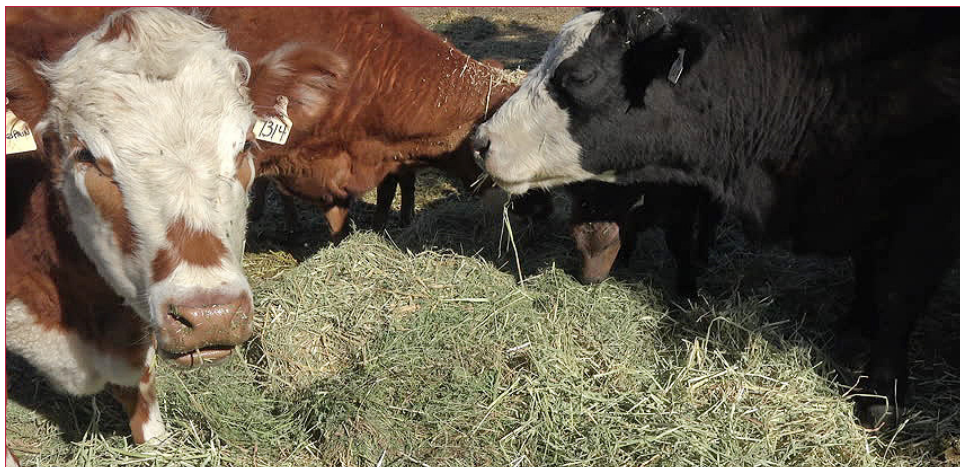
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## Grazing fall pasture growth extends high-price hay

BY DUANE DAILEY  
University Extension

COLUMBIA, Mo. – Managed grazing makes better use of forage in a year of high-price hay. After a drought with short grass and little hay, fall pastures grew fast with good rains.

Management-intensive grazing (MIG) extends fall grass supplies. Or the grass can be saved for winter grazing, says Craig Roberts, University of Missouri Extension forage specialist.

Controlled grazing cuts waste and extends grazing.

In pastures not divided into grazing paddocks, hot-wire fences can restrict cattle grazing. Lush fall grass is divided into a day's supply of feed. All it takes are step-in posts and a roll of wire.

A single-strand electric wire holds cattle on a limited strip of grass. Research shows MIG adds one-third more grazing.

Continuous grazing wastes feed. Cattle trample and defecate on ungrazed grass.

In a non-growing season, no back fence is needed on the grazed strip. Moving the hot wire forward in the pasture opens fresh feed.

Cows entering fresh grass start grazing, mowing down grass. They don't wander.

MIG systems are taught in grazing schools. New users can improvise a system in this year of short feed.

Feed can be restricted on cows not needing weight gains. Grass gives a maintenance diet, Roberts says. If cows need body condition, grains can be fed on grass.

At fall MU Extension meetings, farmers report unexpected good fall pasture growth. They ask specialists how to use a grass bonanza.

Fall growth is uneven across the state. "Calling the rains 'spotty' may be overstated," Roberts says. "We had speckled rain."

Farmers with lush toxic tall fescue pastures should delay grazing. Delays lower toxins in fescue.

In another advantage of MIG, cattle move to fresh grass before they grub paddocks into the ground. New MU research shows that the highest toxin levels are found in 2 inches at the bottom of fescue plants.

Overall, fall pastures are of high quality, Roberts says. It's better than late spring grass. No seed heads grow in the fall.

To delay grazing, use available hay and grain supplement to sustain the herd. Turn into a toxic pasture in the winter, not fall.

During hand feeding, restrict cows to small sacrifice areas. That prevents wide damage to pastures.

Roberts reminds herd owners to attend a grazing school in 2019. There will be MIG schools from MU Extension and the Natural Resources Conservation Service. Newer novel endophyte fescue schools are taught by the Alliance for Grassland Renewal. The schools teach replacing toxic fescue with a nontoxic grass.

Novel endophyte varieties replace grass causing fescue foot. This isn't endophyte-free fescue, Roberts says. Novel varieties are infected with a nontoxic fungus.

Fescue foot causes feet to freeze and hooves to fall off. That can be fatal.

Go to [www.grasslandrenewal.org/education.htm](http://www.grasslandrenewal.org/education.htm) (opens in new window) for Alliance schools.

Research on managed grazing came from the MU Forage Systems Research Center, Linneus. That is part of the College of Agriculture, Food and Natural Resources.

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## Missouri farmer profits from direct marketing, rotational grazing

Pierce City, MO -- Like other livestock farmers trying to make a living in the grasp of a severe drought, Adam Boman was on the road to Kansas City in early August to market some of his cattle. But Boman, owner of Good Life Grass Farms, was only transporting the few cows he direct markets each month. The others were still back on the Lawrence County farm where he raises grass-fed beef in a rotational-grazing system that was still providing plenty of forage for his herd.

“Even through this summer, I shouldn’t have to feed any hay,” Boman said. “There is still plenty of fescue in the fields. It is still green, but has stopped growing for sure. But thus far we are getting enough rain here and there to where the warm-season grasses are continuing to grow.”

Boman said the combination of rotational grazing and direct

See **Rotational grazing**, Page 27B

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## Rotational grazing • from page 26B

marketing is profitable and also allows him time to care for his three young children when his wife Teresa is working. Teresa is an associate professor at Missouri Southern State University.

Boman, who also raises and direct markets grass-fed lambs, said the grazing system allows him to rotate 22 cattle through 13 permanent paddocks that can be turned into 26 with temporary fencing. The system allows him to manage the grass resource so that it does not get overgrazed and it

grazing operation: creating more drought resilience, in part because accumulated grass cover from Spring keeps soil temperatures lower and helps retain soil moisture in the summer; growing more forage per acre while maintaining stock rates; and feeding much less hay.

“My stocking rate is 1.9 acres per animal unit. That is close to the typical stocking rate in my area. But the impressive part is how long we can graze without feeding hay,” Boman said. “By leaving

marketing and not owning a lot of equipment, you can make a living off of agriculture.”

More information about the Bomans and Good Life Grass Farms is available at [www.goodlifegrassfarms.com](http://www.goodlifegrassfarms.com).

## Grazing system performs well through severe drought

builds in plenty of rest periods for the grass to recover.

After the Bomans purchased the farm in 2013, they applied for assistance from the USDA’s Natural Resources Conservation Service (NRCS) to convert the land along Clear Creek from cropland to pasture. Rita Mueller, NRCS resource conservationist, said NRCS’ financial and technical assistance helped the Bomans install a well, a pump plant, pipeline, water tanks, fencing and a windbreak, in addition to establishing non-toxic, novel endophyte tall fescue.

Boman left his job as a fisheries biologist in 2015 to devote more time to farming and to installing the practices in his Environmental Quality Incentives Program contract. He said that NRCS’ assistance greatly sped up his goal of leaving his job and fulfilling his dream of being a full-time grass farmer.

“We love projects like this because they improve the health of the soil and protect the quality of the water in the creek,” Mueller said. “And on top of that it feels nice being able to help people like Adam and Teresa enjoy the lifestyles they desire.”

Boman said the grazing system has allowed him to make three important management changes: evenly grazing half of the growth and leaving the other half; increasing days of rest between grazing; and keeping the animals only eating the high-energy grass tips during fast-growing periods in early fall and early spring.

He said these practices resulted in three key improvements to the

grass behind you throughout the year, once winter hits you end up with a large amount of stockpiled grass that can be strip-grazed once grass stops growing. Last year we grazed through the dry spell in the fall all the way to January 5. Cutting down on hay usage makes the farm much more profitable.”

Boman said because last fall was dry, followed by a cold, wet spring, most of the livestock farmers in the area had to feed hay from early November until the end of April. On the other hand, he was grazing his herd again on March 7.

“We were feeding hay for two months versus six months,” he said. “That’s because healthier plants begin growing back a lot sooner. The key is to leave plenty of grass height throughout the growing season, to not brush hog or mow grass into the ground any time of the year, and to leave 4-6 inches of grass residual in the winter when you start feeding hay. Let the cows clean up the field when they start grazing in March. They will really go after that dead grass left from last year because they crave the fiber in March.”

Boman said he can’t imagine operating without his rotational-grazing system.

“People say ‘but you have to move them every day,’ but it only takes five minutes,” he said.

Boman, who grew up on a farm in the area, said he wondered when he was young if he could ever make a living at farming. He is learning that he can.

“The key is regenerative agriculture and direct marketing,” he said. “I learned that by direct

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## What World War II taught us about feeding cattle

**VAUGHN HOLDER**  
for The Progressive Cattleman

Nutrigenomics is the scientific study of the interaction of nutrition and genes or, alternatively, the effect of nutrition on the expression of genes.

One of the earliest observations of nutrigenomic changes dates back to the end of World War II, when the food embargo in the Netherlands resulted in a famine that reduced average caloric intake of its people to 400 to 800 kilocalories per day. (2,000 to 2,500 kilocalories is considered the requirement.)

Women who were pregnant during this time of nutrient restriction had children who were more likely to become obese during early adulthood, and those children were also more likely to develop late-onset diabetes. Two generations later, children of those children were more likely to be obese by the age of 50. What has this taught us? Even a relatively short-term nutritional intervention can have a long-term effect on successive generations of offspring.

Rather than the traditional concept of changing gene sequences by either breeding or artificial means, programmed nutrition is a program that stems from an evaluation of the effects of nutrition on the expression of genes without changing the gene sequences.

In this case, instead of the nutrigenomics effects being negative, as they were in World War II, the science of nutrigenomics seeks to use this information to improve the long-term health and productivity of animals.



The power to evaluate the effect of a nutritional intervention on the expression of every gene simultaneously provides a powerful tool. Feeding programs can be customized to fulfill specific goals, such as improving immune function, improving production parameters or even modifying meat quality.

**You are what your mother ate:  
Heritable changes in gene expression  
that span generations**

The programmed nutrition concept seeks to take advantage of these nutritional

fetal programming effects to bring positive changes to livestock production systems.

For example, in a 2017 study, total replacement of inorganic trace minerals with proteinated trace minerals and selenium yeast in the diet of beef cows resulted in heifer calves out of those cows having

confirmed puberty nine days earlier and confirmed pregnancy eight days earlier than their inorganic trace mineral-fed counterparts.

Even more powerful, though, was: Calves born to those heifer calves that remained on the organic mineral program had confirmed puberty 41 days earlier and were confirmed pregnant 18 days earlier than their inorganic mineral counterparts.

In addition, 160 calves from each treatment were fed out in a feed yard under common management and nutrition conditions. Animals coming from the organic mineral-supplemented cow herd had 18 pounds greater carcass weight and a 0.93 percent increase in dressing percent (63.04 percent versus 63.97 percent).

Therefore, we can see these epigenetic fetal imprinting effects can become more and more powerful over time and can be persistent even once the nutritional interventions are removed. This emphasizes the need to look at a long-term nutritional strategy with all nutrients when considering changes in the supplementation strategies of your herd.

**You are what you eat: Persistent**

See **Cattle**, Page 29B

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**Cattle • from page 28B**

**changes in gene expression within a single generation**

Much of the attention in the field of epigenetics is focused on the ability to cause heritable changes in gene expression, like fetal imprinting effects. However, there is plenty of evidence for persistent changes in gene expression within a single generation, driven by a specific nutritional intervention.

This is particularly important in the beef industry, where the segmented nature of the industry may prevent us from fully exploiting the fetal imprinting effects at the feedlot level.

There is significant pressure on the beef industry to eliminate or reduce the use of antibiotics. However, producers and industry stakeholders must balance those pressures with protecting both animal welfare and the sustainability of the beef business. So does the concept of programmed nutrition offer a solution?

Two successive trials with a major cattle feeder evaluated the ability of a nutritional program, developed through nutrigenomics, to be able to raise feedlot cattle in a traditional system without the use of a common antimicrobial agent. A standard feedlot ration was compared to the programmed nutrition ration, which contained no monensin or tylosin.

In the first study, carcass weight of the programmed cattle was higher by an average of 14 pounds ( $P=0.015$ ); however, dead and rejected cattle numbers tended to be higher, and liver abscesses were significantly higher in the programmed nutrition treatment (13.6 percent versus 26.5 percent,  $P$  less than 0.001).

In the following study, the program was refined, resulting again in superior hot carcass weight (927 pounds versus 935 pounds,  $P=0.03$ ) but with equivalent deads, removals and digestive death rates as the antibiotic-containing control ration. Liver abscesses were also very much improved in the second trial, being statistically equivalent to the control.

This is a simple example of the process by which new technologies can be brought to the marketplace rapidly through the understanding nutrigenomics information gives us.

**Rethinking the process of taking beef products to the marketplace**

It seems clear we're not going to be able to change the process of how beef products

are taken into the marketplace. The pressure from consumers to remove hormones and antibiotics from beef rations gets stronger every day.

There can be a financial incentive for producers to make some of these consumer-demanded changes. Still, we need to find ways to incorporate some of these changes without sacrificing the welfare of the animals and our industry.

Consumers may demand antibiotics to be removed from animal rations but, if an animal gets sick, you need to treat that animal with antibiotics. The same would happen if your child got sick, as you would go to the doctor and give them antibiotics to get better.

With the power to select a diet blueprint for an animal through nutrigenomics, we can feed an animal for a specific outcome, whether that is maximizing production or feeding them in a system that does not contain antibiotics.

**Is programmed nutrition the key to meeting demand in the future?**

Learning from the past is key to preparing for the future. As we learned from World War II, generations to come can be affected by maternal nutrition.

Beef will remain an important protein source, and we must continue to use the tools available – such as programmed nutrition through nutrigenomics – to increase the efficiency of resources, whether that be at the cow-calf or the feedyard stage.

## Agriculture and the economy

Many people rely on the agriculture industry for their foods, but think little of the impact that agriculture has on the larger economy. However, data indicates that agriculture can serve a significant role in the process of solidifying the economy of a country, particularly developing nations. Agriculture also can contribute to the economic prosperity of advanced countries. IPP Media points out that the economic history of many developed countries indicates that agricultural prosperity contributed heavily to their economic advancement. When the basic food supply is strong, the national economy can be strong as well. Particularly in the early days of the United States, farming held a crucial place in establishing the American economy and culture, and still shapes the country today. Many states find that farming and other agricultural pursuits contribute much to the local and national economy. For example, new research from the University of Wisconsin-Madison and University of Wisconsin-Extension show that agriculture is a powerful economic force in Wisconsin. Agricultural businesses help generate more than \$83 billion in activity and have created more than 400,000 jobs in that state. The public should not disregard how strong a factor agriculture can be in establishing a strong economic environment. Safeguarding agricultural jobs and the agricultural industry is crucial to economic stability.

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## Cow water beds make for sweet dreams and more milk

BY LINDA GEIST  
University Extension

COLUMBIA, Mo. – Water beds for cows improve comfort and milk production at the University of Missouri’s Foremost Dairy Research Center near Columbia.

**COWS AT** Foremost Dairy relax more since water beds were installed last year. The water beds offer better cow comfort, which leads to more milk production. Photo by Stacey Hamilton.

See **Water beds**, Page 31B



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## Water beds • from page 30B

MU Extension veterinarian Scott Pook and dairy specialist Stacey Hamilton are part of the Foremost team that researches how the beds improve herds. They monitor cows on cameras and record data about resting times and milk production.

Foremost began using the new beds in fall 2018. Cows adapted quickly, Hamilton says, with an estimated 75 percent of the herd using the beds by the second day.

The amount of rest a cow receives affects the quantity of milk she produces. In freestyle barn operations, dairy operators want cows to lie down 12-14 hours per day to prevent lameness and increase milk production. With the water beds, cows stay longer in stalls and lie down sooner, Pook says. Before the water beds, cows lay down an average of 8.5 minutes after entering a stall. They now lie down within five minutes.

The dual-chamber beds offer extra support for the cow's knees. Once the cow kneels, the pillows offer a cushion for pressure points with gentle support. Strong joints provide better stability and prevent leg and foot injuries, sores and infections that can

reduce mobility.

It is "all about cow comfort" and profit for the herd owner, says Hamilton. "Comfortable cows are happier and make more milk."

Foremost staff put wood chips in the stalls to cover the water beds and catch waste. If Foremost used sand, it would take 50 pounds of sand per day per 160 stalls. The water beds are an easier option, Hamilton says.

The bovine beds cost about a third more than beds previously used at Foremost. Those beds, made of interlocking chopped rubber pieces, deteriorated with time and use.

Many dairy farms still use sand, straw, wood shavings or grass to keep stalls dry and comfortable for cows. Foremost Dairy is among a growing number of dairy farms using the new technology.

Last year, the BBC reported that cows at Queen Elizabeth II's farm at Windsor Castle enjoy the luxury of water beds. Queen Elizabeth also pampers her cattle with green pastures and automatic brushes that remove dirt and relieve stress. The queen's dairy uses robotics to milk cows and clean barn floors.

Meanwhile, across the pond, Foremost



**MU EXTENSION** veterinarian Scott Pook sets up a camera to record how long cows rest on newly installed water beds at MU's Foremost Dairy. Photo by Jessi Dodge.

cows receive the royal treatment too.

Learn more about the Foremost Dairy

Research Center at [ForemostDairy.missouri.edu](http://ForemostDairy.missouri.edu).

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