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NOBLE NEWS & VIEWS

LIVESTOCK

From the Pilot's Seat: The Integrity Beef Sustainability Project

by Myriah D. Johnson, Ph.D. | mdjohnson@noble.org and Deke O. Alkire, Ph.D.

Ten years ago, sustainability seemed like a fad that would surely fade away. Now, sustainability has taken center stage, driving beef demand and many conversations today. Sustainability has never been more talked about than it was at the National Cattlemen's Beef Association annual trade show and convention this year. The opening session at Cattlemen's College was headlined by the talk "Sustainable Beef: Beyond What's Possible." During the CattleFax session, Randy Blach also spoke on the role that sustainability is now playing in beef. Beyond this one convention, sustainability is now commonplace among many conversations and is increasingly discussed.

Consumers have a desire to know that their food is produced in a sustainable manner. Moreover, shareholders in many food companies are further pressing the issue. With all of these questions about food, and specifically beef production, it is not surprising that the conversation has come all the way back to the beginning of the supply chain. In the most recent Center for Food Integrity report, only 25% of consumers surveyed strongly agreed with the statement, "I trust today's food system." So, producers have an opportunity to participate in and positively impact this conversation.

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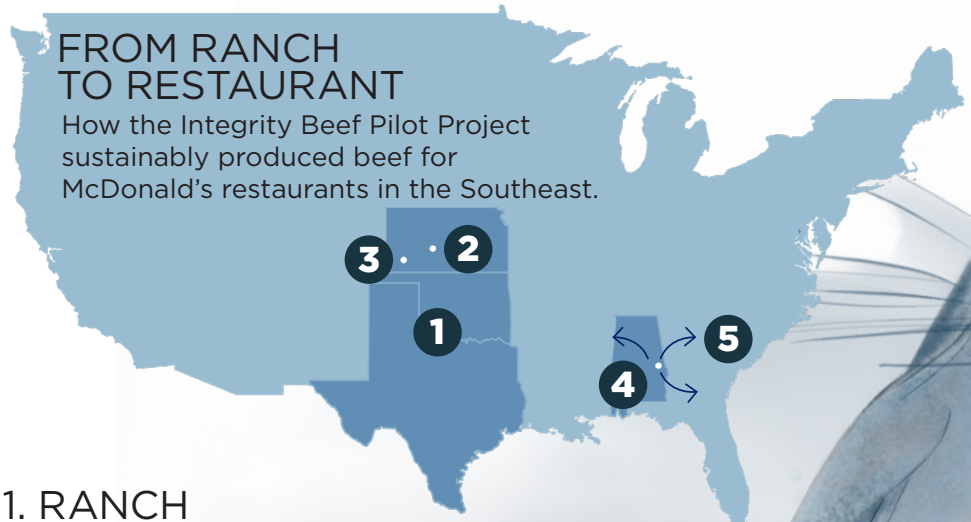
INTEGRITY BEEF PILOT PROJECT

ILLUSTRATED

FROM RANCH TO RESTAURANT

How the Integrity Beef Pilot Project sustainably produced beef for McDonald's restaurants in the Southeast.



1. RANCH

Calves were born on ranches in Oklahoma, Texas and Kansas, during February and March. They had access to fresh grass from birth and were weaned from their mothers at 6 to 8 months of age.

2. FEEDYARD

Calves were sold and went to the BMG feedyard in Great Bend, Kansas, in November and December. There, they ate a well-balanced diet formulated to help them grow and develop marbling.

3. PACKER

Calves were harvested at a Tyson plant in Garden City, Kansas, in May, June and July.

4. PROCESSOR

Hamburger meat was shipped within three to five days after harvest to Golden State Foods in Opelika, Alabama, where it was formed into patties.

5. CONSUMER

Hamburger patties were distributed by McDonald's across the Southeast U.S. in May, June and July.

DFW

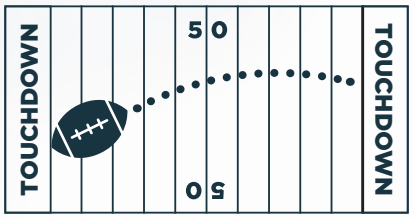
36 COW-CALF PRODUCERS

TEN BLUE WHALES

During the two-year program, 3.5 million pounds of beef were harvested, which is equal to the weight of 10 adult blue whales.

NYC

You could take 74,000 round trip flights from Dallas to New York with the $6 million in total beef that was produced during the project.



69K FOOTBALL FIELDS

The number of football fields it would take to equal the amount of acres that were involved in the pilot project.

The project produced the equivalent of 2.4 million quarter pounders.

THE SUSTAINABILITY PILOT PROJECT

In 2017, an ambitious group came together to establish the Integrity Beef Sustainability Pilot Project. Representatives from Noble Research Institute, Integrity Beef Alliance, Beef Marketing Group, Tyson Foods, Golden State Foods and McDonald's set out to test the United States Roundtable for Sustainable Beef (USRSB) metrics and align the segments of the beef supply chain. This pilot project tracked cattle from birth to burger, across two years. In total, 36 cow-calf producers provided more than 4,300 calves, which resulted in more than 3.5 million pounds of beef worth around $6 million. While this is a small project relative to the U.S. beef industry, these producers manage more than 92,000 acres and have a positive impact on their ecosystems.

SELF-ASSESSMENT TOOL

Further, these producers, and our collaborators, were the first to test a new self-assessment tool created by this project. This free, web-based tool provides an opportunity for each user to evaluate their company's sustainability in a private and practical way. It can be found at: https://nobleapps.noble.org/usrsbassessment.

A self-assessment is available for each of the production segments in the beef industry: cow-calf, feedyard operator, packers or processors, retail or food service, and auction market. Each segment's assessment asks thought-provoking questions about specific management practices relative to the USRSB metrics for each priority indicator area. This tool will allow all producers to benchmark their current sustainability and make improvements over time.

> SUPPLY CHAIN ALIGNMENT IS NOT COMMON IN THE BEEF INDUSTRY DUE TO ITS SEGMENTED NATURE AND, THEREFORE, TAKES SIGNIFICANT PLANNING AND COORDINATION.

RESULTS: BEEF INDUSTRY CONTINUES TO IMPROVE

Overall, we observed that the beef industry is doing a great job relative to sustainability. This should come as no surprise given that producers continue to do more with less. Compared to the mid-1970s, the U.S. produces the same amount of beef with one-third fewer cattle. Additionally, hundreds of thousands of producers are Beef Quality Assurance (BQA) certified, and the beef sector only contributes 3.7% of the U.S. greenhouse gas (GHG) emissions. Each of these sustainability areas continues to improve. So, it is quite difficult to point fingers and say that one steak is "sustainable" and another is not. Two steaks could have been produced under the exact same conditions, yet one does not have the sustainability verification or label.

BENEFITS OF COMMUNICATION ACROSS THE CHAIN

This project proved to be insightful for everyone involved. Supply chain alignment is not common in the beef industry due to its segmented nature and, therefore, takes significant planning and coordination. Our collaborators were committed to achieving this and took the time to make it happen. We hosted a series of meetings and tours at each production stage to provide perspective to all members about the specific challenges in each sector. Everyone

Story continues on next page

appreciated the opportunity to learn more about the other segments.

This project also provided a rare opportunity for increased communication across the supply chain. Producers shared calf vaccination and management information and the assurance that land resources were sustainably managed in return for data about how their cattle performed in the feedlot and on the rail. In addition, retailers shared what their shareholders desire and what would benefit them.

CHALLENGES TO THE PROJECT

One challenge was that the scale of this pilot was small, which created some inefficiencies, especially in respect to carcass utilization. Including additional retail partners that utilize beef cuts other than ground beef would have helped provide a more feasible model, but this would have increased the complexity of coordination. Additional retail partners were excited to purchase sustainably produced beef but did not participate because of the relatively small supply from this project. A sufficiently large scale is required to provide adequate beef products in order to maximize carcass utilization.

Another challenge is that the perceived value proposition and actual profits are different for each segment, making it difficult to optimize the system. Optimization of the system can occur if one company owns the supply chain, like in the poultry industry. However, the segmented nature of the beef industry prevents this. Each company is a separate, proprietary business that has to balance transparency and competitiveness. We believe that a sustainability-focused, value-added program is possible if a value proposition exists for all segments. Additional data sharing will be required to achieve this, likely through business-to-business relationships across the supply chain.

> PRODUCERS SHARED CALF VACCINATION AND MANAGEMENT INFORMATION AND THE ASSURANCE THAT LAND RESOURCES WERE SUSTAINABLY MANAGED IN RETURN FOR DATA ABOUT HOW THEIR CATTLE PERFORMED.

TRACEABILITY OPPORTUNITIES AHEAD

As shareholders and consumers ask for more sustainable products, there is an opportunity for every producer. We know that we are doing well as an industry, but the opportunity lies in verifying it and, in turn, building trust. Many technologies now allow animals to be tracked and traced, and more are coming online every day. Through this pilot, we had the opportunity to work with one such technology, IBM Food Trust, and inform them about the beef supply chain. Inevitably, there will be a learning curve as these technologies are deployed, but we believe they will provide great value to the industry by allowing producers to reach out and inform the consumers they feed.

FINAL THOUGHTS

Overall, the Integrity Beef Sustainability Pilot Project was an invaluable experience as the beef industry imagines what it might look like moving forward. Every piece that was utilized in this project may not move on, but there are certainly pieces that will gain adoption in the industry. We are fortunate to have participated in and helped shape the industry as it moves forward. It takes every one of us stepping up and contributing to make the beef industry what we want it to be.

PARTNERS IN THE INTEGRITY BEEF PILOT PROJECT:

NOBLE RESEARCH INSTITUTE · INTEGRITY BEEF · BMG · gsf · Tyson

SPECIALTY AG

3 New Build-Your-Own Garden Planter Construction Guides

by Steve Upson, senior soils and crops consultant | sdupson@noble.org

During my tenure with Noble Research Institute, I have had the opportunity to visit hundreds of gardens of all types: school gardens, community gardens, backyard gardens and market gardens. During these visits, I routinely come across old tractor, truck and automobile tires repurposed as garden beds.

For generations, tires of all shapes and sizes have been used by city dwellers and country folk alike to grow fruit and vegetable crops. What is it about old tires that make them attractive for gardening?

Story continues on next page

BUILD YOUR OWN RAISED BED GARDEN

Go online to download construction plans for:

Modular Tire Planter
bit.ly/modular-tire-planter

Bunk Planter
bit.ly/bulk-planter

Rubber Lumber Raised Bed
bit.ly/rubber-lumber-raised-bed

You can also watch a step-by-step video of Steve Upson building the modular tire palnter online at: www.noble.org/diy-tower-garden.

For most folks, cost is the primary consideration. Most tire shops have no problem giving away tires destined for recycling. You will need to load your own, but this is worth the work considering the tires are free.

Because tires don't rot or rust they will provide countless years of service when used as rubber lumber, a growing container or as a platform for bed construction. It is estimated that an intact tire can take several hundred years to breakdown. Because of this durability, the annual cost of maintaining a bed or container made from tires is very low.

Repurposing tires to support crop production is environmentally friendly. What can be more rewarding than transforming a waste product into a growing system that fosters environmental sustainability, enhances quality of life and generates wealth?

WHAT ABOUT SAFETY CONCERNS WITH USING RUBBER TIRES?

Questions pertaining to the potential adverse health effects caused by heavy metal leachates from tires arise from time to time. While there is no argument that tires contain traces of heavy metals and other organic contaminants, there is no direct evidence that intact tires or tire tread used as borders for raised garden beds leach these contaminants into the soil.

If tires were susceptible to leaching they would lose their ability to stay inflated over time. Leaching doesn't occur (or occurs at a miniscule level) because the ingredients are bound up in the rubber matrix during the cooking and curing process. Of course, the choice to use or not to use tires in the garden is up to the individual. If you are not comfortable with using tires, there are plenty of other materials available for constructing raised bed and container gardens.

RUBBER LUMBER RAISED BED

During the past 25 years, Noble Research Institute has researched and demonstrated new and novel ways scrap tires can be used to grow specialty crops. As with most discovery projects, some concepts proved to be viable while others did not.

Our first publication documenting the use of scrap tires to fabricate rubber lumber for use in raised bed construction was released in 1997. This construction guide has recently been revised and is now available in a new publication entitled, "The Noble Research Institute Rubber Lumber Raised Bed." The new construction guide offers better graphics and is more detailed compared to the original.

EASY ACCESS RAISED GARDEN BED

In 2015, the publication, "The Noble Research Institute Easy Access Raised Garden Bed," was released. This particular bed was designed in response to requests by gardeners for a relatively

Story continues on next page

SPECIALTY AG EVENTS MOVING TO UNIVERSITY CENTER

Join Steve Upson, senior soils and crops consultant, at the University Center of Southern Oklahoma to learn about growing specialty crops. Find the events at noble.org/events.

The University Center of Southern Oklahoma will be hosting these upcoming events:

So You Want to Grow Specialty Crops
Tuesday, May 19

So You Want to Grow Fruit
Thursday, Sept. 10

So You Want to Grow Vegetables
Thursday, Sept. 17

University Center of Southern Oklahoma
611 Veterans Blvd
Ardmore, OK 73401

low cost bed with a sufficiently high growing platform to enable gardening in the standing position. It utilizes discarded truck (tractor-trailer) tires to create an elevated base, making the bed easier to access. This construction guide is available at bit.ly/easy-access-garden.

MODULAR TIRE PLANTER AND BUNK PLANTER

In the past three years two additional planters have been developed. Similar to the Easy Access Bed these planters have a higher profile compared to most raised bed and container gardens.

The Noble Research Institute Modular Tire Planter derives its name from a stack of tires. Each tire in the stack is a module serving as either a support (base) module or a growing module. The overall height and plant rooting depth of the planter depends on the number and ratio of base to growing modules used. The planter is equipped with a frame that ensures the integrity of the structure and serves as a point of attachment for accessories, such as a mini greenhouse, shade structure and crop trellis. The modular planter is nothing special to look at but offers the gardener the best value in terms of construction cost per square foot of growing area and annual maintenance cost of any of our high profile planters.

The latest planter to be developed and what I believe to be the most attractive of all our tire planters is the Noble Research Institute Bunk Planter. The bunk planter uses two erect, standing semi-truck tires to form the planter frame. Dimensional lumber or sheet metal can be used to clad the structure. Due to its novel design, the bunk planter can be easily fitted with a greenhouse cover for extended season growing.

To my knowledge none of our planter models are available for purchase. In order to minimize assembly costs, all of them by design are intended to be DYI (Do-It-Yourself) projects. Some folks, depending on strength and skill level, may find the construction and assembly process for some of the beds challenging. In most cases an extra set of hands will improve project ease and speed. If you enjoy building things, I believe you will find these projects to be both rewarding and fulfilling.

USE AT HOME OR TO MAKE MONEY

All of our tire-based planters have application in the home or school garden while some have commercial application. It is our hope that the use of these new and novel planter designs will make gardening less challenging and more enjoyable, enable you to be a more productive and successful gardener, and improve your overall gardening experience.

SMALL GRAINS

Goals for Small Grains Breeding at Noble Research Institute

by Xuefeng Ma, Ph.D., assistant professor, small grains breeding | xma@noble.org and Joshua D. Anderson, senior research associate | jdanderson@noble.org

Small grains are an integral part of the forage-livestock system in this region as they can be grazed from late fall to spring, when perennial warm-season forage species remain dormant. In addition, the program aims to improve small grains for enhanced utility as a cool-season cover crop to facilitate agricultural cropping systems that regenerate the land. The major crops covered under the program are wheat, rye, triticale and oat.

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The Small Grains Breeding Program's primary goal is to develop small grains cultivars with increased grazing tolerance, winter hardiness, forage yield and forage quality to benefit livestock production primarily in the southern Great Plains, where livestock and forage production are the largest contributors to agricultural income.

WHEAT

Wheat is the largest and most important grain crop in the southern Great Plains. About 9 million acres of wheat are planted in Oklahoma and Texas annually. Wheat is not only grown for grain. It is also an important cool-season forage crop in the region. About 30-50% of the wheat planted in the region is grazed in a graze-only or graze-and-grain (dual-purpose) system. When growing conditions are favorable, managing wheat as a dual-purpose crop may provide an economic advantage rather than managing it as a grain-only or forage-only crop. Although forage yield of wheat is lower than rye and triticale, it is still the most popular small grain crop for winter forage production because of its economic flexibly on producing forage and/or grain depending on market profitability.

9M

About 9 million acres of wheat are planted in Oklahoma and Texas annually.

In collaboration with Oklahoma State University, the wheat breeding program at Noble Research Institute develops improved dual-purpose wheat cultivars with superior fall-winter forage production. One focus of the wheat program is to increase early seedling vigor with superior heat and drought tolerance to reduce risk of establishment failure in the fall when the crop is planted early for producing more fall-winter forage. Grazing tolerance, regrowth vigor, resistance/tolerance to multiple diseases/pest, and grain yield, among many other traits, are also primary targets to improve. Currently, the program is advancing a wheat breeding pipeline consisting of a 10-12-year-cycle of breeding materials at various stages. Three wheat lines are at the pre-release stage with a potential of being released within three years.

RYE

Cereal rye has excellent biotic stress tolerance to multiple diseases and abiotic stress tolerance to frost, drought, low pH and marginal soil fertility. It is an important forage crop for fall-winter grazing in the southern Great Plains. It always performs better than any other small grain in the light-textured soils of the Red River Valley due to its prolific root system. Rye is also the most widely grown cover crop because of its competitive ability to suppress weeds and scavenge residual soil nitrogen after other crops. Oklahoma is the largest rye-growing state in the USA, at least partially due to Noble's historical contribution in releasing a few well-known rye cultivars, such as "Elbon," which has been widely grown for more than 60 years.

In addition to increasing fall-winter forage yield, the rye breeding program also focuses on selecting resistance to seedling blight. Early planting in the fall may increase occurrence of seedling blight, which causes seedling death under high temperature and excessive moisture conditions after thunderstorms. Delayed flowering is also an important trait for not only extending the grazing season of rye but also increasing seed yield by alleviating potential cold damage on pollens in early spring as rye flowers rather early. At present, the rye breeding program advances a rye breeding pipeline with materials at various breeding stages from preliminary yield trials to elite yield trials. Four rye lines are at the pre-release stage, and one of them is to be commercialized soon.

TRITICALE

Triticale is a manmade crop from hybridizing wheat and rye for combining the best traits of the two parental species. It inherited its grain yield potential from wheat and its tolerance to various stresses from rye. Triticale has been widely grown for different purposes, from grazing to feed, in the livestock agricultural system. Triticale is an important small grain forage as it produces more forage biomass than wheat, especially in low nutrient or marginal land, and better forage quality than rye. Besides being grown for filling the forage quantity gap in winter, triticale is also widely used for producing silage to cover the forage quality gap during dry, hot summers.

Triticale has the potential of becoming more popular as an alternative forage to wheat and rye in the region although it has received the least breeding effort compared to other small grains. The small grains breeding program at Noble Research Institute aims to establish a triticale breeding pipeline with a focus on developing improved cultivars for grazing pasture. Similar to wheat, fall-winter forage yield, total forage yield, seedling vigor, grazing tolerance, delayed senescence, grain yield, pre-harvest sprouting resistance and awnless traits are of primary interest under selection.

OAT

Oat is an important forage crop and is a useful alternative to wheat grown for stocker cattle production. Oat is generally the most preferred forage by grazing animals among all small grains because of its superior palatability. The expanding stocker cattle production in the southern Great Plains has created a viable market potential for oat as a winter forage crop.

Oat grows fast and generates very competitive forage biomass yield in the autumn and spring when air temperature is optimal for the crop. However, it produces much less forage in the winter than other small grains because of its sensitivity to freezing temperatures. Therefore, improving freezing tolerance is the primary focus of the oat breeding program at Noble. The program has screened thousands of oat germplasm lines for establishing a breeding pipeline that will deliver improved winter oat cultivars for forage production.

FINAL THOUGHTS

In short, these four species fit best in different livestock production systems, and they provide complementary advantages for cool-season grazing. Breeding goals of the four species are similar, but each has its own emphasis. While the program is still establishing the breeding pipelines of triticale and oat, it has already produced improved wheat and rye elite lines that can be released periodically.

SPECIALTY AG

Improving Nitrogen Use Efficiency in Bermudagrass

by Malay C. Saha, Ph.D., Professor, Grass Genomics | mcsaha@noble.org

Warm-season perennial grasses are essential components of pasture systems in the southern U.S., where beef and forage production are the largest contributors to agricultural income. Bermudagrass is the most prevalent warm-season perennial grass species in the region. It is also a predominant turf grass.

Bermudagrass produces lush green forage and/or ground cover during summer months and remains dormant during fall-winter. However, standing or stockpiled bermudagrass can be grazed in fall and early winter. Overseeding of bermudagrass pastures with cool-season annual grasses (such as rye or ryegrass) and legumes (such as clovers) can be practiced for late winter and spring grazing.

Bermudagrass can be adapted in a variety of soil types. It has excellent grazing tolerance and can produce a high amount of good quality forage when soil nutrients are not restricted. Most traditional bermudagrass varieties are open pollinated and are usually propagated by seed. However, hybrid bermudagrass varieties were developed starting in the 1940s.

Hybrid varieties can produce more than twice as much forage compared to common bermudagrass at moderate fertility levels and are usually propagated by sprigs. Water and nitrogen (N) fertilizer are the two most limiting factors for bermudagrass forage production. It is very responsive to N fertilizer and needs a lot of N to grow, develop and produce high biomass (Figure 1). However, plants can uptake and utilize only a part of the applied N fertilizer. Improving N use efficiency (NUE) is a common target in many crop improvement programs.

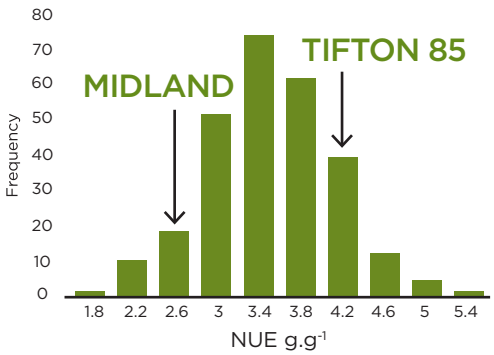
WHAT IS NUE?

NUE is defined as the fraction of applied N that is absorbed and used by the plant to produce forage, grain and other products.

WHY IMPROVE NUE?

Application of N fertilizers enable growers to maximize biomass yield. However, NUE in the major crop species is low (30-70%) and even lower in grass species (less than 40%). Globally, up to 64% (an average of 18%) of applied N was lost via ammonia volatilization, and the losses significantly increased with higher N application rates. Another part of N applied is lost by nitrate leaching, which is also a major worldwide cause of groundwater pollution. Surface runoff of N fertilizer to rivers and ocean causes the death of fish and aquatic organisms. A crop that demands large amounts of N fertilization to reach full production implies large agronomic, economic and energetic inefficiencies, as well as a large potential for excess N to be lost from crop fields and to cause environmental pollution.

Figure 1: Evaluation of nitrogen use efficiency (NUE) of bermudagrass germplasms. Twenty accessions that have NUE better than Tifton 85 were identified.



Plant NUE is generally composed of both N uptake and N utilization efficiencies. Nitrogen uptake efficiency is defined as total shoot N relative to the amount of N applied to the soil, while N utilization efficiency is defined as total crop yield relative to total shoot N content. Thus, to improve NUE, attention needs to be paid to both N uptake

Story continues on next page

and its utilization. Increased N uptake and utilization efficiency may allow growers to maximize yield under a moderate rate of N fertilization instead of the traditional high rate of applications.

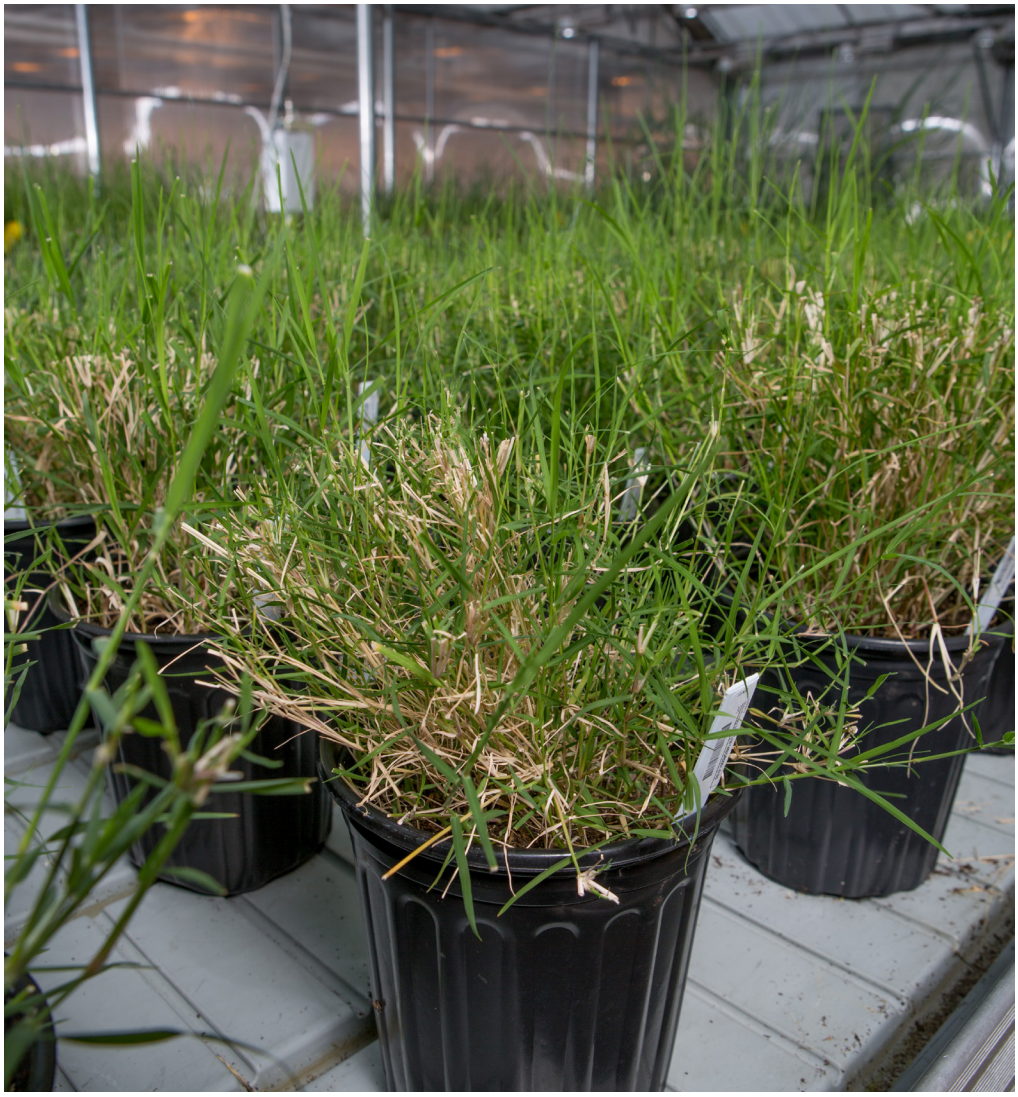
IMPROVING NUE IN BERMUDAGRASS

We have collected bermudagrass germplasms and its relatives from Germplasm Resources Information Network and other breeding programs and evaluated those in greenhouse and hoop house experiments to evaluate their NUE. The NUE of these accessions was compared with the commercial cultivars commonly cultivated in the region. The addition of N fertilizer had a distinct positive effect for all the studied traits. Average leaf length was increased by 46%, leaf width by 30% and internode length by 13%. A threefold difference in NUE (from 1.72 g.g-1 to 5.21 g.g-1) was observed among the accessions. We have identified at least 20 accessions, which have higher NUE than the best commercial cultivar, Tifton 85 (Figure 1). These accessions have been planted in the field to evaluate their NUE, biomass yield potential and other characteristics suitable for forage (Figure 2). The best accessions from this selection will be used as parents to develop synthetic and hybrid populations.

INFLUENCE OF NUE ON FORAGE YIELD AND CRUDE PROTEIN

N fertilization strongly affects biomass production with significant increments as more N was applied. The highest relative increment in biomass was obtained when the first dose of N was applied, and biomass tended to be stabilized at higher N rates. NUE had a strong positive correlation with dry biomass production. This relationship got even stronger with increased application of N fertilizer. No significant interaction between bermudagrass accessions and N rates was observed for NUE, indicating that N use efficient accessions performed similar in low and high N rates. On average, NUE drastically decreased as more N was added to the plants. Lower NUE at higher N rates implies that plants cannot absorb and/or utilize all the N added or that the N losses exceeded the rate of plant uptake.

Along with biomass yield, forage quality is an important parameter that determines the effectiveness of bermudagrass as a forage. Crude protein (CP) is an important quality characteristics of bermudagrass. It was observed that, in N limiting conditions, bermudagrass showed a trade-off between dry biomass production and CP content. Application of N fertilizer improved both forage yield and CP content. However, at the beginning, most of the applied N was utilized for biomass production. When N is abundant, the crop gives priority to improve CP over biomass production.



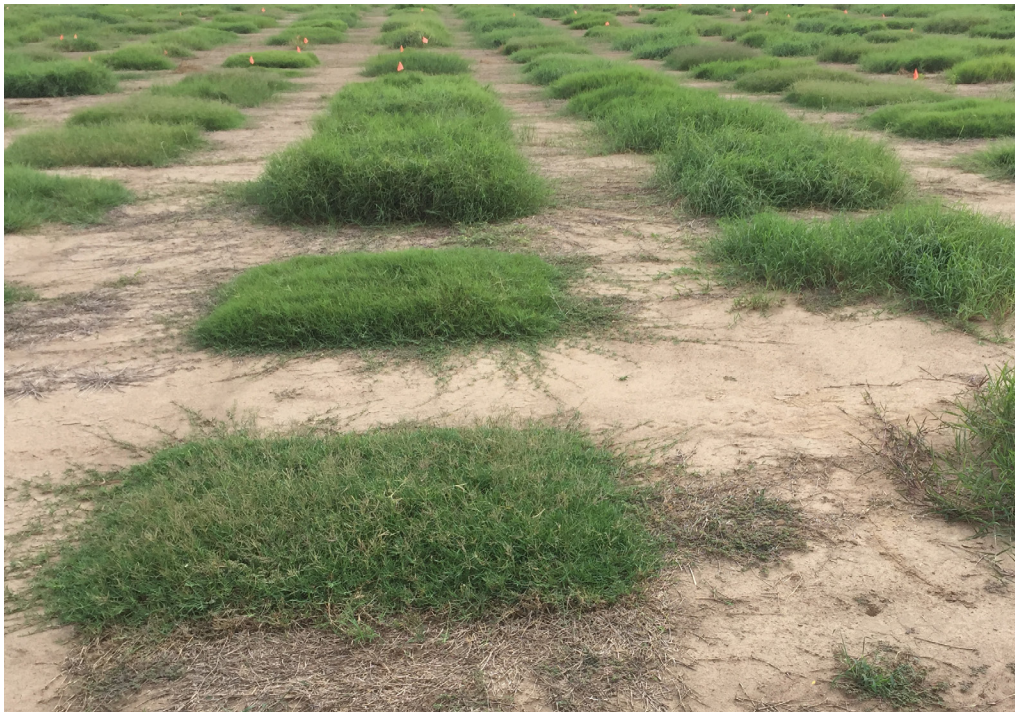


Figure 2: Field screening of bermudagrass accessions for nitrogen use efficiency. Accessions with higher NUE compared to commonly used control cultivars have been identified.

CERTIFIED SEED

Seed Certification: What Is It and What Does It Mean for You?

by Mike Trammell, senior plant breeder | matrammell@noble.org

Have you ever wondered why it is recommended to purchase certified seed? Really, what is the purpose of that blue tag that says "certified seed" sewn on the seed bag you are wanting to buy? Why is that label so important? As a farmer, rancher or frequent buyer of seed, these are all great questions to ask. So, let us get down to business and try to address these questions. After all, seeds are a basic and critical input for many agricultural enterprises to enhance their operational productivity.

WHAT IS SEED CERTIFICATION?

Seed certification is an internationally recognized system to preserve the genetic identity and purity of crop varieties.

WHAT IS THE PURPOSE OF SEED CERTIFICATION?

The purpose of seed certification is to maintain and make available to the public, high quality seed and propagating materials of adapted superior crop varieties grown and distributed to ensure varietal identity and purity. Seed certification is based on the premise that proper identification of crop varieties is essential to everyone who handles seed — from the breeder, commercial grower, seed cleaner, and seed distributor, to the farmer or rancher who purchases the seed.

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SEED CERTIFICATION IS BASED ON THE PREMISE THAT PROPER IDENTIFICATION OF CROP VARIETIES IS ESSENTIAL TO EVERYONE WHO HANDLES SEED.

WHAT IS THE IMPORTANCE OF SEED CERTIFICATION?

Certified seed is the starting point to a successful crop. In the early days of crop improvement, most varieties had easily identifiable phenotypic (visible) traits. At present, most varieties are a synthesis of many complex genotypic characteristics, many of which are not necessarily visible. It is also important to remember that certified seeds are the outcome of many years of research and development for improved traits, such as herbicide tolerance, resistance to pests or improved grazing tolerance. Thus, seed certification through field and laboratory inspections, along with continuous pedigree records, provides the most practical and reliable method of verifying genetic identity and purity for the improved varieties commercially available.

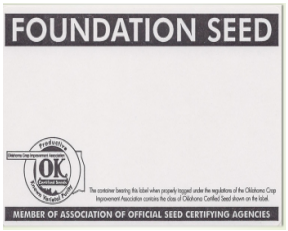
HOW IS SEED CERTIFIED?

Seed certification requires planting eligible seed stocks, field inspection of the growing crop, proper conditioning or cleaning, representative sampling, thorough laboratory analysis, and proper labeling. Certification involves the inspection of the crop in the field as well as samples of the harvested seed. If seed of a variety is produced in separate fields, each field, or "lot," is considered independently for acceptance or rejection for certification. The field and seed inspections from each unit or lot are made by employees of the certifying agency, such as your state crop commission. The requirements that must be met for certification, such as purity or germination percentage, differ for each crop and from state to state.

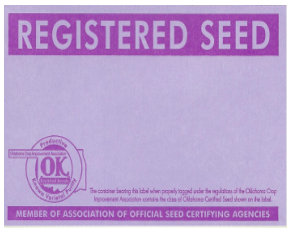
WHY BUY CERTIFIED SEED?

Good crop production begins with planting high quality seed, and seed certification procedures provide the best possible third-party assurance of good quality seed. As previously stated, standards may vary from crop to crop and from state to state, but remember, a certification tag on a bag of seed is the symbol of quality. It assures you, the purchaser, that the seed inside the bag is the variety stated and it has met the required standards for germination and purity by the inspecting agency.

FIRST GENERATION



SECOND GENERATION



THIRD GENERATION

Each class of certified seed is associated with a colored seed tag. Certified, or blue tagged, is the most common class of seed available to farmers for purchasing. Since breeders' seed is not available to the public, a tag is not shown for the class.

TWO MORE REASONS FOR PURCHASING CERTIFIED SEED

CLEAN SEED

1 Strict production standards ensure a high purity with minimal weed seeds and other contaminants.

TRACEABILITY

2 Traceability is an important consideration in today's agricultural environment. You can only be sure of your product if you know of its origins. Using certified seed will provide you with this traceability.

WHAT ARE CERTIFICATION CLASSES?

The classes of seed in the certification programs of the United States are breeder, foundation, registered and certified. Each class of certified seed is associated with a colored seed tag. Since breeders' seed is not available to the public, a tag is not shown for the class. Certified seed tags are blue, registered are purple and foundation tags are white. The certification class refers to the number of generations away from the original variety that was developed by the plant breeder. Breeder, the first class, is seed provided by the breeder of the new plant variety and is of the highest class of genetic purity and quality. Foundation is the second class and one generation removed (the progeny of the breeder seed). Registered is the progeny of foundation seed and two generations removed from the breeder class. Foundation and registered seed are also of premium quality, intended for commercial seed increases, and are not necessarily available for the public to purchase. The final class of seed is certified, and it may be the progeny of registered or foundation seed. Certified, or blue tagged, is generally the class of seed available to farmers for purchasing. For certification to be valid, buyers must be provided proof of certification.

NOBLE
NEWS&VIEWS

IN THIS ISSUE

JUNE 19

Understanding Factors Affecting Calf Prices

9 a.m.-3:30 pm
Oswalt Ranch
Registration Fee: $25

Want to sell calves directly off the ranch but not sure if you are getting a good price? Join us as we take a look at all of the details that go into a cattle bid and then try your hand at pricing sets of cattle. By the end of this workshop, you should have the information you need to decide on the best marketing strategy for your operation.

JULY 21

Understanding the Impacts of Fire on Your Property

9 a.m.-4 p.m.
Coffey Ranch
Registration Fee: $25

Fire can improve wildlife habitat, reduce woody plants, remove thatch, and improve forage quality and quantity for livestock. The most important way to safely burn is to gain experience conducting burns. If weather parameters are within prescription during the field day, we will attempt multiple burns to give you real experience conducting prescribed fire management.

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CHECK NOBLE.ORG FOR EVENT CANCELLATIONS

In response to the developing COVID-19 situation, Noble Research Institute has canceled or will reschedule all educational events through April 30.

UPCOMING EVENTS

Preregistration is requested. Registration fees for paid events will increase by $10 one week before the event. *For more information or to register, visit www.noble.org/events. For other agricultural questions, please call our Ag Helpline at 580-224-6500.*

MAY | 7

Selecting the Right Fence for You

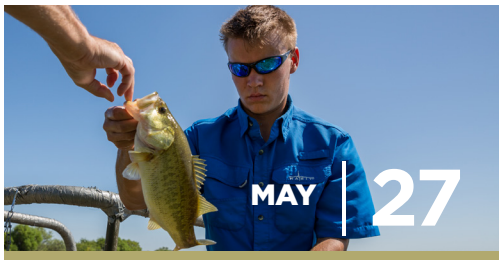
It is important to incorporate a degree of flexibility for grazing management. Join us for a day of demonstrating all of the possibilities in fencing. As a bonus, we will be installing a livestock watering system for a managed grazing system. There will also be an optional afternoon tour of Noble's Red River Grazing Facility.

Noble Research Instiute Pavilion
8:30 a.m.-3:30 p.m.
No Registration Fee

MAY | 19

So You Want to Grow Specialty Crops

6:30-8:30 p.m.
University Center of Southern Oklahoma
611 Veterans Blvd
Ardmore, OK 73401



MAY | 27

Managing Your Pond for Recreation

1-5 p.m.
Oklahoma Co-Op Extension
2500 NE 63rd Street
Oklahoma City, OK 73111

JUNE | 2

Understanding the Essentials of Grazing Management

9 a.m.-3 pm
Coffey Ranch
Registration Fee: $25

JUNE | 4

Managing Eastern Bluebirds

5-8 pm
Protected Ag Demo Area
Registration Fee: $25