Of all the components of soil, organic matter is probably the most important and most misunderstood. Organic matter serves as a reservoir of nutrients and water in the soil, aids in reducing compaction and surface crusting, and increases water infiltration into the soil. Yet, it’s often ignored and neglected. Let’s examine the contributions of soil organic matter and talk about how to maintain or increase it.

What is organic matter?
Many times we think of organic matter as the plant and animal residues we incorporate into the soil. We see a pile of leaves, manure or plant parts and think, “Wow! I’m adding a lot of organic matter to the soil.” This stuff is actually organic material, not organic matter.

What’s the difference between organic material and organic matter? Organic material is anything that was alive and is now in or on the soil. For it to become organic matter, it must be decomposed into humus. Humus is organic material that has been converted by microorganisms to a resistant state of decomposition. Organic material is unstable in the soil, changing form and mass readily as it decomposes. As much as 90 percent disappears quickly because of decomposition.

Organic matter is stable in the soil. It has been decomposed until it is resistant to further decomposition. Usually, only about 5 percent of it mineralizes yearly. That rate increases if temperature, oxygen and moisture conditions become favorable for decomposition. This often occurs with excessive tillage. Stable organic matter is analyzed in a soil test.

How much organic matter is in the soil?
An acre of soil measured to a depth of 6.67 inches weighs approximately 2 million pounds, which means that 1 percent organic matter in soil weighs about 20,000 pounds. Remember, it takes at least 10 pounds of organic material to decompose to 1 pound of organic matter, so it takes at least 200,000 pounds (100 tons) of organic material applied or returned to the soil to add 1 percent stable organic matter under favorable conditions.

In soils formed under prairie vegetation, organic matter levels are generally comparatively high because organic material was supplied from both the top growth and roots. We don’t usually think of roots as supplying organic material, but a study in the Upper Great Plains showed that a mixed prairie had an above-ground (shoot) yield of 1.4 tons of organic material per acre, while the root yield was about 4 tons per acre. The plants were producing roots that were more than twice the weight of the shoots.

Soils that have developed under forest vegetation usually have comparably low organic matter levels. There are at least two reasons for these levels:
1. Trees produce a much smaller root mass per acre than grass plants.
2. Trees do not die back and decompose every year. Instead, much of the organic material in a forest is tied up in the trees instead of being returned to the soil.

Soils formed under prairie vegetation usually have native organic matter levels at least twice as high as those formed under forest vegetation.

What are the benefits of organic matter?

- **Nutrient supply**
  Organic matter is a reservoir of nutrients released to the soil. Each 1 percent of soil organic matter releases 20 to 30 pounds of nitrogen, 4.5 to 6.6 pounds of P$_2$O$_5$, and 2 to 3 pounds of sulfur per year. The nutrient release occurs predominantly in the spring and summer, so summer crops benefit more from organic matter mineralization than winter crops.

- **Water-holding capacity**
  Organic matter behaves somewhat like a sponge, with the ability to absorb and hold up to 90 percent of its weight in water. A great advantage of the water-holding capacity of organic matter is that the matter will release most of the water it absorbs to plants. In contrast, clay holds great quantities of water but much of it is unavailable to plants. An increase of 1 percent soil organic matter can result in an increase of 16,500 gallons of plant-available water per acre.

- **Soil structure aggregation**
  Organic matter causes soil to clump and form soil aggregates, which improves soil structure. With better soil structure, permeability (infiltration of water through the soil) improves, in turn improving the soil’s ability to take up and hold water.

- **Erosion prevention**
  This property of organic matter is not widely known. Data used in the universal soil loss equation indicate that increasing soil organic matter from 1 to 3 percent can reduce erosion 20 to 33 percent because of increased water infiltration and stable soil aggregate formation caused by organic matter.

How can I maintain or improve soil organic matter levels?

Building soil organic matter is a long-term process but can be beneficial. Here are a few ways to do it:

- **Reduce or eliminate tillage.**
  Tillage increases the aeration of the soil and causes a flush of microbial action that speeds up the decomposition of organic matter. Tillage also often increases erosion. No-till practices help build organic matter.

- **Reduce erosion.**
  Most soil organic matter is in the topsoil. When soil erodes, organic matter goes with it. Saving soil and soil organic matter go hand-in-hand.

- **Soil test and fertilize properly.**
  Proper fertilization encourages growth of plants, which increases root growth. Increased root growth can help build or maintain soil organic matter, even if you are removing much of the top growth.

- **Grow cover crops.**
  Growing cover crops can help build or maintain soil organic matter. However, best results are achieved when cover crops are combined with tillage reduction and erosion control measures.

  A good supply of soil organic matter is beneficial in crop or forage production. Consider the benefits of this valuable resource and how you can manage your operation to build or at least maintain the organic matter in your soil.

**References**


**Texoma Cattlemen’s Conference:**

**The Cattle Industry: Evolving through Innovation and Technology**

The U.S. cattle industry leads the rest of the world in science and technology innovations, and cattle producers have been rewarded through strategically adopting innovation. This year’s conference will showcase the impact technologies have had on our industry and the emerging technologies that could prove valuable to cattlemen.

**Registration and Trade Show: 8 a.m.**

9 a.m.-4:15 p.m., Feb. 26, 2016

Ardmore Convention Center

**Registration Fee: $40, includes lunch**
This year’s Texoma Cattlemen’s Conference will be from 9 a.m. to 4:30 p.m., Friday, Feb. 26, 2016, at the Ardmore Convention Center, with the doors opening at 8 a.m. The trade show will be open throughout the day with breaks in the morning, at noon and in the afternoon for producers to visit with our supporting vendors. The theme for this year’s conference is “The Cattle Industry: Evolving through Innovation and Technology.” There is a reason why the rest of the world attempts to mimic the U.S. beef cattle industry. We lead the world in production, efficiency, science and technology. This year’s conference will look at the innovations and technologies that have proven to be the most valuable to U.S. beef cattle producers. We will also look at the innovations and emerging technologies that have the most application and promise of impact to the industry in the years ahead.

The morning will begin with the Cattle Market Outlook with Derrell Peel, Ph.D., Oklahoma State University agricultural economist. Peel will take a closer look at the current market, trends and projections for cattle and other agricultural commodities for 2016. The cattle market peaked in 2014. What follows is a declining market and renewed challenges for producers as margins shrink from an all-time high.

Then, Bryan Nichols, western Oklahoma cattle producer and Noble Foundation livestock consultant, will set the stage for the day with his presentation The Beef Industry in 2050: A Young Producer’s Perspective.

Nichols will discuss his vision of the state of the beef industry when the world population reaches 9 billion people – as he nears “retirement” age. He will also share how he anticipates the evolution of technologies in the cattle industry will allow the U.S. to continue to be the world leader in sustainable beef production.

David Lalman, Ph.D., Oklahoma State University animal science professor, will take a brief look at the most impactful technologies in the beef industry as they have accumulated over the last 40 years. His presentation, titled The Evolution and Impact of Technology in the Beef Industry, will highlight the technologies and science that, when implemented and correctly applied, results in the largest impacts to cattle producers.

After lunch, Mark Thallman, Ph.D., of the Meat Animal Research Center at Clay Center, Nebraska, will speak on Genetic and Reproductive Technologies in the Cattle Industry. Thallman will review the advancements in beef genetics and reproductive technologies over the last few decades, and he will discuss the current research efforts being conducted across the nation that have the greatest potential to impact cattle producers and the beef industry in the near future.

After reviewing technologies that have and will impact cattle producers, we will examine some promising technologies that have the most potential as management applications for livestock operations. Billy Cook, Ph.D., Noble Foundation senior vice president and Agricultural Division director, will present Emerging Technologies Relevant to the Beef Industry. Cook will discuss technologies the Noble Foundation is currently investigating, evaluating and developing that have the most potential for producers to manage their cattle operations “smarter” when packaged together in an application that can be tailored for the individual entity.

The conference will end with The 2015 Political Outlook: Washington D.C. Perspective as presented by Roger Bernard, ag policy and political analyst for Informa Economics. Bernard will provide his insights (and humor) from Capitol Hill on the nation’s ag policy, ag issues to be addressed (or not) by the legislature this year, and the election year political outlook as we gain momentum toward November.

The 2016 Texoma Cattlemen’s Conference sets the stage for a new era in technology application for the beef industry. As positive profit margins become more difficult to sustain, it is ever more critical that producers adopt and utilize the proven technologies within the industry and maintain awareness of the emerging technologies that have potential to enhance efficiencies of operations. Technologies are not only for the innovative and early adopting producers; they are for all producers when applied strategically. The challenge is identifying which technologies are most applicable and most impactful, then incorporating them into a management plan. This conference will provide insight on what has been, is still and will be the technologies to be adopted and integrated into operational management.

Conference registration is $40 and includes a rib-eye steak lunch. For more information and to register, please visit www.noble.org/agevents or contact Maggie Scott at 580-224-6375.
Hello, I’m Rob

Cook. I have spent the last 11 years working for the Natural Resources Conservation Service (NRCS). In September, I left my position with the NRCS in Amarillo, Texas, and joined the Noble Foundation as a pasture and range consultant. This has been an exciting time for my family as well as an exciting time for agriculture. Everywhere we turn things are changing. There is a new technology or innovation that promises to make some part of our lives easier. It is almost impossible for a person to keep up. As I think about this, I realize that in many ways technology has made our lives easier. Although, one look at the average family sitting down at the dinner table with their heads buried in some type of “smart” device, I realize that we sometimes allow technology to replace or interfere with some of our core values. The agriculture industry is not immune from this.

The term “magic bean” comes from the old child’s fable “Jack and the Magic Beanstalk.” We all know the producer who is constantly looking for the “magic bean.” They are always in search of the new type of grass that cannot be grazed out, is extremely drought tolerant and doesn’t require nutrients to grow. There is always talk about a grazing system that will double stocking rates or the breed of beef cattle that has 600-pound weaning weights with no inputs. I know I’m guilty of always looking for that new technological tool, like Global Information Systems for instance, that will make me more efficient. At some point or another, everyone has probably tried to rely on some new innovation or technology to bypass our core values or foundation. We have yet to develop a grass that doesn’t require water, ample leaf area for photosynthetic material and healthy soil to grow. The breed of cow that can produce a heavy calf every year on dirt, three-awns and a little hay hasn’t been developed. Even with new innovations in plant and animal genetics and advancements in geographic information systems (GIS) and other technologies, we must still rely on sound grazing management techniques, beef cattle management and nutrition principles, and good old-fashioned hard work as a foundation to properly manage our resources.

Please don’t misunderstand me. Farmers and ranchers will need to continue to feed an ever growing world population with fewer and fewer resources available for production. This will only be accomplished with technological advances and innovative ideas. Those new ideas and technologies must be used as tools to help build upon the foundations and best management practices that have been put in place. Innovation might change the way we view or understand these founding principles and practices, but it will never allow us to bypass them. I’m excited about my new position with the Noble Foundation and look forward to working with you, the agricultural producer, on founding forage production principles as well as new and innovative practices and technologies to improve production agriculture.
My name is Amy E. Hays, and I have recently joined the Noble Foundation Agricultural Division as the education services manager. My family and I spent 21 years in Texas with Texas A&M AgriLife Extension and the Texas Parks and Wildlife Department. I am excited to join the Agricultural Division as the organization establishes this new consultation position for education services.

I am probably much like you in that I consider myself a life-long learner. What I have learned during my career in agriculture and natural resources is that things seem to change faster than we have time to process. As soon as we learn something new or different about agriculture and natural resources, we turn around and there is even more to learn.

Life-long learning is why I joined the Noble Foundation. There is nothing more important we can do to support the future of agriculture than to continue to learn all we can about the relationship between efficient production and sustainable production. My job is to make those learning environments as meaningful as possible for producers.

There is no doubt that "education" as a whole has changed, especially for nonformal learning opportunities. You and I have a world of learning at our fingertips in a way unlike those before us. You and I have constant access to information 24/7 through smart devices and online information. From an educational perspective, that means new opportunities exist for learning that were not present when information traveled slower. That also means both online and face-to-face learning (through consultation, programs and events) might need to be revamped to include a wider variety of ways in which people learn. The Noble Foundation created my position to enhance the ways in which we serve producers by bringing to bear the variety of ways people learn through consultation and events. I will spend the next year working with consultants and staff to serve producers by incorporating new ways to provide learning opportunities that complement the high quality consultations and events already well-established.

Part of the process of re-tooling learning opportunities involves feedback from producers like you who have information and education needs that change as well. I look forward to meeting you and hope that, if you have the opportunity, you will contact me about your ideas on ways we can support producers into the future.

Jim Johnson, soils and crops consultant, demonstrates the rainfall simulator, which illustrates the ability of ground cover to retain water and control erosion.
Knowing what to look for minimizes calving difficulty

by Clay Wright / jcwright@noble.org

Anyone who has been through even one calving season has most likely dealt with calving difficulty. Dystocia (calving difficulty) is the biggest cause of calf death loss at birth. It can be minimized by managing factors like genetics and nutrition; but once the calving season is upon us, those things are in the past. Now the focus becomes observation and possible intervention. Being prepared to provide assistance is critical. It’s been estimated that timely and appropriate intervention can save up to 70 percent of calves that otherwise would die due to dystocia. It’s also just as important to know when not to intervene and just let the calving processes continue uninterrupted. The key is experience and knowing the normal sequence of events up to and through calving, which will vary tremendously between individual cows. It’s also important to know when not to intervene and just let the calving processes continue uninterrupted. The key is experience and knowing the normal sequence of events up to and through calving, which will vary tremendously between individual cows. It’s also important to know when not to intervene and just let the calving processes continue uninterrupted.

As calving approaches

Two weeks or more out:
- The cow’s/heifer’s udder fills out; it can be even more gradual in first-calf heifers.
- The vulva will noticeably relax and enlarge, “Springing,” in more common terms.
- The cervical (mucous) plug may dislodge and be excreted.

12 to 24 hours out:
- The pelvic ligaments will relax, resulting in “lank” appearance around tail and pins.

12 hours out:
- The cow/heifer may exhibit behavioral changes, such as trying to isolate herself or not coming to feed, etc.

At calving

The calving process itself is divided into three stages.

Stage one starts when the cervix begins to dilate in preparation for delivery. The cow/heifer may begin to have minor contractions, but these often go unnoticed. She may isolate herself and show signs of discomfort like tail switching, licking her side, stomping her feet or elevating her tail. You may see an increased mucous discharge. Although stage one can precede the birth of the calf by four to 24 hours, it’s common to check things out when the cow/heifer has been in stage one for more than eight hours without progressing to stage two.

Stage two begins when the membranes and fetus move into the birth canal and ends after the calf is born. Contractions provide the force necessary to deliver the calf. In a normal birth, the first water bag appears or ruptures, then comes the amnion (fetal sac) or, if the amnion ruptures internally, the front feet with hooves facing down followed quickly by the calf’s muzzle and head. Any other presentation of the calf is not normal and should be investigated.

Stage three is expulsion of the first water bag appears or breaks; for cows, this process usually lasts less than two hours and for heifers, less than four hours. Work at Oklahoma State University and the USDA station in Miles City, Montana, indicates these times should be shortened to 60 to 90 minutes for heifers and 30 to 60 minutes for cows. It follows then, that intervention should be considered if the calf is not born within two hours after the first water bag appears. After intervening, if you are not able to progress the birth within 30 minutes, consider calling the veterinarian.

Stage three is expulsion of the afterbirth, usually naturally within eight hours. If not completely expelled 24 hours after calving, call your veterinarian.

Given the time frame of a normal birth, the most logical frequency to check the herd during calving to catch most of the potential problems would be at least every three hours. Remember, no cow is going to follow the routine of a normal birth, the most logical frequency to check the herd during calving to catch most of the potential problems would be at least every three hours. Remember, no cow is going to follow the routine of a normal birth.

One final note: Time of calving can be influenced by when the cows are fed during the day. A study done by Oklahoma State University with 1,331 cows from 15 farms showed that 85 percent of the calves were born between 6 a.m. and 6 p.m. when fed once daily at dusk.
Education, experience produces successful burn bosses

by Steven Smith / sgsmith@noble.org

Fire is an important process in the ecology of most native plant and animal communities, especially in uplands. Most plant and animal communities in the Great Plains and eastern forests evolved with fire. In many situations, land managers can use prescribed fire to manage native plant communities, wildlife habitat, woody encroachment, forage quality and wildfire risks. Unfortunately, many land managers cite lack of experience and labor as reasons not to use fire when managing their properties.

Land managers interested in implementing a prescribed burn could begin their education by reading materials in print or online from entities skilled in prescribed fire training. Beginning prescribed burn users should further their education by attending prescribed burning workshops such as the ones hosted by the Noble Foundation in January and July or by state wildlife departments, cooperative extension services (Oklahoma Cooperative Extension Service, Texas A&M AgriLife Extension, etc.), Natural Resources Conservation Service, prescribed burn associations such as the Oklahoma Prescribed Burn Association (www.ok-pba.org), and other entities. Workshop attendees typically learn the basics of prescribed burning, such as setting goals, impacts of burning, firebreak types, fuel load management, smoke management, equipment and labor requirements, laws and regulations, fire types, etc.

After attending a workshop, beginning prescribed burn users should assist one or more experienced burn bosses with several burns prior to conducting his/her first prescribed burn. To locate an experienced burn boss, visit with one of the prescribed burning training entities mentioned above.

An experienced burn boss is necessary to safely and effectively coordinate a burn. This person is in charge of all aspects of the burn. A qualified burn boss is someone who has been part of dozens of burns and has served in a variety of roles. The burn boss is familiar with all aspects of the prescribed fire (firebreak preparation, appropriate weather conditions during and after the burn, equipment required and used, area being burned, areas of concern, etc.) and is responsible for deciding whether to burn or not.

I have participated in roughly 100 prescribed burns in the past 15 years and have served as the burn boss for approximately 25 of them. I followed the process described above to become a prescribed burn boss. I attended several courses/workshops and assisted several different burn bosses. From personal experience, I can assure you that participating as an active crew member during a prescribed burn is an invaluable experience. Before serving as a burn boss for the first time, I assisted as a crew member on approximately 10 burns and preformed all crew member positions. There is a noticeable difference in the level of responsibility between a crew member and the burn boss.

Admittedly, I was very nervous the first time I served as the burn boss. I was responsible for the safety of my crew and for completing the burn. After serving as a burn boss, I now have a greater appreciation for good firebreaks, well-maintained equipment and a good crew.

Anyone can become a burn boss with time and patience. Once the burn is finished, there is a great sense of accomplishment knowing you planned, prepared and safely completed it well.
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For more information or to register, please visit [www.noble.org/agevents](http://www.noble.org/agevents) or call Maggie Scott at 580-224-6375. Preregistration is requested.