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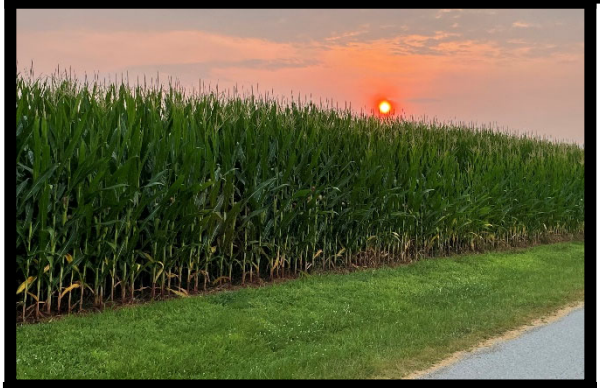
OHIO STATE UNIVERSITY EXTENSION

COSHOCTON COUNTY AGRICULTURE & NATURAL RESOURCES



August 4 Issue (Edition #106)

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Hello Coshocton County! August is off and running with a beautiful week of weather. Our weather will be great for a great celebration of agriculture during "First Farm Friday" on Main Street this Friday evening. This event spearheaded by the Coshocton SWCD is a great collaboration of ag agencies, ag businesses and our farm community. I hope to see many of you downtown!

As I was evaluating the growth stages of our "Boots on the Ground Soybean Test Plot" yesterday I came across a great reference from the University of Wisconsin which explains the growth stages of soybeans. I have attached it to the end of this newsletter for your use.

A lot of field days are happening across the region over the next few weeks –check out the information about each of these events. And it is never to early to buy your Farm Science Review Ticket! Tickets can now be purchased for $7 at our Extension office. Have a great week!

Sincerely,

David L. Marrison

Coshocton County OSU Extension ANR Educator

THE OHIO STATE UNIVERSITY
COLLEGE OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL SCIENCES

First Farm Friday Returns on August 6

After a year pause due to the coronavirus pandemic, **First Farm Friday** is making its return this Friday, August 6 on Main Street in Coshocton from 5:00 to 7:30 p.m. This event is spearheaded by our friends from the Coshocton Soil & Water Conservation and there will be interactive displays from agricultural organizations, agencies and farms.

The goal of First FARM Friday is to be a fun, educational event that helps the general public understand the importance of agriculture in our community and beyond. Some of the highlights of the evening will include:

- Farm machinery- area farmers will bring some of their farm machinery into town for you to climb into and check out. Come and see a planter, sprayer and combine up close.
- Farm Animals- our county has great diversity with regards to animal agriculture. Get up and close with some of our farm animals such as sheep, dairy cows, beef cows and goats.
- Farmers and Agribusiness Personnel- Area farmers and agribusiness will be on hand for you to talk to. It is a great chance to learn from people involved in our industry.
- Pedal Tractor- we will again have the Pedal Tractor Course for kids. This is a great chance for the kids to jump on a pedal tractor and pedal and weave among the farm machinery.
- Whit's Frozen Custard- Kids can earn a free cup of Whit's Frozen Custard when they visit ALL of our 18 vendors and get their stamp card marked. We will have 250 cups of custard to give away! Some the exhibitors who will be on hand include be Brian Powell farm, Daugherty farms, Garden Patch Greenhouse, Coshocton Grain Company, Coshocton Farm Bureau, Gerber & Sons, Haines Angus Farms, Lapp Farms, Millwood Lumber, Pearl Valley Cheese, Porteus Farms, TMK Bakersville, Turkey Bend Farm, Wenmar Farms, OSU Extension, ODNR Division of Wildlife, the Coshocton County Master Gardeners Volunteers, and our hosts the Coshocton Soil & Water Conservation District.
- Prizes-A drawing will be also held for kids 12 and under who participate in the Stamp Card/Pedal Tractor Course. The Coshocton County Fair Board will give away 30 Coshocton County Fair passes which includes the rides. The drawing will be held Monday morning AFTER First FARM Friday and winners will be notified by phone. And finally…..
- Food – There will also be food on-site. Some of the vendors will include the Silver Hammer Food Truck, Sno Shack, Future Leaders 4-H Club, and the River View FFA Lemonade stand. You might even get some fresh salsa on the OSU Extension Blender Bike and cheese samples from Pearl Valley Cheese.

This event could not be possible if it was not for the hard work of the Coshocton Soil & Water Conservation District and the many volunteers who bring equipment/animals/displays to this event. Thank you to Whit's Frozen Custard and Coshocton County Farm Bureau for sponsoring the custard treats for our Stamp Card participants and the Coshocton County Agricultural Society (Fair Board) for providing prizes for our Stamp Card activities.

It will be a great night to celebrate Coshocton County Agriculture. There is no fee to attend and reservations are not needed. Just come down to Main Street on Friday, August 6 from 5:00 to 7:30 p.m. to enjoy First Farm Friday. We hope to see you there!

Agronomy Field Night at Durbin Farms

By Chris Zoller, Extension Educator
Source: https://agcrops.osu.edu/newsletter/corn-newsletter/2021-25/agronomy-update-scheduled

The Tuscarawas County office of Ohio State University Extension will sponsor an Agronomy Update on Thursday, August 26, 1pm to 4pm at Durbin Farms. The farm is located at 4227 Durbin Road SE, New Philadelphia, Ohio 44663.

Many agricultural products continue to be in short supply, and this shortage may continue. What will these supply shortages mean for harvest? Will the shortages continue into planting season next year? Dr. John Fulton, OSU Food, Agricultural, and Biological Engineering, will discuss the situation and provide management recommendations.

Carbon sequestration, carbon credits, and carbon markets are popular terms right now. Nearly every farm publication has an article about the role agriculture can have in this arena. There are many factors to consider prior to entering into a carbon market agreement. Mike Estadt, OSU Extension Educator, ANR, has studied this topic and will address factors farmers must consider.

The program will wrap up with a discussion of agronomy and farm management resources available from Ohio State University Extension and a presentation by Matt and Luke Durbin discussing lessons they learned from building a farm shop.

The agenda includes:

- Parts and Equipment Shortages are Real – Be Prepared: Thoughts on 2021 Harvest & 2022 Planting
  - Dr. John Fulton, OSU Food, Agriculture, and Biological Engineering
- Are You Ready for Carbon Markets?
  - Mike Estadt, OSU Extension Educator, ANR, Pickaway County
- OSU Extension Agronomy & Farm Management Resources
  - Chris Zoller, OSU Extension Educator, ANR, Tuscarawas County
- Lessons Learned from Building a Farm Shop
  - Matt & Luke Durbin, Durbin Farms

There is no fee to attend, but pre-registration is requested no later than August 24. To register, please email zoller.1@osu.edu or call 330-339-2337.

Grazing and Forage Field Day in Licking & Knox County on August 28

By Dean Kreager, Licking County Extension

Extension in Licking and Knox Counties are teaming together with the Ohio Forage and Grasslands Council to provide a drive it yourself tour of two locations in Licking County and one in Knox County on August 28th. Our tour will begin at Lightning Ridge Farm in Granville where Bill O'Neill raises Longhorn cattle utilizing intensive grazing. With twelve divided lots and the capability to increase divisions into twenty-four paddocks, cattle are moved daily and have access to portable piped water. We will also discuss the value of hay quality preservation while touring a new hoop barn constructed for hay storage. The second stop in the tour will move six miles north to a field managed by Ned Campbell who has provided space to plant about twelve varieties of forages following wheat harvest. Attendees will be able to observe and discuss the value of these forages for grazing or harvesting. For the final stop, we will move further north into Knox county to learn about the use of Conservation Reserve Program (CRP) approved warm-season grass production. This field day will begin at 6817 Cat Run Rd. Granville, OH 43023 at 11:00 a.m. and conclude at 3:00 p.m.

There is a $10 registration fee per person. Lunch is included with registration. A $5 discount will be applied if the person registering is an OFGC Member or a resident of the host county. Payment will be collected at the field day. Please register within one week of the event you plan to attend by completing a quick registration form here at https://osu.az1.qualtrics.com/jfe/form/SV_0jRpxTFYnCsHtd4

Questions about the Summer Forage Field Day can be directed to Gary Wilson by calling 419-348-3500, Dean Kreager 740-618-6332, or Sabrina Schirtzinger 740-397-0401 .

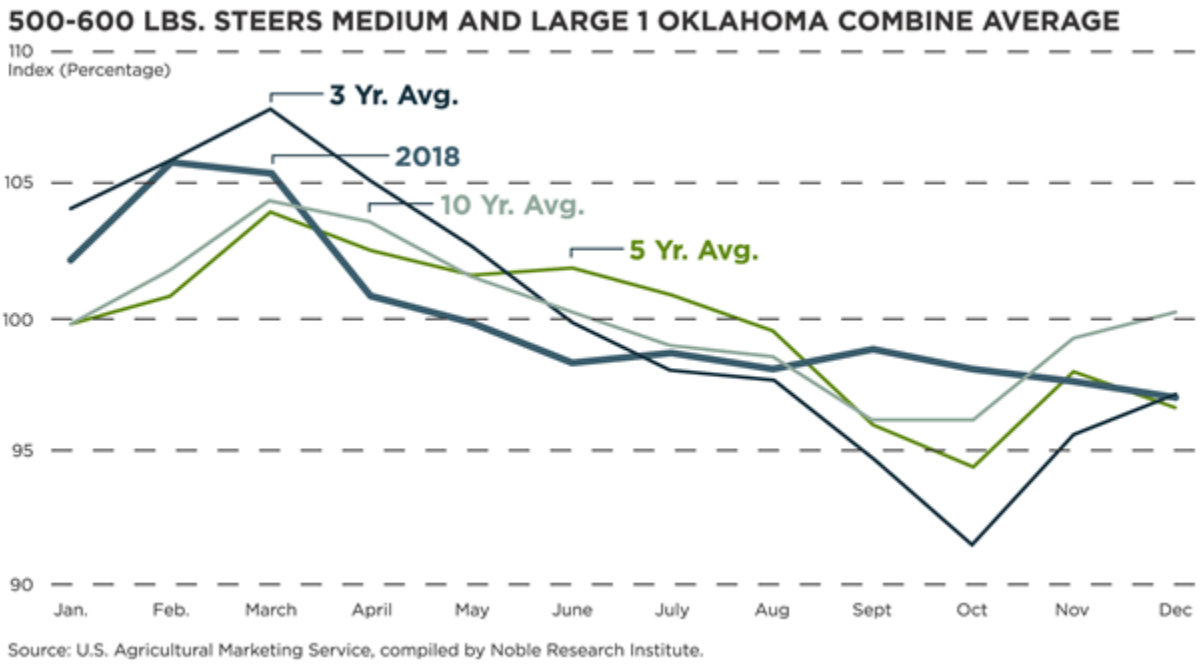
Fall Calving- Is it Profitable?

By: Garth Ruff, Beef Cattle Field Specialist, OSU Extension (originally published in the Ohio Farmer on-line)
Source: https://u.osu.edu/beef/2021/08/04/fall-calving-is-it-profitable/

Fall is my favorite time of the year, hay making is done, the feeder cattle are being marketed, and college football is in full swing. Last winter in a cow-calf webinar, I briefly mentioned the virtues of a fall calving system here in the Eastern Corn Belt. In this article we'll look at how fall calving can be a viable and profitable system.

While fall calving may offer some unique challenges with regard to herd nutrition, there's no arguing the cattle price seasonality benefit it affords!

Seasonality of Cattle Prices – As with most things in agriculture, supply and demand has a great impact on prices. Griffiths et al, 2017 from the University of Tennessee analyzed several studies comparing spring and fall calving systems. After comparing the systems on a 205-day weaning age and two separate feed resource scenarios they concluded that even though spring-calving cows had heavier calves at weaning and lower feed costs than the fall-calving cows, the higher prices of steer and heifer calves captured by fall-born calves were able to cover the higher feed expenses and lighter weaning weights by the fall-born calves. In the fall of the year, when most of the weaned spring-born calves are marketed, supply is plentiful for order buyers to fill their feedlot orders. This increased supply contributes to our annual low in feeder cattle prices.
During the spring when there is demand for calves to graze wheat in the plains, and grass here locally, prices on a per cwt basis are significantly higher due to a tighter supply of calves. That tight supply of fall born calves contributes to seasonality of the markets and our annual high for stocker calves and feeder cattle.



Don't forget that the cull markets are seasonal as well. Griffiths et al, also looking at Tennessee cull cow prices from 1990-2013 demonstrated that fall calving culls sold in April and May were valued on average $8-9 cwt higher than spring calving culls sold in September or October.

Mud –As rainfall patterns shift here in Ohio and the rest of the eastern Cornbelt, indications are that our springs are going to be warmer and wetter over time. I think we can attest to that if recent memory serves us well. As mud becomes more of an issue, especially in the last trimester of gestation for a beef cow, research

conducted at the Ohio State University has shown suggests that a cow in muddy conditions requires an additional 1.8 Mcal Net Energy/day to maintain adequate body condition, Nickles et al, 2020.

Not only does mud have an impact on cow body condition, management and feeding also become a challenge when excessive muddy conditions persist. Fall calving in September to mid-October, when soil conditions are, on average drier, can be one method to reduce the impacts of mud on cow performance.

Management Considerations – Historically, one of the biggest drawbacks to fall calving has been the increased cost to feed and maintain a lactating cow over winter. As acknowledged previously, that feed cost can be offset by higher calf values in the spring of the year.

In the past couple of years, hay quality and quantity has been a limiting factor for some cattlemen. If forage is a at a premium and cow condition is being compromised with fall calving cows why not consider reducing the caloric needs of the cow by ending lactation around 120 days of age?

In addition to improving management of available forage. We can also better manage calf performance once they are weaned. Weaned calves can be fed a grower ration until marketing later in the spring. In order to do so, there is a transfer in feed cost cost from the cow to the calf. The goal is to have calves that are healthy, "green", and not over conditioned when turned out to graze. Whether or not higher spring calf values will offset higher calf nutrition and management costs is something to think about.

Final Thoughts – Having a defined calving season is better than none at all. What works in other parts of the country may or may not work for your herd, however it always good to evaluate various management systems and current on farm practices.

Sources:

- Bradley, J. 2019. Consider Economics of Spring vs. Fall Calving Season. Noble Research Institute. Noble News and Notes. March 2019.
- Griffith, A.P., C.N. Boyer, G.W. Henry, J.A. Larson, S.A. Smith, and K.E. Lewis. 2017. "Fall Versus Spring Calving: Considerations and Profitability Comparison." University of Tennessee Extension publication W 419.
- Nickles K., Relling, A., and Parker, A. Cost of Mud to the Beef Cow. Ohio Beef Letter, Ohio State University Extension. December 2021.\

Using Nutrient Removal Rates to Improve Forage Productivity

By: James Morris, OSU Extension Educator, Brown County and Greg LaBarge, OSU Extension Field Specialist, Agronomic Systems
Source: https://u.osu.edu/beef/2021/08/04/using-nutrient-removal-rates-to-improve-forage-productivity/

As the calendar flips over to August and temperatures continue to rise, our cool season forages are in the heart of what we call the "summer slump" and vegetative growth begins to decline. Numerous resources are available that provide excellent strategies for reducing the negative effects of this slump. Forage growers can utilize summer annuals to boost yields during this time of the year, but it's also important to ensure our forage stands are healthy prior to be exposed to heat and other environmental stressors. So, while "summer slump" seems to get all of the attention right now, what if our forages had "spring fever"?

Figure 1. Yellow unthrifty grass stand spring 2021.

We normally consider springtime to be the period of rapid and lush growth for our cool-season forages, but what if our stands look like the Figure 1? The attached image was taken this spring in a stand of a cool-season hay mix. Of course, this problem will impact tonnage, but a weak stand will also allow more opportunities for weed emergence, reduce winter

survival, and as mentioned above, reduce their ability to tolerate stressful summer conditions. While it may be too late to beat the heat, action can still be taken to prepare forages for winter and set ourselves up for a better spring.

What's the issue with this stand and the several others I visited this spring? Let's put ourselves into the situation as if it was our own field. Where do we begin? Well, stunting and yellowing can be descriptions for numerous issues related to plants. As we further survey the field, a defined difference between plant health is visible between the edges and center of the field. What was done differently in along the edges? Less compaction from equipment, no herbicide application, and no harvest. We ruled out herbicide injury and didn't notice any extreme compaction. So, we took soil samples and found the culprit. Extension Educators sometimes sound like broken records as we always advise, "don't guess, soil test". This is a prime example of how soil results can easily take the guess work out of problem solving.

Nutrient Removal

Using the recommended critical levels from the Tri-State Fertilizer Recommendations (go.osu.edu/tri-statefert), the results showed us that the soil phosphorus (P2O5) was only 8ppm below the critical level, but soil potassium (K2O) was 76ppm below the critical levels. Why is there such a big difference in soil levels? Let's think about what type of fertilizer was being used. Most fields I see in this condition have had repeated applications of a balanced fertilizer such as, 19 (N)-19 (P)-19 (K). What's the issue with a balance fertilizer? Well, according to our newest Nutrient Removal for Field Crops fact sheet (ohioline.osu.edu/factsheet/anr-96), a cool-season grass hay mix can remove 12 pounds of P2O5 and 48 pounds of K20 per ton of forage production.

Again, let's put ourselves in this situation. If our hay averages 3 tons/acre yield at harvest, our crop potentially removed 36 pounds of P2O5 and 144 pounds of K2O. Hopefully, this helps explain why we saw such large difference in the soil nutrient levels. Now, we apply 200 pounds /acre of 19-19-19 fertilizer. That equals out to 38 pounds of P205 and K20 applied. As you can see in table 1, this meets our replacement needs for P205 but only replaces about 26% of the K20 that was used. If our soil levels were already deficient as shown in our example, much larger rates will be needed to begin our "build-up" process. As you can imagine building soil levels back up within our critical ranges can become expensive.

Table 1. Nutrient balance when 200 lbs./ac 19-19-19 is used as fertility program for 3 ton/ac grass hay.

Nutrient	Nutrient Removal (lbs./ac) @ 3 ton/ac grass hay harvest	Nutrient supplied (lbs./ac) with 200 lbs./ac of 19-19-19	Nutrient Balance (lbs./ac)
P_2O_5	36	38	+ 2
K_2O	144	38	-106

Since a balanced fertilizer doesn't match our unbalanced nutrient removals, we can consider using a fertilizer such as 9-23-30. An application of 200lbs/acre of this fertilizer would return 46 pounds /acre of P205 and 60 pounds /acre of K2O. This allows us to begin building up our P205 levels and replace about 41% of our K2O. We can apply additional K2O with the use of 0-0-60 (potash) fertilizer. Of course, fertilizer costs and our Return On Investment (ROI) is also a factor in this decision making process. Will we get enough yield boost to pay for the fertilizer? I am working with a producer in Brown County to conduct on-farm research that may help answer that question. We made a base application of 9-23-30 and will follow up with 3 replications of an additional application of potash vs no additional application. Yield and ROI results will be available in our 2021 OSU eFields publication.

Developing Fertilizer Recommendations

Now that we understand the nutrient removals rates and the approaches that can be used to maintain and build adequate fertility, how do we calculate the fertilizer needs? If you despise math, don't quit reading just yet. Our team at OSU Extension has developed an easy way to calculate nutrient needs based on soil test results and it doesn't require lengthy calculations. This spreadsheet utilizes information from the resources provided in this article to compute nutrient needs. Users simply input their soil test results, crop information, and yield expectations. The spreadsheet will automatically calculate the needs and costs per acre of P_2O_5, K_2O, and lime applications. This spreadsheet, along with a user guide and more background information can be found at go.osu.edu/FertilityCalculator. Applying this information to create an accurate fertilizer plan for your forages can significantly increase production in deficient soils. Figure 2 shows the field from Figure 1 before a sufficient fertilizer plan was applied (top) and after (bottom).

Figure 2.Grass before (top) and after (bottom) fertilization in spring/summer 2021.

Four Never Fail Rules of Grazing

By: Victor Shelton, NRCS State Agronomist/Grazing Specialist
Source: https://u.osu.edu/beef/2021/08/04/four-never-fail-rules-of-grazing/

It's state fair time! I enjoy watching the livestock shows, eating some "healthy" food and getting to talk to people at the Pathway to Water Quality. Walking through the beef barn always reminds me of old cattle shows and sleeping on old Army cots located where the cattle were stalled during the day. It was exciting and a lot of work, but very traditional and still done with a straight back truck at the time – different times, but all good memories.

I hear people mention the "lazy days of summer," but I'll have to admit that has never really seemed valid for me. I'm glad that the days are long, because quite often, I need every minute of daylight and then some. Precarious weather seems to be timed quite well to disrupt plans and tasks. This is only doubled in difficulty when you are also holding down an off-farm job, which always seems to take you away when the weather is perfect. You have to just shut your mind off, focus on the task at hand and not dwell on the farm work that must be completed. I know that I am not the only one this happens to.

I had something sent to me recently and I thought it made some good points. When time is sparse, as it seems it often is, then we need to be as efficient as possible and that includes pasture management. The brief synopsis included four never fail rules of grazing. Let's explore these.

In areas with adequate precipitation, summer regrowth has been excellent!

Number 1 – Never let seed heads form on plants.

I often talk about three major stages of forage growth. The immature stage is early in the year when forages are high in moisture and usually nitrogen and have less structural components. Next is the vegetative stage of rapid growth with some plants in the boot stage and thinking about sending up seed stalks. Finally, is a maturing stage, where seed is produced and eventually matures if not removed. Ideally, you want to keep the forages in that second stage as long as possible. During this stage, nutrition is good, bite size is good, and the plant is continuing to grow leaves. Once seed heads start forming, a lot of energy is shifted to seed production and away from the leaves and roots.

We can keep most plants in vegetative form by rotating livestock across them on a regular basis and then providing adequate rest before grazing again. Allocating out smaller amounts helps to provide more even grazing and less patch grazing and avoidance. Grazing helps to delay seed head production and sometimes, if the forages are not stressed, there can be a reduced amount seed heads.

If needed, a timely clipping can really slow down seed head production and help promote regrowth. This is best done after the grazing event to even the stand. If it hasn't been grazed yet and it is starting to mature, a quick grazing over it can help to reset it or hay could be taken off the site for winter use if it won't be needed for grazing in the near future.

Though quality of the forage will be better if seed heads are controlled, there are situations, especially when you are trying to build soil organic matter, when letting a field sit idle and mature is good. This allows sufficient time for the plants to fully express themselves and allows for maximum root depth. These stands can then be strip grazed allowing the livestock to eat the best and lay down the rest.

Number 2 – Never let livestock graze more than seven continuous days on a pasture.
This is actually a really good rule of thumb. When animals are left too long on an allocation, they will eventually stop grazing existing vegetation and move to regrowth. Specifically, new regrowth from what was just grazed.

Why? Because it is generally a higher nutritional plane than the older growth. The forage needs some R&R before being grazed off again to help maintain the plant and the quality of the sward. When the livestock switch to new regrowth, what they then avoid tends to get ranker and avoided even more. Some grazing ruminants have the ability and desire to be more selective and perhaps have more sensitivity to nutritional needs, like sheep, and they'll switch to regrowth within about three days. Sheep, therefore, should really be rotated every three days. Longer grazing periods tend to enhance differences in growth with more spots overgrazed and under grazed and very little in between that is considered more ideal. You also start seeing more undesirable species appearing and desirable species being reduced.

Number 3 – never graze closer than three inches.
I often mention trying to maintain "stop grazing" heights. Those are the shortest forages present, not the tallest. It's important to maintain a certain amount of leaf growth to keep the "solar panel" in good working condition. When a minimum amount of forage is maintained, the plants are also able to continue to support their root system better, keep the ground covered better, keep the soil cooler and usually help support more regrowth. Stop grazing height is the amount of residual live plant material left behind after a grazing event. If some of the forage has been grazed down to 1.5 inches, then that is the residual height and, in most cases, it is considered overgrazed at this point. Stop grazing heights vary according to the species being grazed. Short cool season forages like Kentucky bluegrass and white clover are more tolerant to closer grazing. Most tall cool season forages like orchardgrass and tall fescue are best kept at least four inches. Tall warm season forages such as big bluestem, Indiangrass and Switchgrass need to have a minimum of six inches but do better with 8-10 inches. That goes for grazing and mechanical harvest. The exception to the rule is post dormancy early winter. Forages will tolerate a closer grazing then and that opens an opportunity to improve conditions for frost-seeding clover mid-winter.

Number 4 – never return to a pasture in less than 30 days.
On average, this is a good rule. That time frame is usually enough under normal conditions to get adequate regrowth to be able to graze the field again. Quite often during the spring rapid growth period, that is too long. I prefer to keep rotating pastures in the spring until that first paddock is ready to be grazed again and then start over. If you don't do that, there will be a lot more fields potentially getting out of control and rule number one goes out the window. Later in the season, when things often get hotter and drier, the rest period is usually closer to 45-50 days. It's best to just keep an eye on the forages, reassess them on a regular basis and move according to the amount of forage present as suggested in rule number three.

There are still dry areas around. There are also areas that were blessed with enough rain that now when it is turning drier, the plants are very quickly reacting to it. After being wet for extended periods of time, plants get lazy and some don't put down good, deep roots. So, when it does turn dry, they tend to be affected more than usual.

There is a lot about grazing that is more art than science and a whole lot of "it depends." Keep your eye on the forage. Remember, it's not about maximizing a grazing event, but maximizing a grazing season! Keep on grazing!

Roundup Stays for Farmers but not for Lawn/Garden Use

By Julie Harker
Source: https://brownfieldagnews.com/news/roundup-stays-for-farmers-as-bayer-sets-aside-dollars-for-future-claims/

Bayer says it's committed to ensuring access to glyphosate for its farmer customers but will replace all U.S. lawn and garden glyphosate-products with NON-glyphosate-based formulations to mitigate any future litigation risk. Bayer says it is putting aside more than $4.5 Billion dollars for future lawsuits about Roundup but stresses the product will remain available for farmers. This spring, a judge rejected Bayer's plan to limit the cost of settlements in claims that its glyphosate product cause non-Hodgkins lymphoma.

In a call with investors on July 29, Bayer officials say they will file a petition with the U.S. Supreme Court to review the lower court ruling in favor of Roundup user Edwin Hardeman. If the ruling is in Bayer's favor, they say it would end Roundup litigation. But, if it does not, Bayer says it will have the set aside amount for future cases. Bayer says their case has only gotten stronger about the safety of Roundup since the litigation began when the product was owned by Monsanto.

Considering Carbon Farming? Take Time to Understand Carbon Agreements

By: Peggy Kirk Hall, Associate Professor, Agricultural & Resource Law

"Carbon farming" is a term that came and went about a decade ago, but it's back and gaining traction. Ohio farmers now have opportunities to engage in the carbon farming market and receive payments for generating "carbon credits" through farming practices that reduce carbon emissions or capture atmospheric carbon. As with any emerging market, there are many uncertainties about the carbon market that require a cautious approach. And as we'd expect, there are legal issues that arise with carbon farming.

Some of those legal issues center on carbon agreements--the legal instruments that document the terms of a carbon farming relationship. Each carbon market program has its own carbon agreement, so the terms of those agreements vary from program to program. Even so, understanding the basics of this unique legal agreement is a necessity.

Here's what we know at this point about carbon agreements and the legal issues they may raise.

New terminology. Carbon markets and carbon agreements speak a new language, containing many terms we don't ordinarily use in the agricultural arena. The terms are not fully standardized, and their meanings may differ from one program to another. Understanding these new terms and their legal significance to the carbon agreement relationship is important. Common terms to know are below but check each program to clarify its definitions for these terms.

- Carbon practices. Farming practices that have the potential to reduce carbon emissions or sequester carbon.
- Carbon sequestration. The process of capturing and storing atmospheric carbon.
- Carbon credit. A measurable, quantifiable unit representing a reduction of carbon dioxide emissions that can be transferred from one entity to another. A credit typically represents one metric ton of "carbon dioxide equivalent, which is a metric that standardizes the global warming potential of all

greenhouse gases by converting methane, nitrous oxide and fluorinated gases to the equivalent global warming potential of carbon dioxide.

- Carbon offset. Using a carbon credit generated by another entity to offset the emissions of an entity that emits carbon elsewhere.
- Carbon inset. A reduction of carbon within a specific supply chain that emits carbon, accomplished by adopting practices within that supply chain.
- Carbon registry. An entity that oversees the registration and verification of carbon credits and offsets.
- Verification. The process of confirming carbon reduction benefits, typically performed by a third-party that reviews the carbon practices and the accounting of carbon credits generated by the practices.
- Additionality. Carbon reduction that results from carbon practices incentivized by the carbon agreement and that would not have occurred in the absence of the incentive.
- Permanence. The longevity of a carbon reduction, which may be enhanced by a requirement that carbon practices remain in place over a long period of time and steps are taken to reduce the risk of reversal of the carbon reduction.
- Reversal risk. Risk that a carbon reduction will be reversed by future actions such as changing tillage or harvesting the trees or vegetation planted to generate the carbon reduction.

Initial eligibility criteria. Each carbon program has specific requirements for participating in the program. Two common eligibility criteria are:

- Location. The program may be open only to farmers in a particular geographic location, such as within a specified watershed, region, or state.
- Acreage. A minimum acreage requirement often exists, although that can vary from 10 acres to 1,000 or more acres. Some projects may allow adjacent landowners to aggregate to meet the minimum acreage requirement, but that can raise questions of ineligibility should one landowner leave the program.
- Land control. If the farmer doesn't own the land on which carbon practices will occur, an initial requirement may be to offer proof that the farmer will have legal control over the land for the period of the agreement, such as a written lease agreement or certification by the tenant farmer.

Payment. While the goal of a carbon agreement is often to generate carbon credits to be traded in the carbon market, there are varied ways of paying a farmer for adopting the practices that create those credits. One is a per-acre payment for the practices adopted, with the payment amount tied to the reduction of carbon resulting from the adopted practices. Another approach incorporates the carbon market—a guaranteed payment that can increase according to market conditions. Concerns about market transparency abound here. Yet another method is to calculate the payment after verification and quantification by a third-party. For each of these different approaches, the amount could be based upon a model, actual soil sampling, or a combination of the two. Payments may be annual or every several years. Another consideration is the form of payment, which could be cash, company credits, or "cryptocurrency"—digital money that can be used for certain purposes. Also be aware that some carbon agreements prohibit "payment stacking," or receiving payments for the same carbon practices from multiple private or public sources.

Acceptable carbon practices. Carbon practices are the foundation for generating carbon credits. An agreement might outline acceptable carbon practices a farmer must adopt as the basis for the carbon credit, such as NRCS Conservation Practices. Alternatively, an agreement might allow flexibility in determining which carbon practices to use or could state practices that are not acceptable. Typical carbon practices include planting cover crops, using no-till or reduced tillage practices, changing fertilizer use, rotating or diversifying crops, planting trees, and retiring land from production.

Additionality. Many agreements require "additionality," which means there must be new or "additional" carbon reductions that occur because of the carbon agreement, which would not have occurred in the absence of the agreement. On the other hand, some agreements accept past carbon practices up to a certain period of time, such as within the past two years. This is a tricky term to navigate for farmers who have engaged in acceptable practices in the past. An agreement may address whether those practices count toward the generation of a carbon credit or for payment purposes.

Time periods. Two time periods might exist in an agreement. The first is the required length of time for participation in the program, which may vary from one year to ten or more years. The second relates to the concept of "permanence," or long-term carbon reductions. To ensure permanence and reduce the risk that gains in one year could be lost by changes in the next year, the agreement may require continuation of the carbon practices for a certain time period after the agreement ends, such as five or ten years.

Verification and certification. Here's an important question—how do we know whether the carbon practices do generate carbon reductions that translate into actual carbon credits? Verification and certification help provide an answer. But verification is a testy topic because there is uncertainty about how to identify and measure carbon reductions resulting from different practices on different soils in different settings. Predictions that are based upon models are common, but there is disagreement over appropriate and accurate methodology for the models. Some programs may also verify practices with data acquisition and on-the-ground monitoring activities and soil tests. And it's common to require that an independent third party verify and certify the practices and carbon credits, raising additional questions of which verifiers are acceptable. A final concern: who pays the costs of verification and certification?

Data rights and ownership. The verification question naturally leads us to a host of data questions. Data is critical to understanding and verifying carbon practices, and every agreement should include data sharing and ownership provisions. What data must be shared, who has access to the data, how will data be used, and who owns the data are questions in need of clear answers in the agreement.

Legal remedies. There's always the risk that a contract will go bad in some way, whether due to non-performance, non-payment, or disputes about performance and payment. A carbon agreement could include provisions that outline how the parties will remedy these problems. An agreement might define circumstances that constitute a breach and the actions one party may take if breach conditions occur. An agreement could also list reasons for withholding payment from a farmer; one concern is that insufficient data or proof of carbon reductions or carbon credit generation could be a basis for withholding payment. There could also be penalties for early withdrawal from the program or early termination of the agreement. It's important to decipher any legal remedies that are contained within a carbon agreement.

We've heard of carbon farming before, but today it raises new uncertainties. Caution and careful consideration of a carbon agreement should address some of those uncertainties. Our list offers a starting point, but it's not yet a complete list. As we learn more about the developing carbon farming market, we'll continue to raise and hopefully resolve the legal issues it can present.

For more information on carbon agreements, see this listing from the Ohio Soybean Council of programs available to Ohio farmers with a side-by-side comparison of those programs, and this report on How to Grow and Sell Carbon Credits in US Agriculture from Iowa State University Extension..

BQA Re-certification Sessions Planned

BQA Re-certification Sessions Planned

The Coshocton County Extension office will be offering a series of **Beef Quality Assurance (BQA)** re-certification meetings throughout the remainder of this year as a total of 179 producers will need to obtain re-certification before the end of 2021.

To help producers obtain their certification, we have scheduled a series of re-certification sessions for the remainder of the year. These sessions will be held in Room 145 at the Coshocton County Services Building located at 724 South 7th Street in Coshocton County. Producers can choose the session which bests fits their schedule. Sessions will be

held on:

- Monday, August 9 (7:00 to 8:30 p.m.)
- Monday, September 13 (7:00 to 8:30 p.m.)
- Monday, October 11(7:00 to 8:30 p.m.)
- Wednesday, November 3 (7:00 to 8:30 p.m.)
- Wednesday, December 1 (7:00 to 8:30 p.m.)
- Tuesday, December 14 (7:00 to 8:30 p.m.)

Pre-registration is required for each session as space is limited. There is no fee to attend. Call 740-622-2265 to pre-register. These sessions also qualify for anyone who is seeking a first time certification. A program flyer is also attached to this newsletter.

Other Ways to Re-certify:

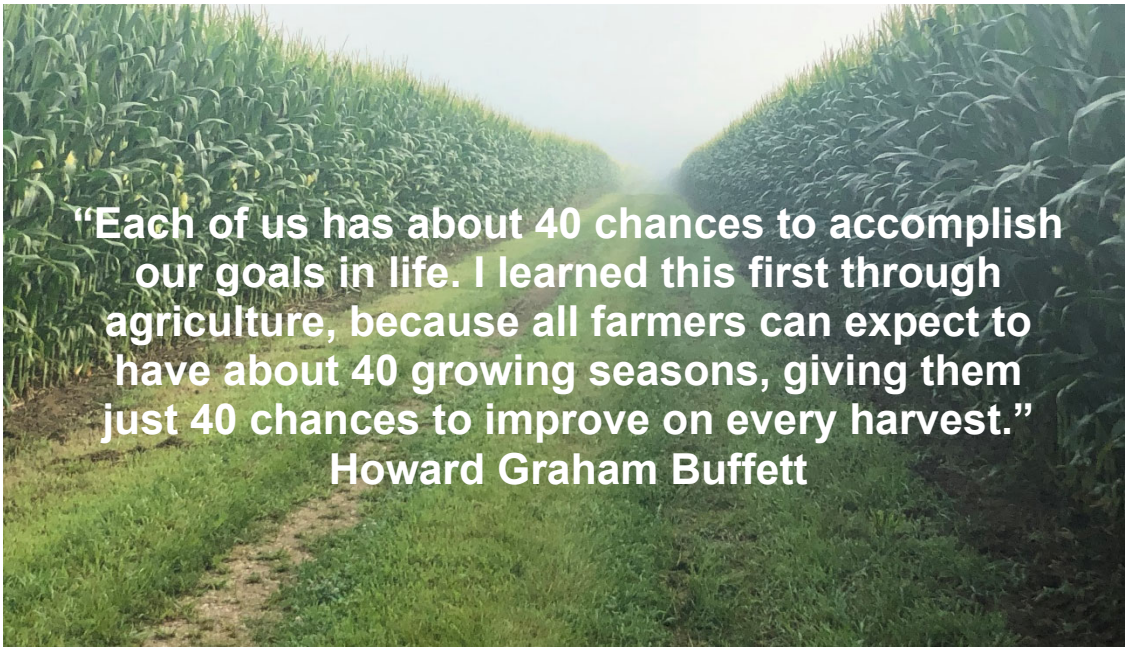
- Online certification and recertification is also available and can be completed anytime at https://www.bqa.org/beef-quality-assurance-certification/online-certifications.

- Producers can also attend sessions hosted by the Tuscarawas County Extension office at the Sugarcreek Stockyards on August 10 (1 p.m.) or August 25 (7 p.m.). Pre-registration is requested by calling 330-339-2337 or by emailing Chris Zoller at Zoller.1@osu.edu

Farm Science Review Tickets Now on Sale

The Ohio State University's Farm Science Review, which was held online last year because of the pandemic, will return this year to be live and in person for the 59th annual event. Advance tickets for the Farm Science Review are available at all Ohio State University Extension county offices for $7. This year's Farm Science Review will be held at the Molly Caren Agricultural Center in London, Ohio on September 21-23, 2021. Tickets are $10 at the gate; however, presale tickets can be purchased at your local OSU Extension for $7 per ticket through Monday, September 20, 2021. Children 5 and under are admitted free. The review hours are 8:00 a.m. to 5:00 p.m. on September 21 & 22 and from 8:00 a.m. to 4:00 p.m. on September 23.

Farm Science Review is known as Ohio's premier agricultural event and typically attracts more than 130,000 farmers, growers, producers and agricultural enthusiasts from across the U.S. and Canada annually. Participants are able to peruse 4,000 product lines from roughly 600 commercial exhibitors and engage in over 180 educational workshops, presentations and demonstrations delivered by experts from OSU Extension and the Ohio Agricultural Research and Development Center. More information about the Farm Science Review is at http://fsr.osu.edu



CFAES

Agronomy Update

Thursday, August 26, 1pm - 4pm at Durbin Farms
4227 Durbin Rd. SE, New Philadelphia, OH 44663

Please pre-register by **August 24** in order to have materials prepared.
Call 330-339-2337 or email zoller.1@osu.edu to register.

- **Parts & Equipment Shortages are Real - Be Prepared: Thoughts on 2021 Harvest & 2022 Planting**
  - Dr. John Fulton, OSU Food, Agriculture, and Biological Engineering
- **Are You Ready for Carbon Markets?**
  - Mike Estadt, OSU Extension Educator, ANR, Pickaway County
- **OSU Extension Agronomy & Farm Management Resources**
  - Chris Zoller, Extension Educator, ANR, Tuscarawas County
- **Lessons Learned from Building a Farm Shop**
  - Matt & Luke Durbin, Durbin Farms

Chris Zoller, Associate Professor, Extension Educator, Agriculture & Natural Resources
OSU Extension, Tuscarawas County 419 16th St SW, New Philadelphia, OH 44663
Email: zoller.1@osu.edu Office: 330-339-2337 Direct: 330-365-8159

Tuscarawas.osu.edu

THE OHIO STATE UNIVERSITY
COLLEGE OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL SCIENCES

We Sustain Life

Sheep 101 Field Day

Saturday, August 14
9:00 a.m. – 2:30 p.m.

OSU Extension – Morrow County and Morrow County Farm Bureau are offering a FREE small ruminant field day for local sheep producers. The program is set up for beginning and experienced producers. The topics in the program will include:

- Labor Saving Time Tricks
- Shearing
- Vaccinations
- Scrapies eradication
- Lambing Simulator
- Experienced Producer Q&A Panel

The sessions will be taught by OSU Extension Educators and industry professionals. Lunch will be provided. Funding for the program is provided by OSIA, OSWP and ASI.

Dale and Cathy Davis Farm
3149 County Road 169
Cardington, Ohio 43315

Please RSVP by July 31 to Morrow County Farm Bureau
419-747-7488 or
morrow.ofbf.org

OHIO FARM BUREAU EST. 1919 MORROW COUNTY

4-H YOUTH DEVELOPMENT · COMMUNITY DEVELOPMENT · MASTER GARDENER · OSU EXTENSION MORROW COUNTY · SNAP-ED NUTRITION · AGRICULTURAL & NATURAL RESOURCES · FAMILY & CONSUMER SCIENCES

OSIA Ohio Sheep Improvement ASSOCIATION

ASI

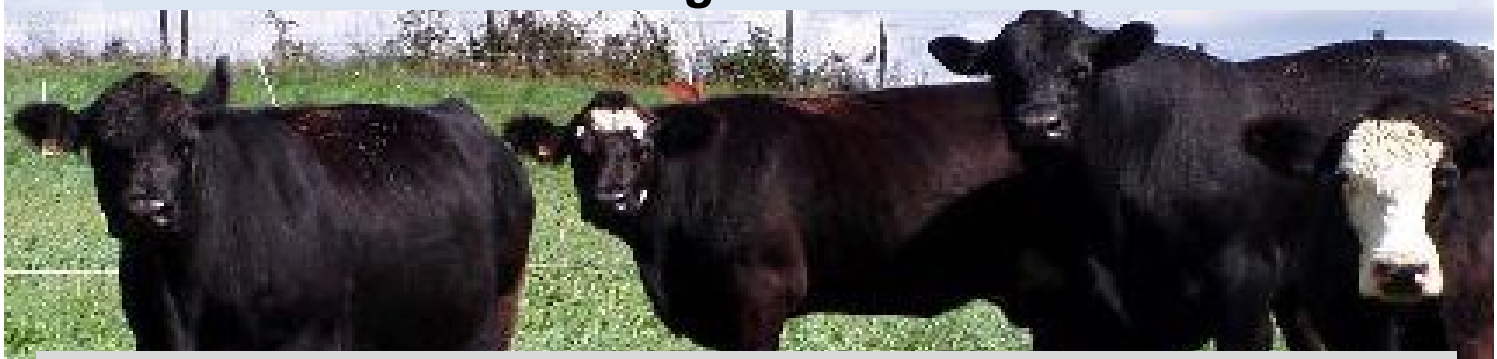
THE OHIO STATE UNIVERSITY
COLLEGE OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL SCIENCES

CFAES

OHIO STATE UNIVERSITY EXTENSION

BEEF QUALITY ASSURANCE

Re-certification Trainings for Livestock Producers



Coshocton County will be hosting a series of Beef Quality Assurance re-certification programs to allow beef and dairy producers to re-certify their beef quality assurance. Pre-registration is required for each session as space is limited.

Sessions Will Be Held:

July 12, August 9, September 13, October 11, November 3, December 1 & 14

7:00 to 8:30 p.m.

Coshocton County Services Building
724 South 7th Street - Room 145, Coshocton, OH 43812
Seating is limited, so please RSVP
Register by calling: 740-622-2265

Other Sessions are being offered in neighboring counties or can be completed on-line anytime at bqa.org.

THE OHIO STATE UNIVERSITY
COLLEGE OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL SCIENCES

COSHOCTON COUNTY EXTENSION

CFAES

OSU EXTENSION – TUSCARAWAS COUNTY

Beef Quality Assurance (BQA) Recertification

Beef and dairy producers who have a BQA certification that expires in 2021 can attend one of the following sessions to satisfy recertification requirements.

- **July 21 at 1pm**
- **July 29 at 7pm**
- **August 10 at 1pm**
- **August 25 at 7pm**

Location:
Sugarcreek Stockyards
Cost:
No Charge

Pre-Registration is requested in order to have materials prepared.

Please call: **330-339-2337**

Chris Zoller, Associate Professor, Extension Educator, Agriculture & Natural Resources
OSU Extension, Tuscarawas County 419 16th St SW, New Philadelphia, OH 44663
Email: zoller.1@osu.edu Office: 330-339-2337 Direct: 330-365-8159

COOL BEAN

University of Wisconsin-Madison | UW Extension

WWW.COOLBEAN.INFO

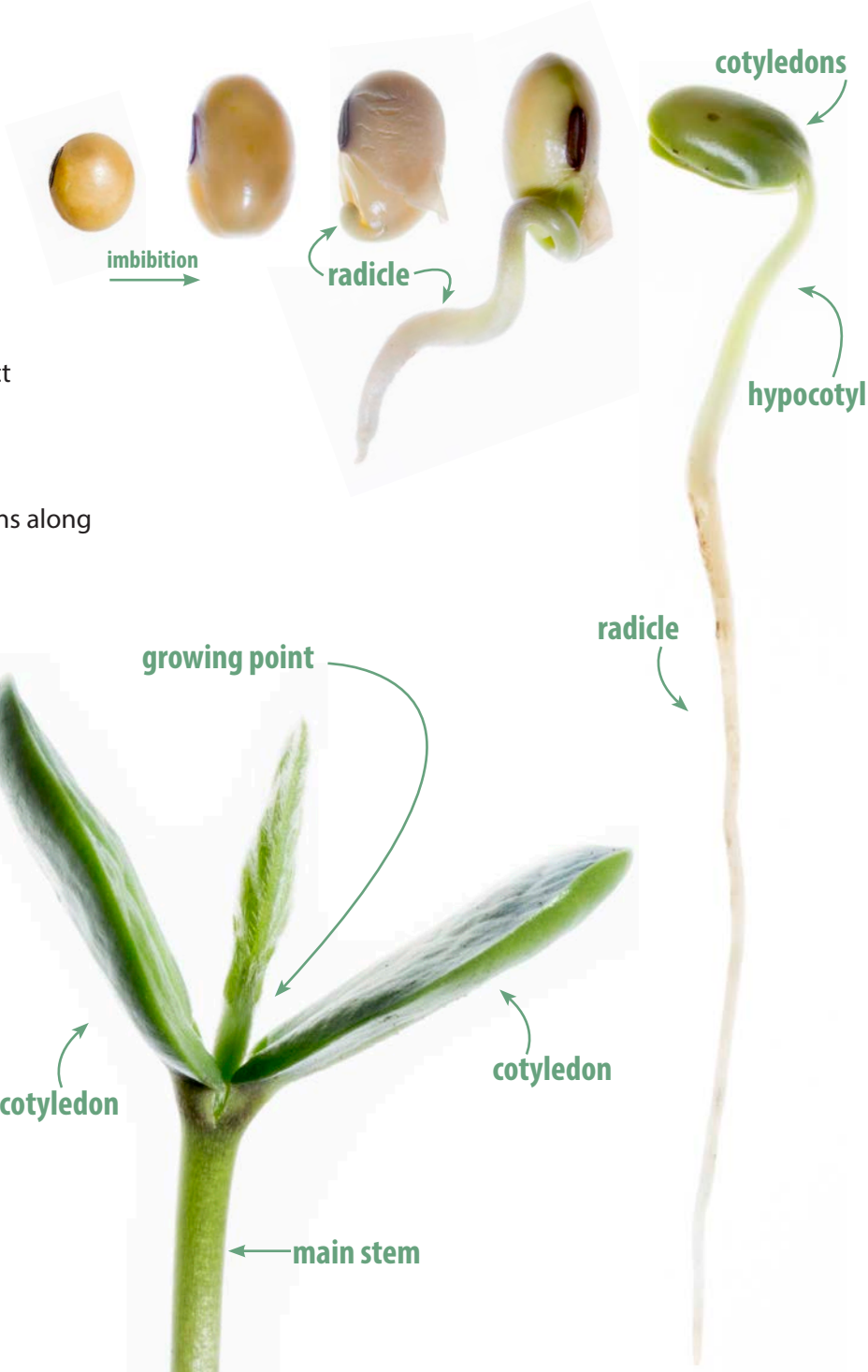
A Visual Guide to Soybean Growth Stages

Understanding and being able to correctly identify the growth stages of soybean is important for making sound agronomic management decisions. This guide describes the growth stages starting with germination, progressing through the vegetative stages (V) and concluding with the reproductive stages (R). Coolbeans!

Germination

Germination begins with the seed absorbing 50% of its weight in water, this is called imbibition

- Imbibition is dependent on soil temperature (optimum 60-70°F) and soil moisture (optimum 50%)
- Imbibition requires good seed-to-soil contact
- The radicle (or primary root) grows from the swollen seed and elongates downward
- The hypocotyl begins elongation upward toward the soil surface, pulling the cotyledons along



VE

Vegetative Stage Emergence

Cotyledons above the soil surface

VE stage occurs approximately 5-14 days after planting depending upon the soil temperature, which can be influenced by planting date

- Soil crusting and planting depth (either too deep or too shallow) can inhibit emergence
- Planting too deep can also delay emergence; planting depth should be between ¾ to 1-½ inches

Methods

There are two methods used to determine the **vegetative** growth stages of soybean. Although they use different techniques, the resulting growth stage determination is the same; it's helpful to understand how both work and be familiar with the terminology.

1. Hybrid Method (P. Pedersen)

Pedersen, Palle. 2009. *Soybean growth and development.* Iowa State University Extension, Ames, Iowa.

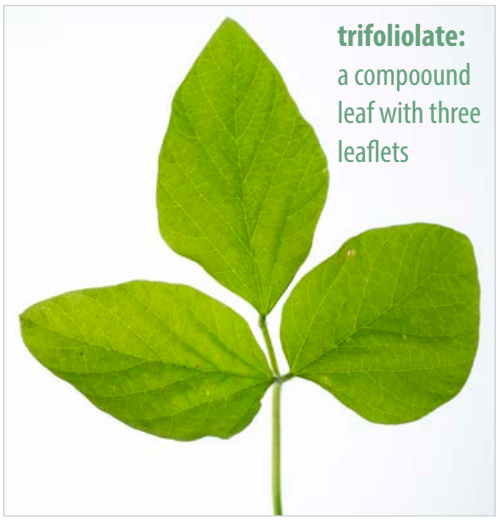
This method is commonly used in the field and grower publications; it counts the number of **open** trifoliolate leaves on the main stem.

2. Fehr and Caviness Method

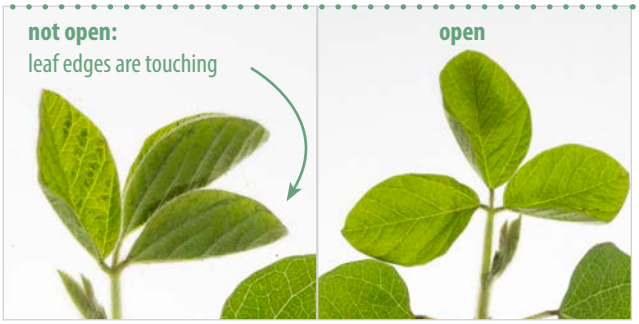
Fehr, W.R., Caviness, C.E., 1977. *Stages of soybean development.* Cooperative Extension Service, Agriculture and Home Economics Experiment Station, Iowa State University, Ames, Iowa.

This method is used in academic settings and journal articles; it counts the number of nodes on the main stem, beginning with the unifoliolate nodes, that have or have had a **fully developed** leaf. A leaf is considered fully developed and the node is counted when the leaf at the node immediately above it is open.

Quick tips!

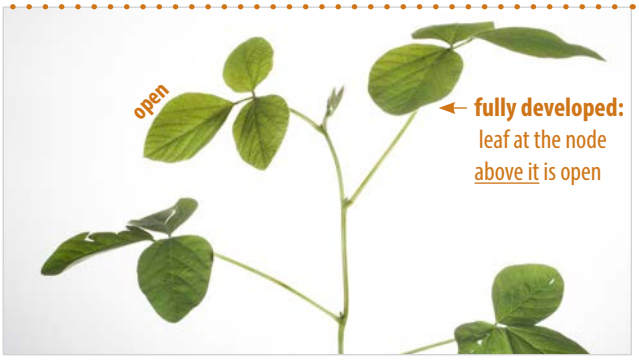


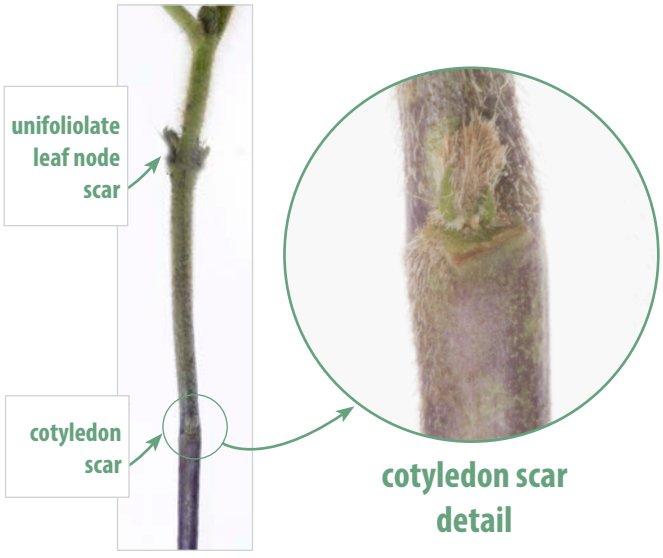
A leaf is considered **open** when the individual leaves are unrolled, and the leaf edges are no longer touching.



A leaf is considered **fully developed** when the leaf at the node immediately above it is open.

A node is the part of the stem where the leaf petiole develops.



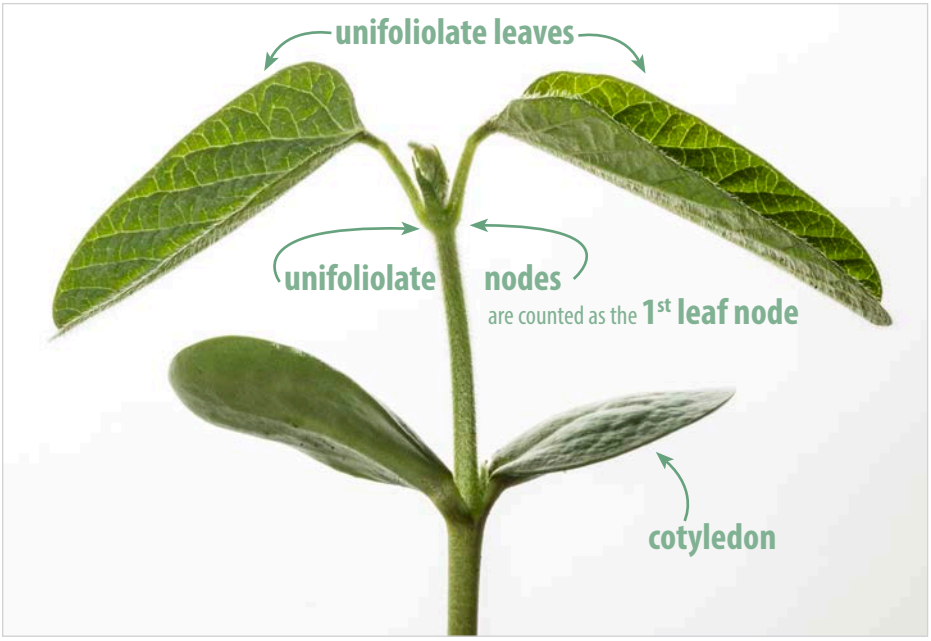


Leaf scars can be useful for locating nodes even if the leaves are lost or damaged.

1. Begin at the lowest portion of the stem above the soil surface. Feel for the first set of scars from the cotyledons. The scars will be opposite on the stem.
2. Above these are a second set of opposite scars that mark the unifoliolate leaf nodes.
3. All of the scars above the unifoliolate leaf nodes are singular and opposite on the stem.

VC

Vegetative Stage Cotyledon

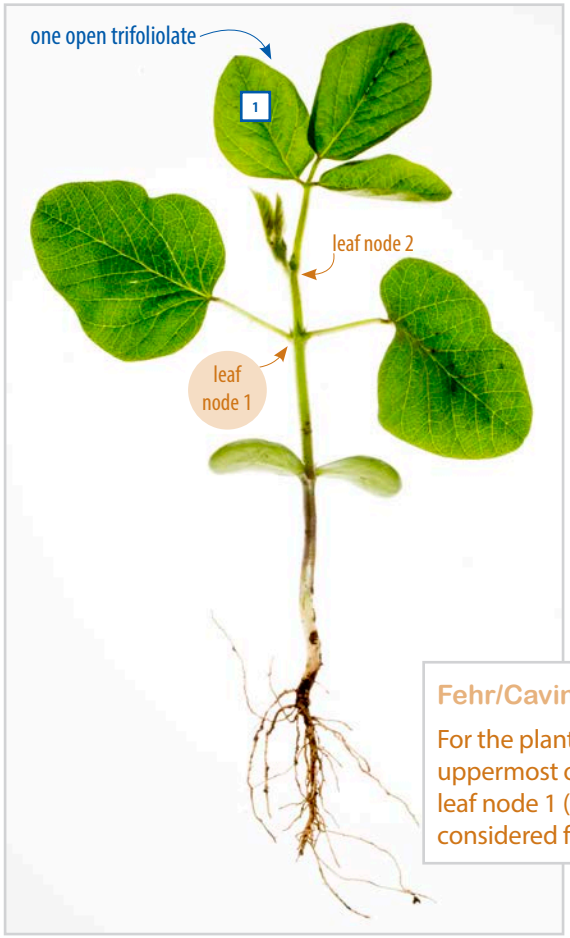


Unifoliolate leaves unrolled sufficiently so the leaf edges are not touching

- Unifoliolate leaves are simple, consisting of a single leaf blade
- Unifoliolate leaf nodes are opposite on the stem and are counted as the 1st leaf node
- The cotyledons are the first source of nutrients and energy prior to photosynthesis
- Plants will not recover if damaged below cotyledons

V1

Vegetative Stage 1



Hybrid method:

One open trifoliolate

Fehr/Caviness method:

Fully developed leaves at unifoliolate nodes

- The 2nd leaf node and all nodes to follow are singular and alternate on the stem
- Nitrogen fixing root nodules begin to form on the roots through infection by *Bradyrhizobium japonicum* bacteria (introduced via inoculation or native in the soil)
- Nitrogen fixation is necessary for high yields
- Assess stand count during this stage to determine if replanting is necessary

see *Think Twice Before Replanting Soybeans* at http://www.coolbean.info/library/documents/SoybeanReplant_2014_FINAL.pdf or download the BeanCam app, links available at http://ipcm.wisc.edu/apps/beancam/

3 easy steps — Fehr/Caviness method

1. Starting at the top of the plant, find the uppermost **open** trifoliolate on the main stem and locate the corresponding node.
2. Move down the stem to the next node.
3. Count that node and all nodes below it on the main stem including the 1st leaf node (unifoliolates nodes).

   The number of nodes counted is the vegetative growth stage.

Fehr/Caviness method:

For the plant pictured, leaf node 2 has the uppermost open trifoliolate, so the leaves at leaf node 1 (the unifoliolate nodes) would be considered fully developed; the plant is at V1.

Good to know!

Each method uses a similar notation for the vegetative stages:

Hybrid method: **Vn** .....where **n** represents the number of open trifoliolates

Fehr/Caviness: **Vn nth node**..where **n** represents the number of nodes on the main stem (beginning with the unifoliolate leaf nodes) that have or had a fully developed leaf

V2

Vegetative Stage 2

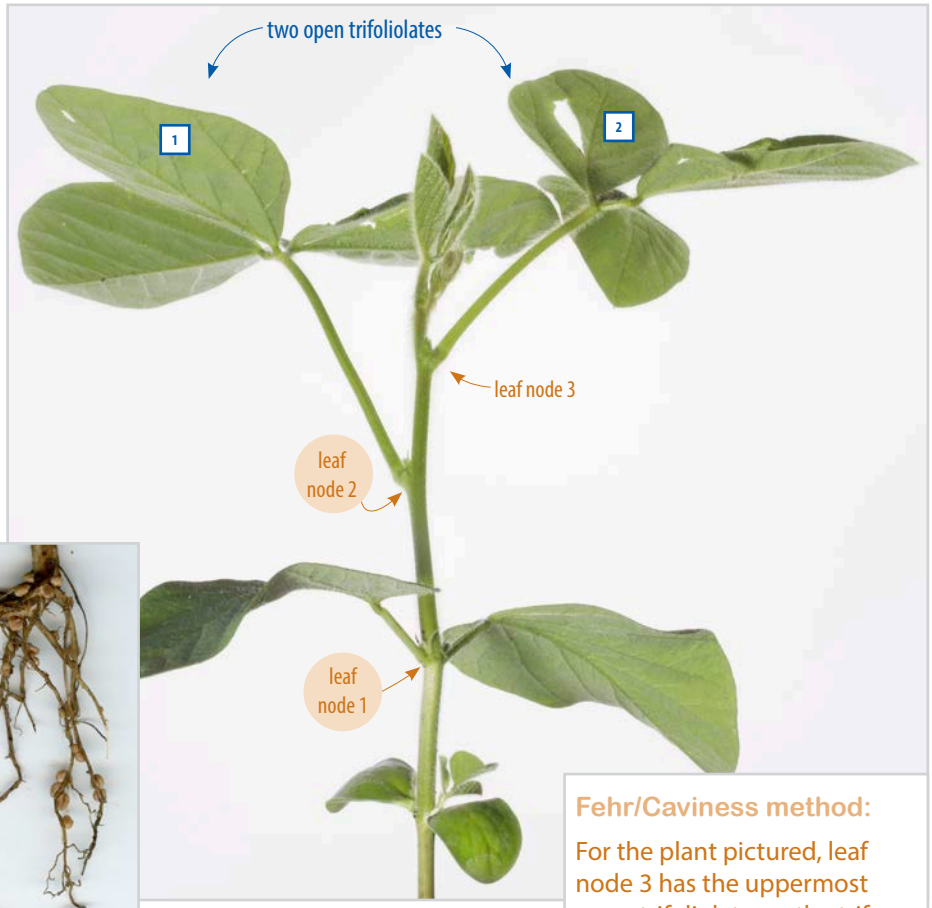
Hybrid method:

Two open trifoliolates

Fehr/Caviness method:

Fully developed trifoliolate leaf at node above the unifoliolate nodes

- Lateral roots are growing rapidly
- Active nitrogen fixation of the root nodules has most likely begun



Fehr/Caviness method:

For the plant pictured, leaf node 3 has the uppermost open trifoliolate, so the trifoliolate at leaf node 2 (the node above the unifoliolate nodes) would be considered fully developed; the plant is at V2.

If weeds are present during these stages, consider herbicide application to minimize yield loss

V3

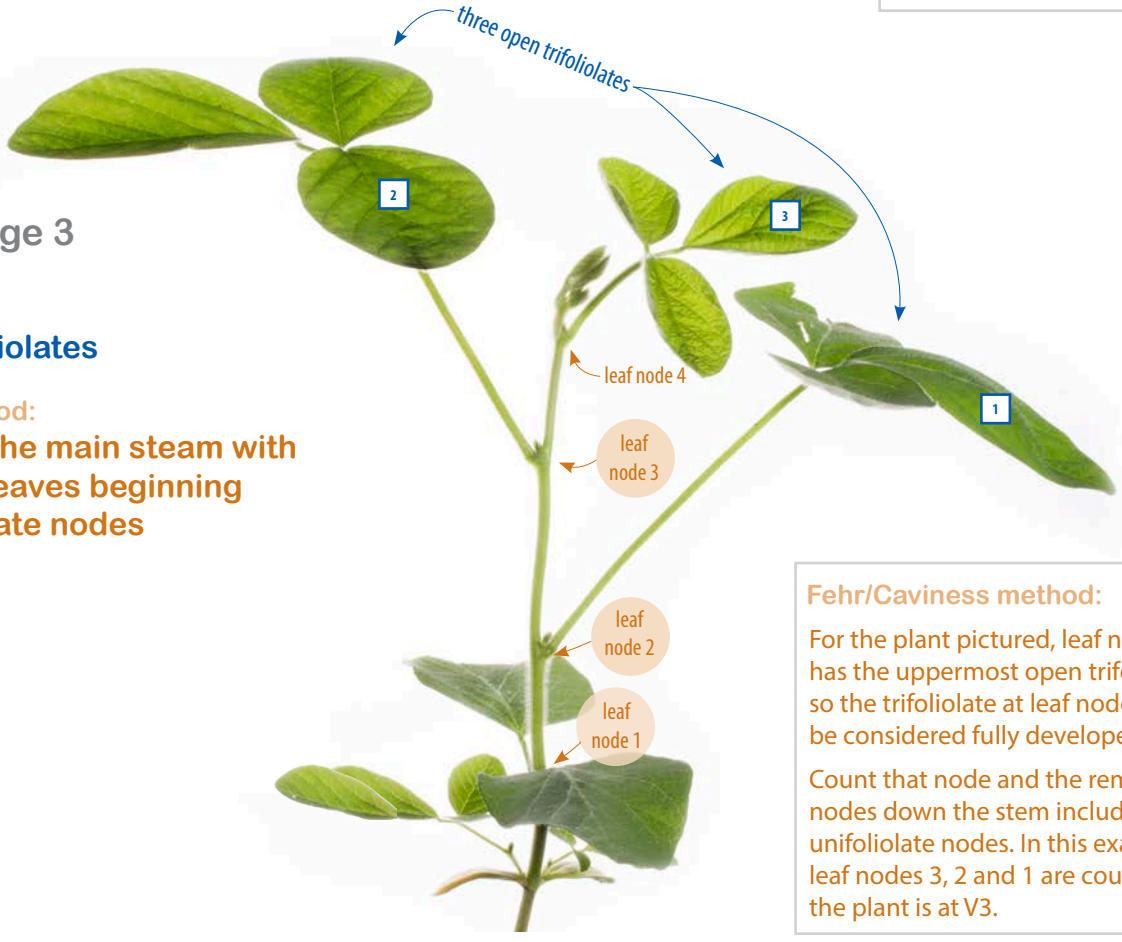
Vegetative Stage 3

Hybrid method:

Three open trifoliolates

Fehr/Caviness method:

Three nodes on the main steam with fully developed leaves beginning with the unifoliolate nodes



Fehr/Caviness method:

For the plant pictured, leaf node 4 has the uppermost open trifoliolate, so the trifoliolate at leaf node 3 would be considered fully developed.

Count that node and the remaining nodes down the stem including the unifoliolate nodes. In this example, leaf nodes 3, 2 and 1 are counted; the plant is at V3.

V4

Vegetative Stage 4

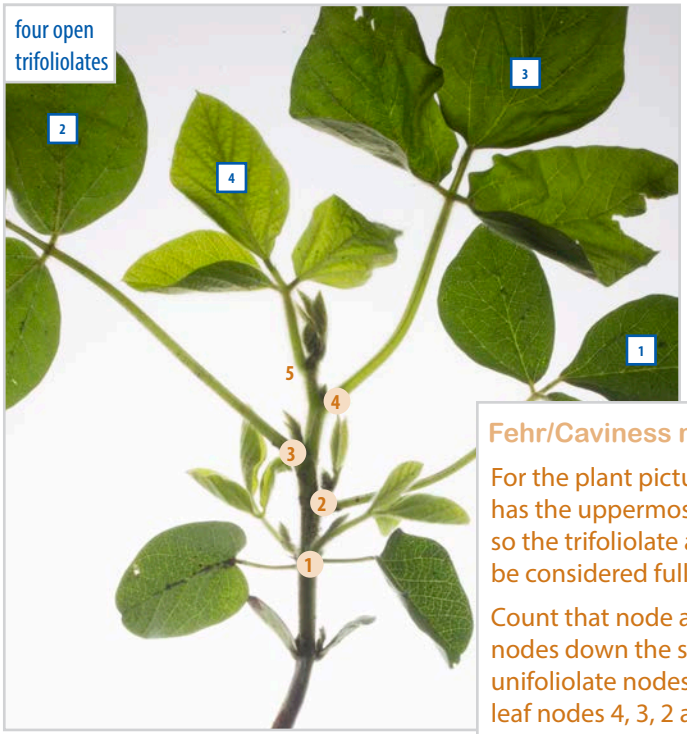
Hybrid method:

Four open trifoliolates

Fehr/Caviness method:

Four nodes on the main stem with fully developed leaves beginning with the unifoliolate nodes

- For May planting dates in Wisconsin, flower buds start to develop between V4-V6
- Plants can recover from 100% defoliation at this stage with minimal risk of yield loss



Fehr/Caviness method:

For the plant pictured, leaf node 5 has the uppermost open trifoliolate, so the trifoliolate at leaf node 4 would be considered fully developed.

Count that node and the remaining nodes down the stem including the unifoliolate nodes. In this example, leaf nodes 4, 3, 2 and 1 are counted; the plant is at V4.

V5

Vegetative Stage 5

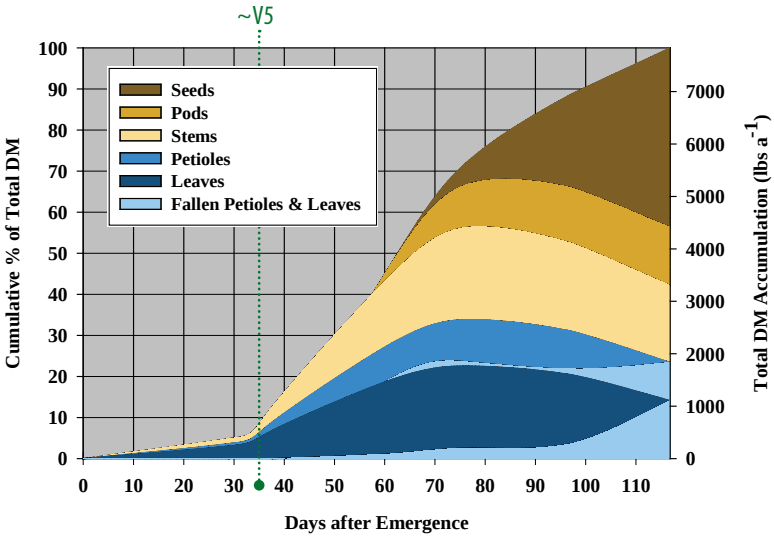
Hybrid method:

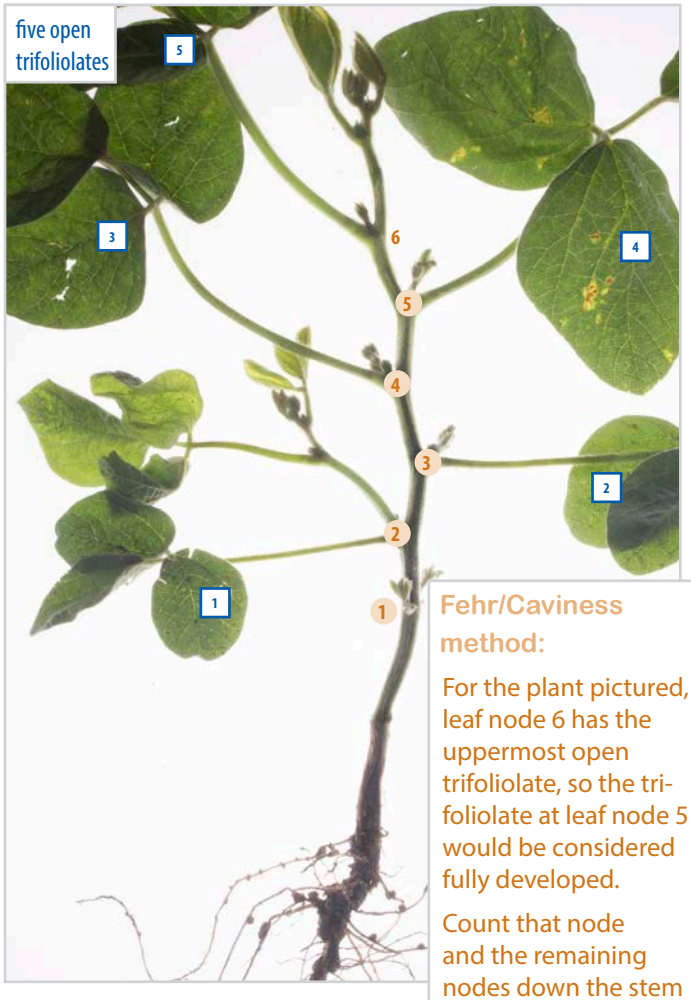
Five open trifoliolates

Fehr/Caviness method:

Five nodes on the main stem with fully developed leaves beginning with the unifoliolate nodes

- Rapid dry weight accumulation begins





Fehr/Caviness method:

For the plant pictured, leaf node 6 has the uppermost open trifoliolate, so the trifoliolate at leaf node 5 would be considered fully developed.

Count that node and the remaining nodes down the stem including the unifoliolate nodes. In this example, leaf nodes 5, 4, 3, 2 and 1 are counted; the plant is at V5.

Keep going!

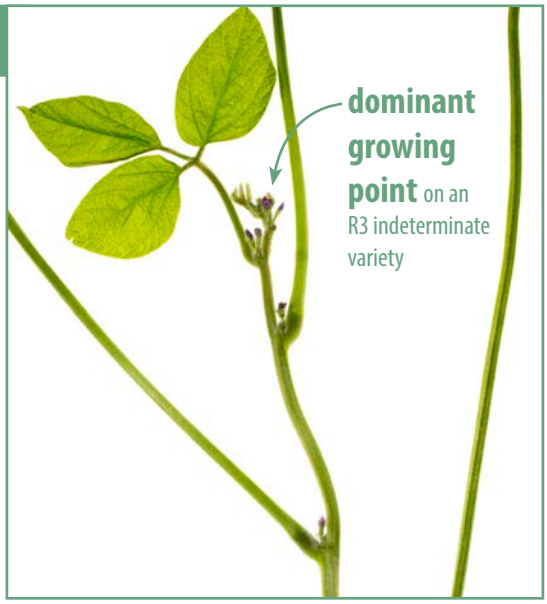
V6, V7, etc., you get the picture. After V6, stages progress rapidly, usually every 3-5 days. Soybean growth habit (whether a variety is determinate or indeterminate) will influence how many more V stages occur and if the V stages cease or continue after the R stages begin.

Soybean growth habits

The dominant growing point's behavior differs with the two types of soybean growth habits.

Indeterminate

Continues new vegetative growth even after flowering begins



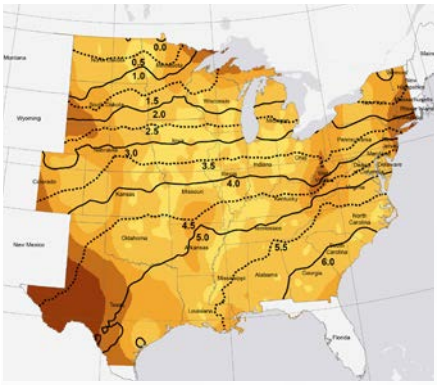
The dominant growing point on the main stem is also called the apical meristem or the stem apex.

IMPORTANT NOTE!

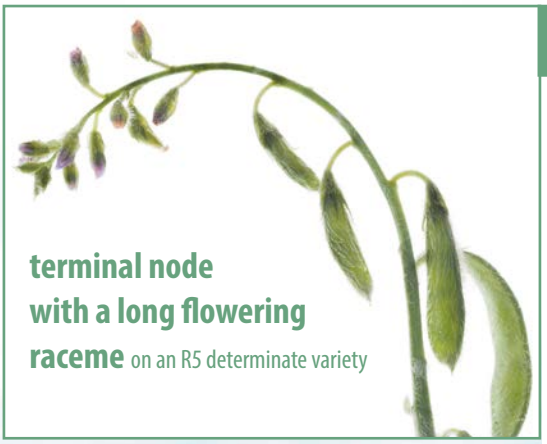
*The images in this guide generally represent **indeterminate** varieties grown in Wisconsin, keep in mind:*

- *Rate of development can vary based on temperature, maturity group, soil conditions, planting date and planting patterns*
- *Differences may occur in time between stages, internode length, plant height and number of leaves*

Indeterminate varieties are typically grown in the Central and Northern U.S. **(maturity groups 0.0~4.5)**



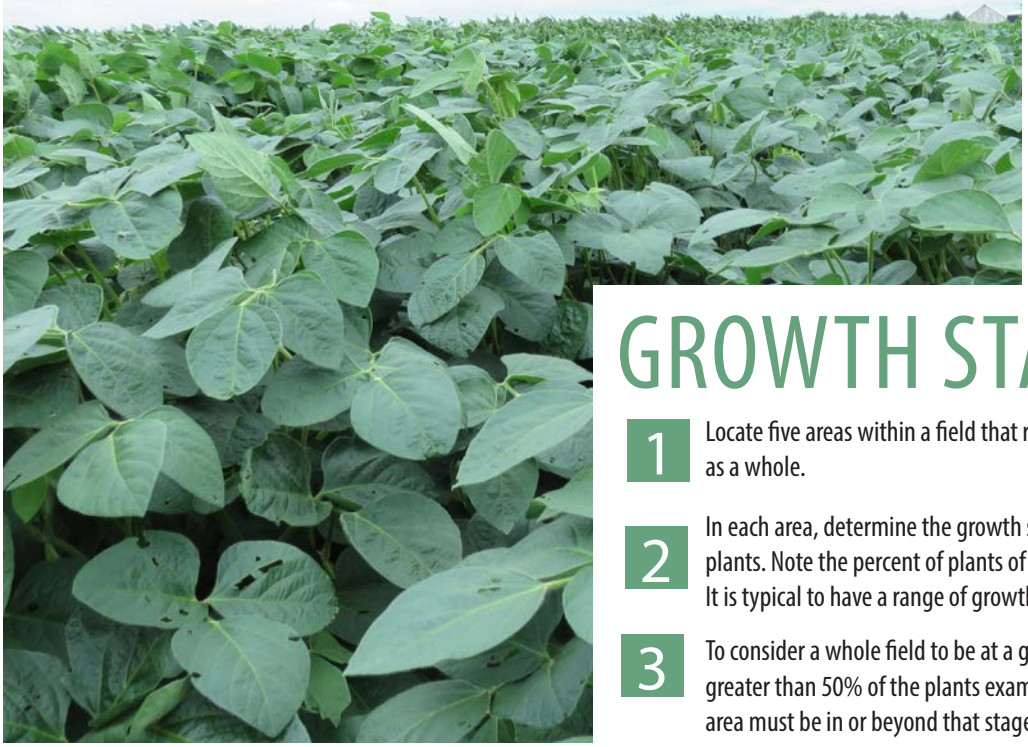
Determinate varieties are typically grown in the Southern U.S. **(maturity groups 4.5~6.0)** and in South America



Determinate

Ceases new vegetative growth soon after flowering begins

- Determinate plants have a terminal node with a long flowering raceme on the main stem, indicating the end of vegetative growth
- Flowers develop around the same time on determinate varieties; therefore pod and seed development are more uniform when compared to an indeterminate variety



It is critical to accurately identify the correct growth stage for the entire field in order to make sound management decisions!

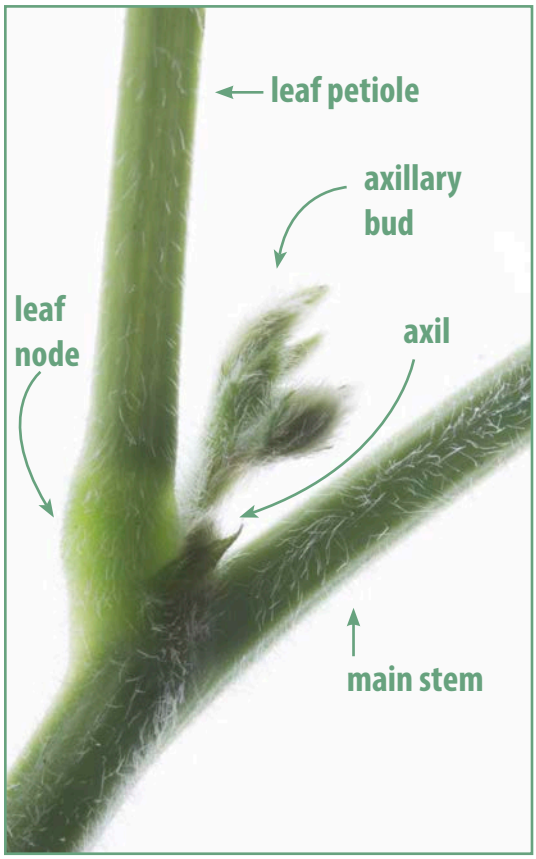
GROWTH STAGING A FIELD

1. Locate five areas within a field that represent the field as a whole.
2. In each area, determine the growth stage of at least ten plants. Note the percent of plants of each growth stage. It is typical to have a range of growth stages.
3. To consider a whole field to be at a growth stage, greater than 50% of the plants examined within each area must be in or beyond that stage.

	Growth Stage	
Area	V3	V4
1	50%✓	50%
2	40%	60%✓
3	70%✓	30%
4	60%✓	40%
5	60%✓	40%

The field in this example would be at V3.

Axillary buds



Soybean plants have multiple growing points on the main stem called axillary buds. They are located in the axil, which is located at the upper-angle junction between the main stem and leaf petiole. Each axillary bud is capable of branching or can remain dormant.

If the dominant growing point is damaged, the plant responds by directing the axillary buds to branch and further develop.

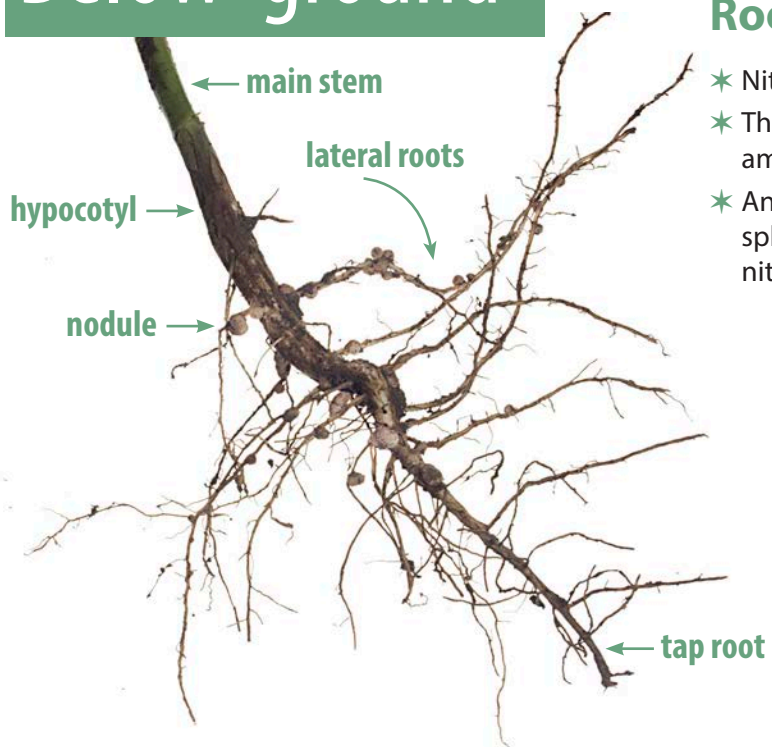
This is important! If a plant's growing point is damaged (by hail, for example), the plant has the capacity to recover via the axillary buds. Pretty cool....

Compare these V5 plants: The growing point (apical meristem) of the plant on the right has been clipped; the plant has more branching and consequently more development of leaves, nodes, axils, axillary buds, flowers and pods.

V5 soybean with intact apical meristem

V5 soybean with clipped apical meristem

Below-ground



Root nodules

- Nitrogen fixation continues through R6
- The number of nodules is not strongly correlated to the amount of nitrogen fixed; nodule efficiency is more important
- An actively nitrogen fixing nodule is pink in the middle when split open (green, brown or white internal coloration mean no nitrogen fixation is occurring)

detail of active nitrogen fixing nodule

R1

Reproductive Stage 1

One open flower at any node on the main stem

- Flowering begins on the 3rd to 6th nodes of the main stem
- Flowering on the branches begins after those on the main stem
- Flowers can be purple or white
- If a field has a history of white mold, this is the earliest growth stage to apply an effective fungicide

R2

Reproductive Stage 2

Open flower at one of the two uppermost nodes on the main stem with a fully developed leaf

- Flowering will continue for 3-5 weeks
- 20-80% of flowers produced will be aborted
- 50% defoliation can reduce yield by 6%
- 100% defoliation can reduce yield between 23-40%

R3

Reproductive Stage 3

Pod is 3/16 inch long at one of the four uppermost nodes on the main stem with a fully developed leaf

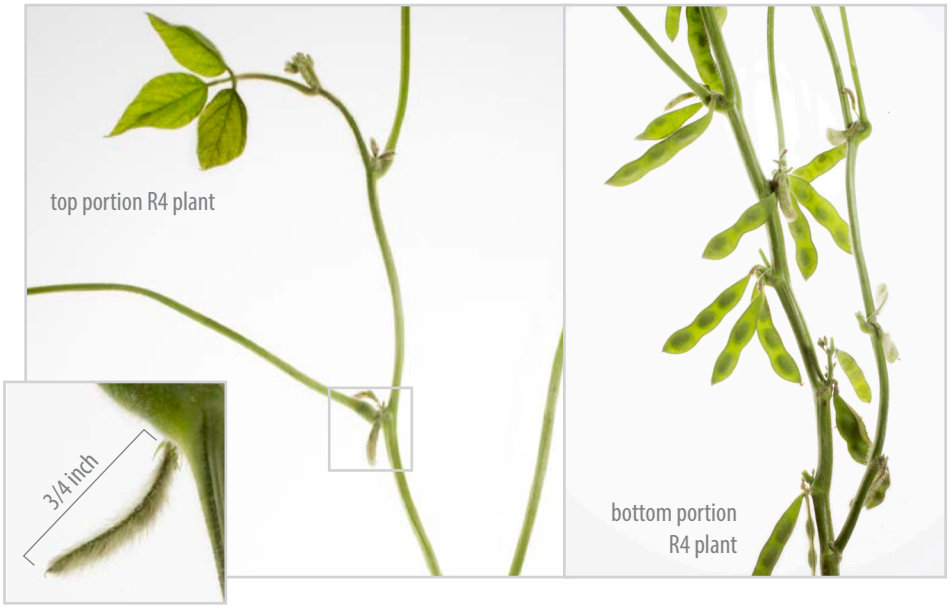
- A plant can have all of the following: developing pods, withering flowers, new open flowers and flower buds
- Potassium uptake rates peak shortly after R2, ranging between 3.5-5.2 lb K_2O /acre/day
- Last growth stage to treat for white mold

R4

Reproductive Stage 4

Pod is 3/4 inch long at one of the four uppermost nodes on the main stem with a fully developed leaf

- At this stage, rapid pod growth is occurring and seeds are starting to develop
- Flowering continues on the upper branch nodes
- Peak nitrogen uptake rates occur between R4-R5, ranging between 3.0-4.0 lb N /acre/day



Pod and seed development

IMPORTANT NOTE!

The size of the developing pods and seeds at one of the four uppermost nodes on the main stem with a fully developed leaf determines the R stage from R3 thorough R6. When staging plants, ***it is important to examine only these nodes*** *as plants will simultaneously have a range of pods and seed sizes above and below these nodes.*

Soybean plant at R6, note the range of pod sizes throughout the plant.

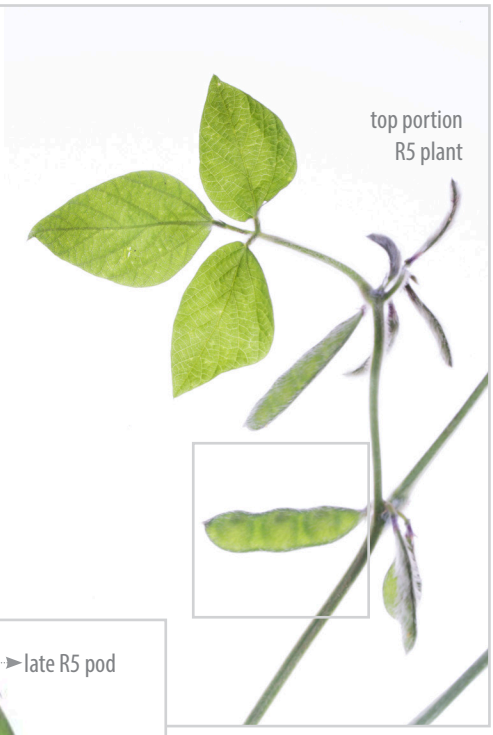
R5

Reproductive Stage 5

Symptoms of many diseases, including white mold and SDS begin to show up at this growth stage. This is a good growth stage to determine the severity of disease. **Treating most diseases with fungicides is not recommended at this time.**

Seed is 1/8 inches long in the pod at one of the four uppermost nodes on the main stem with a fully developed leaf

- Rapid seed filling begins, while root growth slows
- Dry weight and nutrients begin redistributing through the plant to the developing seed
- 50% defoliation can decrease yield by 15-17%
- After R5.5, nitrogen uptake by the roots and existing nitrogen in vegetative tissue begins rapid remobilization to the seed

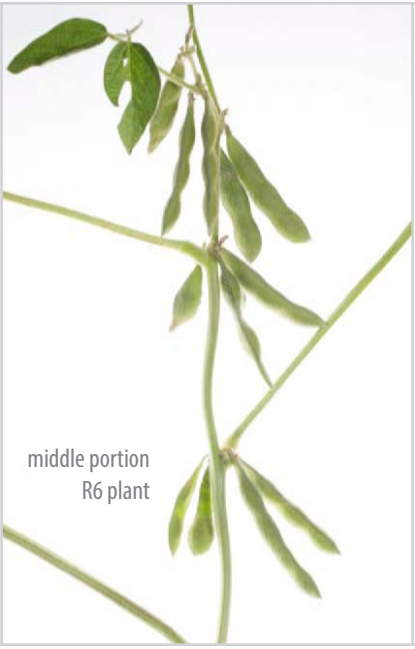


R6

Reproductive Stage 6

Pod containing a green seed that fills the pod cavity at one of the four uppermost nodes on the main stem with a fully developed leaf

- Beans of many sizes can be found on the plant
- Large amounts of nitrogen are still being accumulated from the soil and remobilized to the seed



R7

Reproductive Stage 7

One mature-colored pod anywhere on the main stem

- Yellow pods are moving toward maturity
- Tan, brown or tawny pods (depending on variety) signal physiological maturity
- Seeds at the R7 growth stage are at approximately 60% moisture
- Continue irrigation until R7

late R7 plant

Maturing pods R6-R8

Green pod (R6)

Bean fills pod cavity

Yellow pod

Not physiologically mature

Pod reaches mature color: brown, tan or tawny (R7-R8)

Physiological maturity

Harvestable

R8

Reproductive Stage 8

95% of pods have reached mature pod color

- Mature pod color does not necessarily indicate that beans are ready to harvest
- 5-10 days of drying weather are typically required after R8 for soybean moisture to be less than 15%
- Harvesting at 13% moisture is optimal for storage
- Delaying harvest after optimal moisture is reached can result in yield loss due to shattering and shrinkage

Pod reaches mature color: brown, tan or tawny

Physiological maturity

Harvestable

late R8 plant

TOTAL NUTRIENT UPTAKE AND REMOVAL PER BUSHEL OF SOYBEAN AND NUTRIENT REMOVAL PER TON OF HARVESTED STOVER

Nutrient	Total uptake (lb/bu)	Removal in grain[1] (lb/bu)	Removal in stover[2] (lb/ton DM)
Nitrogen (N)	**3.75**	**3.30**	**19.0**
Phosphorus (P_2O_5)*	**0.90**	**0.74**	**5.2**
Potassium (K_2O)*	**2.30**	**1.17**	**39.0**
Sulfur (S)	**0.21**	**0.16**	**2.2**
Magnesium (Mg)	**0.51**	**0.16**	**9.3**
Calcium (Ca)	**0.96**	**0.12**	**27.5**

Note: These are not nutrient application recommendations, refer to UWEX A2809 ***Nutrient Application Guidelines for Field, Vegetable, and Fruit Crops in Wisconsin*** for more information.

[1] Removal in the grain was calculated at 13% grain moisture.

[2] Stover nutrient content can vary considerably due to the year and yield level. For more accurate estimate of harvested stover, submit samples for nutrient analysis.

* Phosphorus and potassium are displayed in terms of their fertilizer equivalents.

Use this equation to calculate lb/acre uptake or removal for a specific nutrient or use the **Soybean Uptake and Removal Calculator** available at http://badgerbean.com/calculator

expected or actual soybean yield **x** total uptake or removal value of nutrient **=** lb/acre uptake or removal

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This publication is available from the **Nutrient and Pest Management Program** web (ipcm.wisc.edu); phone (608) 265-2660; email (npm@hort.wisc.edu)

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