

EASTERN PANHANDLE AGRICULTURE NEWS



INSIDE THIS ISSUE:

Winter 2020 programs	1-2
Century Farm Program	3
Research Updates	3
SECURE Retirement	4
Recordkeeping	4
Tall Fescue Toxicosis	5
Recycling Christmas Trees	5
USDA Approves Hemp Herbicides	6
Managing Weedy Grasses	6
Know Your Soil by Name	7
Crop updates	8

Winter Dinner Meeting Series

Join us at the start of the new year for another series of educational meetings hosted by WVU Extension.

Thursday, January 16—Transition Planning | Speaker: David Marrison, RSVP by noon January 8

Thursday, February 13—Value Added Cattle Marketing | Speaker: Bill Tucker, RSVP by noon February 5

Thursday, March 12—Weed Control Update | Speaker: Rakesh Chandran, RSVP by noon March 4

Location: WVU Tree Fruit Research & Education Center

67 Apple Harvest Drive, Kearneysville, WV 25430

All sessions will begin at 6:30 PM. Pesticide credits are available for the February and March sessions only. Call the Berkeley County Extension Office at 304-264-1936 to RSVP by the deadline listed above. There is no cost for the meal, thanks to generous local sponsorships.

Eastern Panhandle Grain Growers Conference

Join us on Wednesday, February 12 for the first grain growers meeting, an opportunity to provide timely updates and educational topics to those that work in our row crop industry.

Agenda Topics Will Include:

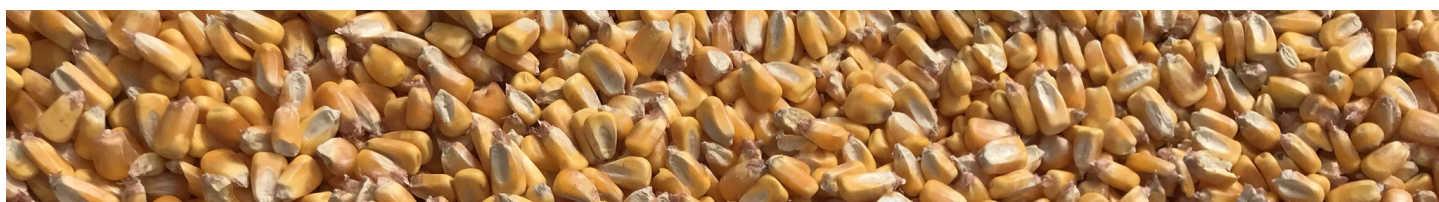
- Grain Bin Safety and Maintenance
Stephen Brown and Michael Dyer, Penn State Ag Safety & Health
- Using Drones for Crop Scouting
Emily Morrow, WVU Extension
- Precision Agriculture in the Panhandle
Chris Conway and Cassie Twigg, Southern States Cooperative

To Register: Send in \$10 payment, cash or check, via mail or in person to:
Jefferson County Extension Office
1948 Wiltshire Road, Ste 3
Kearneysville, WV 25430

Make checks payable to WVU. Payment can also be made at the door, but preregistration is required via phone or email. Pre-registration ends Friday, February 7, 2020. Contact the Extension Office to register.

***Pesticide credits are available for West Virginia, Maryland, and Virginia.

Date: February 12, 2020
Time: 8:30 AM—2:30 PM
Location:
WVU Tree Fruit Research & Education Center
67 Apple Harvest Drive
Kearneysville, WV 25430
Cost: \$10, includes lunch



Farm Business Planning Course

Join us for a five week course that will cover the basics of agriculture entrepreneurship. Whether you are a current producer looking to better understand your finances, customers, or diversity your farm, or a beginner just starting out with a farm business, this course will provide you with the tools to succeed. This class will cover:

- o Evaluate your business idea for profitability, feasibility, and growth potential.
- o Connect with industry professionals and other agriculture entrepreneurs.
- o Create a farm business plan and marketing plan
- o Understand business financials

Snow policy: If Jefferson County Schools are cancelled on a date of class, the class will be postponed until the following week.



Program Details

Time: 6 PM to 9 PM
Location: Jefferson County Extension Office, 1948 Wiltshire Road, Kearneysville, WV
Cost: \$10 for all sessions, collected during the first day of class.
 Preregistration ends January 17. To register or for any questions, call 304-728-7413 or email Emily.Wells@mail.wvu.edu

Schedule

Session 1 - January 22
Getting Started

Session 2 - January 29
4 P's of Marketing

Session 3 - February 5
Know Your Market, Know Your Business

Session 4 - February 12
All About The Money

Session 5 - February 19
Putting it All Together

February 26 - Snow Date

Maryland-Delaware Hay and Pasture Conference Series

January 17 | 8:30 AM to 4 PM

Registration Cost: \$15

Burkittsville Ruritan

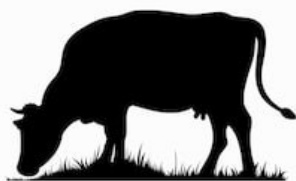
500 East Main St

Burkittsville, MD

Topics to include:

- Tips and Tricks for Successful Forage Renovation and Establishment
- Weed Control in Hay and Pasture
- Making the Most of Adaptive Grazing
- Making Quality Hay and Haylage
- Using Perennials and Annuals in a Balanced Forage System

Visit foragecouncil.com/event for registration.
 Contact Amanda Grev at or 301-432-2767 or email agrev@umd.edu with questions.



Gardening 101

Grow the green thumb you've always dreamed of at this intro to gardening workshop sponsored by the WVU Extension Master Gardener Program. Gardening 101 will be held on Saturday, February 29 from 9 AM—2:30 PM, with doors opening at 8:30 AM.

Topics will include:

- ◆ Setting Up A Garden
- ◆ Seed Selection & Starting
- ◆ What & How To Grow Flowers
- ◆ Caring for Fruit Trees
- ◆ Diseases, Pests, & Weeds
- ◆ Composting

Cost is \$5 cash, paid at the door. Bring a bagged lunch, drinks and snacks will be provided. To register, call the Extension Office at 304-728-7413 or email Emily Morrow at Emily.Wells@mail.wvu.edu. Registration deadline is February 24, 2020.

Saturday, February 29
 9 AM—2:30 PM
 WVU Tree Fruit Research & Education Center
 67 Apple Harvest Lane
 Kearneysville, WV

WVU Extension Small Farm Conference

This annual multi-day conference connects farmers from all across the state.

EXTENSIONSERVICE
SMALL FARM CONFERENCE

SAVE THE DATE

February 19-22, 2020

Charleston Coliseum and Convention Center
 Charleston, West Virginia



Farmers Grow Food and Communities

Choose from more than 110 different classes regarding topics such as: Marketing, Farm Management, Animal Production, Beginning and Advanced Horticulture, Local Food Community, Value Adding and Wholesale Markets, Farm-to-School, Agritourism, Risk Management and Farmers Markets. Visit extension.wvu.edu/conferences to register.



West Virginia Century Farm Program

The West Virginia Century Farm Program is designed to recognize those families who have been farming the same tract of land for at least 100 years. Century Farms, Sesquicentennial Farms and Bicentennial Farms will be recognized. A Century Farm is one that has been in continuous operation by the same family for at least 100 years. A Sesquicentennial Farm has been in continuous operation by the same family for at least 150 years, and a Bicentennial Farm has been in continuous operation by the same family for at least 200 years.

A family member must live on the farm or must be an integral part of the day-to-day operation of the farm enterprise. The farm must consist of at least 10 acres of the original holdings and gross more than \$1,000 annually from farm products. Line of ownership from the first family member owning the land may be through wives, husbands, children, brothers, sisters, nephews, or nieces.

Deadline to Eastern Panhandle Conservation District office is February 1, 2020. Applications can be found on the WVCA website under the Education tab. (www.wvca.us) or call the office at 304-263-4376.

Research Progress in the Panhandle

2019 was a busy year for research in our local Extension Community. The below are just two of several projects have been completed locally.

Needs Assessment—many of you provided us with very valuable feedback as to what types of future research and educational needs you'd like to see in the area. The below topics rated the highest. Keep an eye on our newsletters, the newspaper, and your email for future programs that address these issues.

Crop Production

- ◇ Conservation practices (70.9%)
- ◇ Integrated pest management practices (64.5%)

Farm Management

- ◇ Farm record keeping and evaluation (56.2%)
- ◇ Retirement and transition planning (53.2%)

Marketing

- ◇ Direct marketing (47.7%)

Livestock Production

- ◇ Grazing management practices and economics (69.3%)
- ◇ Conservation practices (66%)
- ◇ Animal nutrition and feeding (65.4%)
- ◇ Monitoring animal health and reproduction (64.5%)

Evaluating Melons as a Potential Farm to School Crop—as part of a statewide trial, watermelons, cantaloupe, and honeydew were planted in late summer at sites across the state and evaluated until fall harvest for disease resistance, marketable yield, flesh color and taste. Although the dry weather impacted yields, the below table shows the top varieties for school markets.

Watermelon	Cantaloupe	Honeydew
Chubbiness (seedless)	Sarah's Choice	Honeyblonde
Moon & Stars	Sugar Cube	
Cathay Belle	Mango	
Blacktail Mountain	Sivan	

Perilla Mint a Potential Problem

A dry late summer meant the arrival of an unwelcomed weed—perilla mint. This pasture pest germinates in shady areas, and can be toxic to livestock if ingested. The good news? When cattle have plenty else to satisfy their rumens, they won't touch the stuff. If you saw Perilla Mint in your pastures in 2019, be sure to scout those areas again between April-June. Take action before the plant goes to bloom by mowing or hand pulling. For large infestations, herbicides with 2, 4-D or tank mixtures with both 2, 4-D and dicamba also provide good control. If the field is also used for hay, avoid any herbicide containing aminopyrliid (Milestone, Grazon), as it can persist in treated hay and manure.



Jefferson County Development Authority Lunch and Learn – Hemp Production

January 28, 2020

WVU Tree Fruit Research & Education Center
67 Apple Harvest Lane
Kearneysville, WV

- 11:00 The Legal Side of Hemp, Kin Sayer
- 11:30 Opportunities with Hemp
- 12:00 Lunch – provided by JCDA
- 12:30 Q&A With JCDA Ag Committee
- 1:30 Adjourn

RSVP is required. RSVP to the Extension Office by January 24, 2020.

Are You Ready for a SECURE Retirement?

By Paul Neiffer, AgWeb

The House passed a spending bill (keeping government afloat through September 2020) mid December and attached to the bill is the SECURE retirement provisions that was passed by the House earlier this year. It is expected that the Senate and President Trump will have signed the bill by the end of 2020.

Here are the key provisions of SECURE:

- Farmers will be able to contribute to an IRA after age 70 1/2. Under current law, they are prohibited from putting any more money into an IRA after that date. Now, they can.
- The required minimum distribution (RMD) date is now age 72, not age 70 1/2. This will allow your IRA to grow tax deferred for an extra year and half, plus you won't have to calculate that extra half year. That messes us up at time.
- Instead of being able to stretch out inherited IRAs for the lifetime

of the heirs, most inherited IRAs will now need to be paid out within 10 years of the death of the original IRA owner. There are certain exceptions for spouses.

There are some other minor provisions but the above three provisions are the major ones. The first two are very favorable to farmers. It allows them to put in more money for retirement and wait a while longer to take it out.

The last provision likely does not affect the majority of farmers since they typically do not have large balances in their retirement accounts at death. IRA's and retirement accounts were originally designed to help a farmer retire and not be an estate planning vehicle which many times they have become. There is nothing wrong with it being used in estate planning, it just that the government is tightening up the ability to stretch it out for more than 10 years.

If you have a trust that calls for stretching out your retirement plan as part of your estate tax planning, you will need to review and perhaps change the trust agreement (assuming that you can change it).

Now's the Time for Recordkeeping

Between winter cleanup, equipment maintenance, planning for the upcoming growing or breeding season, and the holidays right in the middle of it all, this time of year is arguably just as stressful as the summer months. The winter is filled with all sorts of management decisions, like deciding if fertilizer is at its lowest price, whether or not to make a big purchase before the year's end, or starting to gather up those receipts for tax season (is there such a thing as a year WITHOUT an extension?).

Among all these tasks always comes the question on how can we improve our operations for next year. For some that may mean upgrading to some "new to you" equipment, and getting rid of that sputtering 2WD tractor on its last leg. For all of us, improvements can be made without spending an extra penny.

As your compiling those receipts for your CPA, or the lucky family member



that gets the job of going through them all, take a hard look at where the money was spent, and

where it and when it came back to the farm. Breaking out expenses and time by enterprise, by month, or even just by quarter, can help paint a more complete picture of the farm month to month or year to year. It may seem like a simple task, but one that can be easy to fall behind on once we get into the swing of the growing season.

Consider if you have three parts to your farm—you sell hay, you raise beef cattle, and you have laying chickens. When looking at your end of year, it's easy to see if you made or lost money when considering the whole farm. What may be less obvious, unless you keep track of expenses and sales by enterprise, is the fact the eggs are costing you \$500 a year, so this enterprise is stealing money from the other two to support itself.

It's also surprising to think about how few of us truly account for our labor on the farm, or the fact that we grossly underestimate our labor. This small detail can make a big impact when it comes to pricing the products you have control over—such as fruits, vegetables, or meat that is sold direct to consumer.

Similar examples can be set for this area of the farm. On paper, if your tomato enterprise brings you \$500 profit and the carrots only net \$120, it seems cut and dry which one is more profitable. But if you consider it takes 17 hours from planting to harvest on those tomatoes, while the carrots only take 2.5, the tomatoes give you a return of \$29 an hour, while the carrots bring \$48.



If you attended our recent budget series this fall, this is old news. If you were unable to attend, but interested in learning more about the different ways to track expenses, give us a call. WVU Extension has a excel spreadsheet template for every type of budgeting imaginable—from daily, monthly, or yearly. Simply reach out to get all the resources at our fingertips.

There's no right or wrong way. Some prefer keeping all data on the computer, while some get a greater benefit from old-fashioned paper and pencil. What's important is that it's a format that is easy for you to understand and keep up to date.

Is Fescue Toxicosis a Problem in Hay?

Adapted from an article by Gary Bates, Hay & Forage Grower

What causes toxicosis?

KY-31 tall fescue was discovered to be infected with a fungal endophyte in the late 1970s and early 1980s. This endophyte then produces alkaloids (a type of organic compound) that is the culprit behind fescue toxicosis.

Research shows that while the alkaloids are present all year, the levels are particularly high in the spring, when seed heads are produced.

Simply put, animals grazing tall fescue without this toxic endophyte perform better than those grazing KY-31 that is infected.

What about hay?

With toxicity being at it's highest

during prime hay-cutting season, it begs the question if fescue toxicosis extends to hay fields.



Reduce the risk

There are a few other known practices that help lower the toxic alkaloid level in tall fescue hay:

1. Raise the cutting height to 3 inches. Research shows the highest levels of alkaloids are found in the bottom 3 inches of the plant.
2. Delay feeding at least one month. A study from University of Missouri shows that when the tall fescue is cut, dried, and baled, the alkaloid levels drop between 30 to 60 percent, with the majority of the decline occurring in the first 30 days.

3. Ammoniate the hay. While not a common practice, ammoniation, treating lower quality forages with anhydrous ammonia, reduces the toxic alkaloid levels. This may be a useful tool for producers that have high toxicity levels and also the equipment and ability to ammoniate.
4. Seed clovers into the tall fescue stand. The nitrogen fixation abilities of clovers helps eliminate any large amounts of N applied at once to encourage spring growth.

Taking Action

While some producers have been able to utilize fescue varieties infected with nontoxic endophytes, or choose other forage species, if that's not an option, the above strategies can help reduce the risk of using traditional KY-31.

Recycling Christmas Trees

If you're like many, the Christmas tree is rooted (pun intended) in family tradition. Families still opt for the real thing, supporting local businesses and making it a family affair of hunting, choosing, cutting, hauling, and decorating the tree. But now that Christmas is over, have the twinkling lights lost their sparkle? Don't put the tree out with the Christmas trash to be taken to a landfill. There are many options available to reduce your carbon footprint. When recycling trees, make sure the tree is in the same state in which you obtained it—meaning all lights, ornaments, and tinsel are removed.

Local options:

- **Drop off:** The Grapevine Road Recycling Center and the South Berkeley Recycling Center will be accepting Christmas trees, free of charge. Both recycling centers are open every Tuesday through Saturday; 9 AM to 5 PM.
- **Voluntary curbside pickup:** Apple Valley Waste is offering a by appointment voluntary curbside collection of Christmas tree for three days in January. The actual pickup dates are January 7th, 14th or 21st. The cost for the pickup service is \$10.00 per tree. Apple Valley Waste will donate half of the proceeds from the Christmas tree curbside collection to the Boys & Girls Club of the Eastern Panhandle; Martinsburg - Berkeley County Unit. Berkeley County residents desiring pickup service must call Apple Valley Waste during business hours to schedule the pickup.



Other ways to recycle:

- **Yard waste:** Cut the tree to fit into your compost pile.
- **Soil erosion barriers:** Some communities use Christmas trees to make effective sand and soil erosion barriers, especially for lake and river shoreline stabilization and river delta sedimentation management.
- **Fish feeders:** Sunk into private fish ponds, trees make an excellent refuge and feeding area for fish.
- **Bird feeders:** Place the Christmas tree in the garden or backyard and use it as a bird feeder and sanctuary. Fresh orange slices or strung popcorn will attract the birds and they can sit in the branches for shelter. Eventually (within a year) the branches will become brittle and you can break the tree apart by hand or chip it in a chipper.
- **Mulch:** A Christmas tree is biodegradable; its branches may be removed, chipped, and used as mulch in the garden.
- **Paths for hiking trails:** Some counties use shredded trees as a free, renewable and natural path material that fits both the environment and the needs of hikers.
- **Living, rooted trees:** Get a rooted (ball and burlap or containerized) tree and plant it in your yard. You may have some trouble digging the hole while the ground is still frozen. Living trees have a better survival rate in mild climates.





Jointhead Grass (*Arthraxon hispidus*)
Photo credit: Missouri State

TEN PESTICIDES APPROVED FOR USE ON INDUSTRIAL HEMP

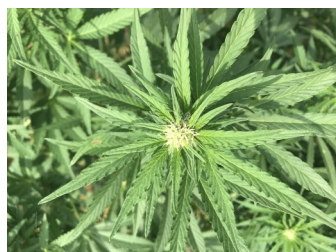
By Chuck Abbot, Successful Farming

With the 2020 growing season on the horizon, the EPA announced on Thursday the approval of 10 pesticides for use on industrial hemp, the first such products cleared for hemp. The 2018 farm bill legalized cultivation of the crop and the USDA released guidelines in October that opened the gate for farmers across the nation to grow it.

Nine bio-pesticides and one conventional pesticide were approved by EPA. Most of them control insects, bacteria, fungi or nematodes. The EPA said process additional applications for approval as they are filed.

“Hemp presents an exciting new agricultural commodity, and the EPA’s action will help provide farmers with the tools they need to seize this opportunity,” said the U.S. Hemp Roundtable.

The EPA also proposed an interim decision on atrazine, a widely used weedkiller, that includes mandatory steps to control “drift” when the herbicide is sprayed onto crops and turf. Atrazine is used on 75 million acres annually and is most often used on corn, sorghum and sugarcane.



A hemp plant grown in Jefferson County during the 2019 season.

Managing Weedy Grasses in Pastures and Hayfields

By Rakesh Chandran, WVU Extension
Fall 2019 IPM Chronicle

Jointhead grass and Japanese stiltgrass invade pastures and hay fields in West Virginia. Both of these species are native to Asia and were introduced to North America in late 1800s to early 1900s.

Description

Jointhead grass and Japanese stiltgrass are both considered warm season grasses, which are characterized by a photosynthetic pathway that is more efficient than that of cool season grasses – especially under warm conditions experienced during summer months. The seeds of both these weeds are fairly short-lived with viability ranging from two to four years. As a species that can thrive in shaded areas, Japanese stiltgrass typically invades pastures and hay fields along the outer edge of wooded areas. However, both grasses can grow well in areas that receive full sun and have the ability to displace more desirable forage species.

Another weedy grass that tends to be a problem in hayfields, especially after first cutting, is yellow foxtail (*Setaria pumila*). It is often found in hay that is fed to horses and can cause blisters to their mouthparts; hence, this weed must be actively managed in horse fed hay.

Management

Both jointhead grass and Japanese stiltgrass possess nutritional value as a potential forage species; however, they are not usually preferred by livestock. Given their invasive nature, it could be a challenge to maintain a balanced stand in pasture without displacing desirable forages.



Japanese Stiltgrass (*Microstegium vimineum*)
Photo credit: NC State

Based on past research in West Virginia, it was determined that the herbicide pendimethalin (Prowl H2O) applied by mid-April when the forsythias are in bloom provided control of both of these weeds. For Japanese stiltgrass, 4 quarts per acre applied prior to germination is necessary to obtain control, whereas, 2 quarts per acre applied prior to germination should control jointhead grass. Prior to applying the herbicide, remove any debris remaining from previous years’ growth to ensure proper contact of the herbicide with the soil. Also, adequate levels of soil moisture are required to activate the herbicide pendimethalin to obtain consistent weed control. If the soil is dry at the time of herbicide application, ¼ inch precipitation or irrigation is needed within two weeks after application for herbicide activation.

Compared to jointhead grass and Japanese stiltgrass, yellow foxtail germinates later in the growing season (late May to early June).



Yellow Foxtail (*Setaria pumila*)
Photo credit: North Carolina State

Therefore, herbicide application timing will need to be modified accordingly. In hay fields, it may be best to wait until after the hay is cut and removed. While foxtail is in the two- to three-tiller stage (about seven to 10 days after cutting hay), apply the herbicide quinclorac (Facet) at 32 ounces per acre (along with methylated seed oil as an adjuvant). Adding Prowl H2O at 2 quarts per acre to the tank mixture during this time will help provide residual control of foxtails that germinate later.

Know Your Soil By Name — Especially When Taking Samples

What’s the difference between Gilpin and Frankstown? No, this isn’t the punchline to some nerdy science joke. In fact, the actual difference can equate to 1 ton of grass clover hay between these two soil types, and hundreds of pounds of fertilizer per field. Both of these factors mean dollars both in and out of your pocket.

Soils are grouped together and named based on similar characteristics. Why does this matter? Different soil types have the potential to hold and distribute nutrients differently, which equates to different yield potential and different fertilizer needs.

The tables are examples of a soil test report from WVU’s lab. Take a look at the recommendations. These two reports are for the same field, but notice how both the yield and recommendations differ between the two soil types: Frankstown on the top and Gilpin on the bottom.

The two columns on the soil test report represent the two ways we apply fertilizer. Column A is suited to supply the nutrients that are taken off year to year by this crop. It’s most often used for fields that are managed on a short term basis—such as rotated crops or rented fields. Column B is for fields on a long term management strategy—it replaces the year’s nutrients removed and then some.

To find your soil’s series, you can visit one of two websites:

1. websoilsurvey.sc.egov.usda.gov/
2. casoilresource.lawr.ucdavis.edu/gmap/

If you’re tech savvy, you can find your way around these sites in no time. But if you’re not, feel free to call the office and I can send out a detailed factsheet on how to navigate these websites, or I can look up the information for you.

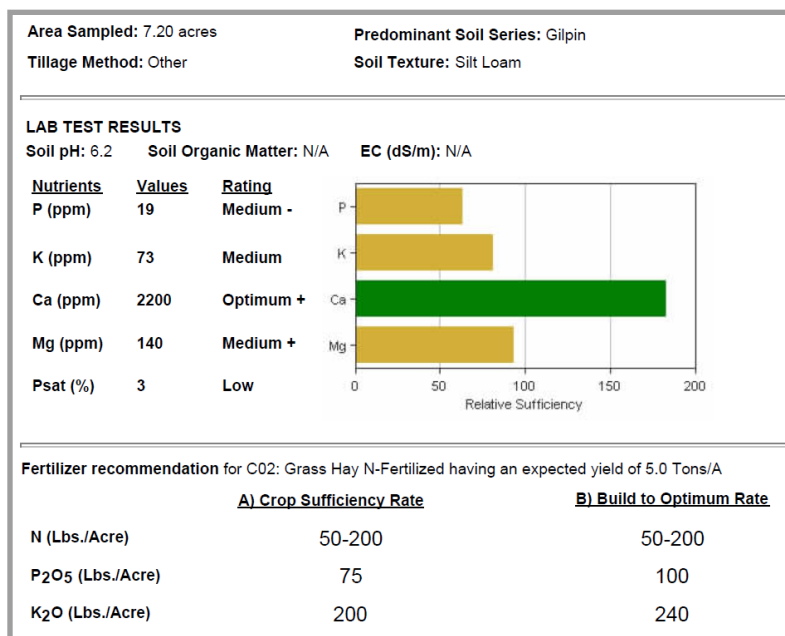
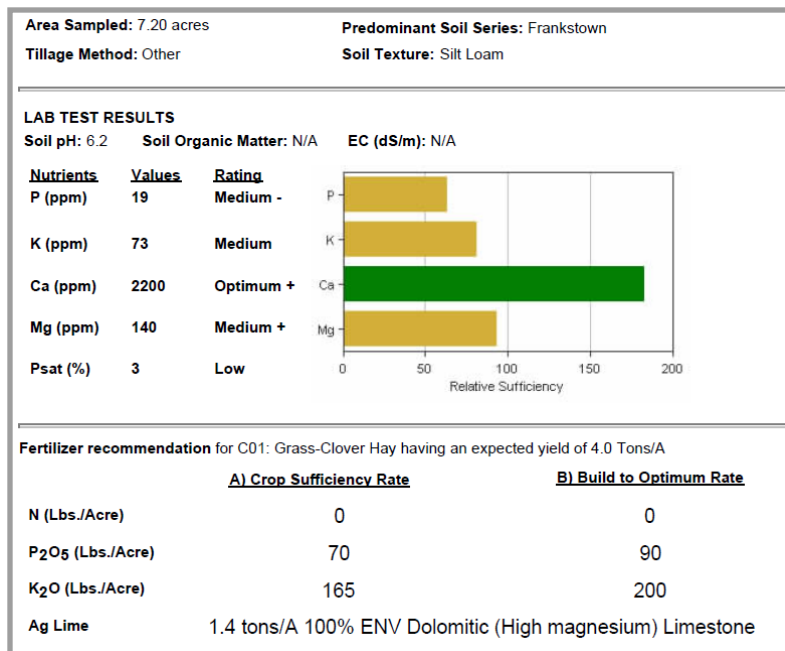
Lucky for growers, the new soil test form also has an abundance of categories to give much more tailored recommendations—everything from high tunnel leafy greens to corn for grain to even parsnips. For the home gardeners, while it’s always beneficial to know what type of soil you have so you can understand its limitations (Berks, for example, is usually very shallow and rocky!) accounting for the soil series on the report does not change the fertilizer recommendation. This is because there are so many different crops or varieties in a home garden it is impossible to consider what the yield will be. The same is said for home orchards, vineyards, and lawns, which don’t have a specific yield goal.



When it comes to a good soil test report, the results are only as beneficial as the sample. Part of that comes with physically taking a proper sample, but the rest comes with fill out the form properly. This includes soil texture. Like soil series, the soil’s texture can impact your yield projections. Think of a clay topsoil compared to a more silty texture. The clay particles not only make it harder for roots to reach down into the soil, but it also restricts the amount of nutrients available, which can equate to lower yields. Combine the wrong soil texture with the wrong soil series, and it’ll be much more difficult to give the soil what it truly needs.

To get a good measure on your soil’s texture, gather a small handful of topsoil, then wet it and work it in your hand until it has the consistency of Playdoh. Once the soil is formed into a ball, push it between your thumb and forefinger until a ribbon starts to form. If the ribbon breaks off after 1 inch, you have a loamy texture, if it is 1-2 inches in length, you have a clay loam texture, and if it lasts 2 inches or more, your texture is clay based. You can further determine the exact type of texture by noticing if your soil feels gritty like sand, smooth like flour, or a little bit of both.

If you want to learn more about taking a good soil sample, or texture, call me at the Extension Office, or visit WVU’s soil test website at soiltesting.wvu.edu/.





Emily Morrow
Agriculture & Natural Resources Extension Agent
1948 Wiltshire Road, Suite 3
Kearneysville, WV 25430
Emily.Wells@mail.wvu.edu
304-728-7413, ext 2

Visit our site

extension.wvu.edu/jefferson



Programs and activities offered by the West Virginia University Extension Service are available to all persons without regard to race, color, sex, disability, religion, age, veteran status, political beliefs, sexual orientation, national origin, and marital or family status.

Trade or brand names used in this publication are for educational purposes only. The use of such product names does not imply endorsement by the WVU Extension Service to the exclusion of other products that may be equally suitable.

US 2019 Crop Acreage and Yields

Source: USDA

CORN

- ◆ 89.9 million acres planted, 81.8 million acres harvested
- ◆ The average harvested in 2019 was 167 bushels per acre
- ◆ Corn acreage saw an increase, but yield saw a decrease from 2018

SOYBEANS

- ◆ 76.5 million acres planted, 75.6 million acres harvested
- ◆ 2019 saw an average of 46.9 bushels per acre
- ◆ Soybean acres declined, as did soybean yield from 2018

WINTER WHEAT

- ◆ 31.2 million acres planted, 24.3 million acres harvested
- ◆ 53.6 bushels per acre average harvest
- ◆ Winter wheat acres also declined, but yield increased from 2018