Using Summer Annual Forages as an Alternative to Double-Crop Soybean

by Liz Ridenour, Amanda Grev, and Jeff Semler, University of Maryland Extension

As of this writing 99.16% of Maryland is experiencing D0-D4 drought conditions according to the U.S. Drought Monitor. This is down from 100% a week ago and 99.94% on January 1. The recent rains have certainly perked things up but have done little to reduce the long-term impacts of drought that are ongoing across the region.

One of those impacts is the reduced yield of first cutting hay and the diminished promise of strong second and third cuttings. This brings us to a potential opportunity.

In most years, soybeans are a common choice for double cropping following wheat harvest in July. This practice can provide a second harvest and source of income for the producer and allow for nitrogen fixation in the soil in preparation for the fall planting season.

However, nitrogen fixation from soybeans is not significant enough to reduce the need for nitrogen fertilizer following soybean harvest, and double-cropping using soybeans may deplete the soil of other nutrients as the growing soybeans draw phosphorus and potassium from the soil.

One viable alternative to soybean double-cropping is the planting of summer annual forages. Summer annual forages have the potential to improve soil health, mitigate pests, suppress weed growth, and reduce soil erosion. They can also be utilized as a fast-growing forage for silage, hay, or grazing, making them an attractive and sustainable alternative to double-crop soybeans.

Summer annuals can help improve overall soil health in several ways. They protect the soil from erosion while their large root systems add organic matter and nitrogen (if legumes are included) back into the soil.

They provide shade for the soil during the hot summer months, lowering soil temperatures, aiding in soil moisture retention, and preventing weeds from sprouting. They can also help to break pest cycles by attracting beneficial pollinators and predatory insects.

When selecting summer annual forages, it is important to keep both prussic acid and nitrate toxicity in mind.

Sorghum species, along with several other species including millet, brassicas, oats, and other small grains, are susceptible to nitrate accumulation.

Adverse environmental conditions such as drought or frost can cause the plant to halt its conversion of nitrates to amino acids, leading to a buildup of nitrates in the plant. Nitrate poisoning is most likely to occur when plants are harvested as hay or grazed under stressful growing conditions, especially when grown in soils with high nitrogen fertilizer.

Prussic acid is a particular risk in sorghum, sudangrass, and sorghum-sudangrass hybrids. Prussic acid toxicity can occur if plant tissues are damaged by some sort of stressor such as severe drought or frost. Proper field curing or ensiling can help reduce the potential for prussic acid toxicity in harvested forages because prussic acid is volatile and some of the toxic components will dissipate as a gas during the drying or fermentation process.

For those producers that cannot graze these crops or have the equipment to harvest them, this may sound like a non-starter. However, before you dismiss this opportunity think about which of your neighbors could benefit and harvest or graze these crops.

This could be a win-win for both of you. The grower receives cash from the crop, and the neighbor can acquire some much-needed forage reserves close to home.

Agriculture is a community endeavor, and farmers have often looked out for each other. In this case it could be mutually beneficial.

(*article continues on page 2*)

Before you dismiss this idea, remember the phrase that keeps many in a rut, "This is the way we have always done it." Rethink your options. Who knows—you might open up future opportunities by simply shifting your paradigm. As always, for specific recommendations for your area, contact your local extension agent.

Resources:
Penn State Extension

Iowa State Extension

Farm Progress.org

Nebraska Institute of Agriculture and Natural Resources

Plant Cover Crops

Summer Annual Forage Options		
Type	**Functional Class**	**Examples**
Cool-Season	Brassicas	Radishes, turnips[1], kale, rapeseed
	Grasses	Annual Ryegrass, oats, barley
	Legumes	Crimson clover, hairy vetch, peas
Warm-Season[2]	Forbs	Buckwheat, sunflowers
	Grasses	Sudangrass, sorghum-sudangrass, sorghum, foxtail millet, Japanese millet, pearl millet
	Legumes	Sunn hemp, cowpeas, forage soybeans

[1]*Barkrant and purple top are heat-resistant varieties*
[2]*Warm-season annual forages are well-adapted to high temperatures and can withstand drought, maintaining soil moisture throughout the summer months*

Animal Welfare of Outdoor Livestock

by Brian Campbell, State Grazing Specialist, Natural Resources Conservation Service

The Law
Know your local laws. Except for normal agricultural activities, practices, and procedures, Pennsylvania state law requires that livestock must have their basic needs met (including food, water, clean shelter to keep warm and dry) and may not be subject to cruelty (including abandonment). Working animals (e.g., horse, mule, ox) may not be driven, led, ridden, or worked more than 15 hours per day or 90 hours per week.

Five Freedoms
For almost 50 years, international and professional organizations have adopted the "five freedoms" of animal welfare, first codified by the Farm Animal Welfare Council (UK):

Freedom from hunger and thirst: by ready access to fresh water and a diet to maintain full health and vigor.

Freedom from discomfort: by providing an appropriate environment including shelter and a comfortable resting area.

Freedom from pain, injury, or disease: by prevention or rapid diagnosis and treatment.

Freedom to express normal behavior: by providing sufficient space, proper facilities, and company of the animal's own kind.

Freedom from fear and distress: by ensuring conditions and treatment which avoid mental suffering.

Diet
Though water is the most important nutrient, forages, feeds, and supplements are important to meet the energy, protein, fiber, vitamin, and mineral needs of each animal. National Research Council publications are the standard technical references for animal nutrition, but consulting a veterinarian and/or animal nutritionist for farm-specific guidance is ideal for most livestock producers.

Nutritional demands change based on livestock type and life-stage, as well as weather. Fast-growing youngstock, late-gestation or lactating females, and working equines will have much higher needs than mature animals without these physiological stresses. Extreme cold will also increase nutritional demands, while heat-stress decreases intake.

Beyond mineral tubs, supplementation can also mean providing feed when grazing poor-quality forages (e.g., cornstalks), or providing a lower-quality hay as roughage when grazing rich forages (e.g., brassicas).

Water
Animal behavior often leads to dominant individuals getting first access to water, feed, and shelter. Later animals may find no water left when they reach the trough. When the group visits the trough together, observe that at least 10% can be watered during a single visit. Even if the water system has adequate flow to the trough, the valve into the trough may be a "bottleneck," preventing quick refilling.

If water flow is insufficient to quickly refill the trough, develop storage capacity so the trough can rapidly refill from storage. Storage could be a separate tank that feeds into the trough, or simply an oversized trough (common with spring-fed troughs). The storage itself can be slowly refilled over a longer period.

Also pay attention to water quality—especially if watering animals from a pond or stream, or if their water is cloudy or growing algae. See PennState Extension's Livestock Water Quality article (extension.psu.edu/livestock-water-quality).

Being aware of animal welfare requires ongoing monitoring. When checking water availability daily, occasionally take additional time to observe individual animals for disease (e.g., lethargy, losing body condition, tearing from pinkeye), injury, distress (including from flies, heat, or cold), isolation, and inactivity.

Pain Prevention & Treatment
Vaccination can be a crucial tool to prevent common livestock diseases, especially of youngstock. Mitigate livestock parasites and other pests with pesticides and/or other management techniques (e.g., deferred grazing rotations to break parasite life-cycles, placing fly traps near water troughs).

(*article continues on page 3*)

Disease prevention can also involve reducing potentially toxic plants (e.g., collecting fallen Prunus branches after a storm, eliminating access to drought-stressed annual grasses). Again, taking time to regularly look over individual animals is key in identifying injuries or disease symptoms. Separate and treat affected animals; consult a veterinarian if unsure how to proceed. Medication or treatment may not be withheld from an animal for the sake of maintaining its Certified Organic status.

Stress

Practice calm, quiet, consistent handling to avoid stressing animals. "Pulling" is easier than "pushing": training animals to be lured with a treat (e.g., small bucket of grain with molasses) can draw the majority, leaving only a few stragglers to be coerced forward.

Transport can be especially stressful. Minimize stress by transporting during the coolest part of the day, not overcrowding, and grouping animals by similar size, sex, and/or age. Ideally, the animals will already be used to your handling. Trailers should be clean, free of sharp objects or slippery flooring, and offer plenty of ventilation (but without direct wind during cold weather). Make sure animals are well-hydrated but not overfed before leaving; provide plenty of water and forage at the destination.

Predators (e.g., coyotes, hawks) are a serious concern for livestock like poultry and small ruminants (including newborn calves). Protection measures can include shelters, nighttime confinement, overhead nets (to deter raptors), guardian animals, and offset electrified or barbed wires on the exterior of perimeter fencing.

% RH	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
72°F	67	67	68	68	69	69	69	70	70	70	71	71	72
75°F	70	70	70	71	71	72	72	73	73	74	74	75	75
79°F	72	73	73	74	74	75	75	76	77	77	78	78	79
82°F	74	75	76	76	77	78	78	79	80	80	81	82	82
86°F	77	78	78	79	80	81	81	82	83	84	84	85	86
90°F	79	80	81	82	83	84	84	85	86	87	88	89	90
93°F	82	83	84	84	85	86	87	88	89	90	91	92	93
97°F	84	85	86	87	88	89	90	91	93	94	95	96	97
100°F	86	88	89	90	91	92	93	95	96	97	98	99	100

Temperature-Humidity Index, based on relative humidity (RH) and degrees Fahrenheit (F)

Environment

Mud reduces animal productivity (e.g., less feed intake, more energy expended) and health (e.g., foot disease, udder contamination). Moving feed, shade, water, and minerals to dry, stable areas will keep livestock from spending weeks or months in mud. See PennState Extension's Mud, Forages, and Livestock Health article (extension.psu.edu/mud-forages-and-livestock-health).

Heat stress is a danger to livestock and farmers! The Temperature-Humidity Index (THI) is shown above. Most livestock begin to experience heat stress at a THI of 75, which becomes more dangerous at a THI of 78 to 80. Sheep and goats are typically an exception, experiencing heat stress at a THI above 81. Another indicator to watch for on warm days is panting animals.

In addition to providing unlimited clean water, mitigating heat stress may require allowing livestock access to shade under trees or structures, ventilating and circulating air in animal shelters, and adjusting animal handling, grazing, and feeding to nighttime hours.

Shelters for shade, warmth, or protection from wind and precipitation should be sized to allow livestock to lie down, stand up, turn around, and fully stretch their limbs. Constructing shelters to meet behavioral needs is also important. For example, because dominant horses may block an entrance to a shelter or trap a smaller horse inside, making the building wider than it is deep—possibly partitioned inside, with multiple entrances, or simply multiple shelters—reduces concerns that all horses will have access. Bedding areas should be kept clean (relative to the livestock species) and dry.

Likewise, in order to express their natural behaviors—such as grazing for ruminants or dust-bathing for poultry—livestock need adequate outdoor space. For example, USDA Certified Organic standards require a minimum outdoor space of 2 square feet per broiler chicken and 3 square feet per laying hen.

Move over, sheep. Cattle are grazing solar sites, too, and that's good news for Virginia.

by Ivy Main, reprinted from Virginia Mercury

The conventional wisdom was wrong. And having helped spread the conventional wisdom, I was wrong, too. Mea culpa. It turns out sheep aren't the only animals capable of handling the job of vegetation management on solar sites.

Farmers are finding that cattle also thrive among solar panels—and they will get their chance to prove it in Virginia.

What's that, you say? You didn't know there was a conventional wisdom on this topic, maybe because you really haven't given much thought at all to solar grazing, so while you have nothing but respect for cattle, sheep and other ruminants, this strikes you as perhaps a bit, shall we say, niche?

Oh, but it's not. Persuading cattle farmers that it's in their interest to embrace solar is the key to unlocking low-cost energy supplies in Virginia and ending the rural war on solar.

Not that there's anything wrong with sheep! In fact, sheep deliver such perfect synergy with solar that including them at solar farms is no longer novel.

The sheep thrive with the forage and shade, and in return they eat the vegetation that would otherwise grow up around the solar panels. Their grazing largely replaces labor-intensive (and polluting) mowers and herbicides while improving soil quality. Thanks to this symbiotic relationship, farmers have managed to keep their land and even grow their operations at farms across the U.S.

The advantages on all sides are so well understood within the solar industry that it's common these days for new utility-scale projects in Virginia to include plans for grazing. Developers and utilities including Dominion Energy tout the local benefits of their partnerships with sheep farmers and beekeepers.

Yet there are more than 15 times as many cattle as sheep in Virginia, many of them in small herds on family farms.

The market for beef is vastly bigger than the market for lamb, so persuading farmers they should diversify into sheep as well as solar is a tall order. But if cattle prove as compatible with solar as sheep are, there will be vastly more opportunities for both farmers and the solar industry. Given the dire economic situation facing small farms in Virginia today, "cattle-voltaics" could offer a lifeline for rural communities.

Cows graze under solar panels at Silicon Ranch's 3.5-MW solar farm in Rutherford County, Tennessee.

Solar site owners and farmers have proceeded cautiously with cattle, fearing the animals might damage expensive solar infrastructure —or themselves—given their great weight and propensity for rubbing their heads on things. And being much taller than sheep, they don't fit as well under solar panels, which at some times of the day will tilt close to the ground to take maximum advantage of the sun's rays. Making the supports taller and stronger adds cost. Hence the preference for sheep.

That's all wrong, according to Josh Bennett, an executive with Colorado-based Huwa Enterprises who spoke at the Virginia Solar Summit in Richmond this spring. Since 2023, Huwa has been helping farmers and ranchers integrate cattle with solar in Colorado and elsewhere, and Bennett is now intent on spreading the word that it works.

At a 2,000-acre solar farm in Indiana, he said, Huwa "hardened" the site for the cattle but did not raise the panels or change their tilt. According to Bennett they had "zero problems" with the cattle, all yearlings of a docile breed that stand about four and a half feet tall. Contrary to expectations, the cattle have shown no interest in using the steel poles as scratching posts.

Elsewhere, Tennessee-based Silicon Ranch, which includes sheep grazing on 15,000 acres across its 15-state solar portfolio, recently launched a technology that it calls CattleTracker.

The software automatically tilts solar panels to horizontal when cattle are present, allowing the animals to graze underneath. When the cattle are moved to other parts of the site, the panels return to their optimum tilt. Silicon Ranch has been testing the approach at its 3.5-MW solar farm in Rutherford County, Tennessee since 2023, while delivering the power to a local electric cooperative.

Here in Virginia, Marcus and Jess Gray see great potential in solar cattle. The husband-and-wife owners of Gray's Lambscaping are among the half dozen or so Virginia sheep graziers who contract with owners of large solar farms for vegetation management.

The American Solar Grazing Association featured the Grays, along with beekeeper Allison Wickham of Charlottesville-based Siller Pollinator Company, in a terrific video that was shown at the Solar Summit to great applause from the home team.

(*article continues on page 5*)

For the Grays, solar cattle are the obvious next step in integrating solar into Virginia's farm culture. At the Solar Summit, Marcus Gray described how he is raising Dexter cattle, a breed that is smaller and more docile than some others, with plans to graze them under solar panels. However, Gray did not provide a target date or site to graze what he calls his "inverter cattle."

Virginia leaders recognize the importance of further developing agrivoltaics as a way to support both farming and energy production. The General Assembly passed a bill this session defining agrivoltaics, and the administration of Gov. Abigail Spanberger plans to form a working group to promote it. In addition to grazing and beekeeping, agrivoltaics can include raising crops between rows of panels, a practice that is mostly still in the research stage in Virginia.

The administration's working group should look for ways to encourage all of these practices, but if it only does one thing, it should create a demonstration program to help farmers understand how to integrate solar and cattle grazing into their operations. Virginia has a huge stake in making solar appealing to rural communities. We need to save our family farms, and we need the low-cost energy that solar provides.

The potential of agrivoltaics is huge, but until farmers see solar as a valuable opportunity for themselves and their families, Virginia will struggle to produce enough electricity to meet our growing demand.

Reprinted from virginiamercury.com

UPCOMING EVENTS

Crop and Forage Field Day
Tuesday, June 23, 8:30 AM–2:30 PM
9030 Farmland Place
Charlotte Hall, Maryland
Join fellow farmers, industry representatives, and Extension Agents for a day of learning about forages, grazing, and cropping systems. Equipment demonstrations will occur throughout the day. Walk nine different annual warm season forage grass plots. Visit agnr.umd.edu for more information.

Pasture Walk
Tuesday, June 23, 6:00 PM–8:00 PM
Western Maryland Research and Education Center, Keedysville, Maryland
Join University of Maryland Extension for an educational pasture walk featuring a mixed-species grazing system with sheep and cattle utilizing both perennial and annual forages. Event is free but registration is required. Please visit go.umd.edu/pwjune to register.

Farmer Field Day
Friday, June 26, 8:00 AM–1:00 PM
VSU Randolph Farm
4415 River Road
Petersburg, Virginia
Come out for a FREE Small Farmer-Focused Field Day designed to help you enhance your farm and protect the environment! Learn about various production systems to boost farm profitability and sustainability. Join us for informative sessions with faculty and staff from the College of Agriculture to explore exciting opportunities in the field of agriculture. Visit ext.vsu.edu/events to register.

Pasture Walk
Wednesday, July 15, 6:00 PM–8:00 PM
13521 Clopper Road
Hagerstown, Maryland
Join University of Maryland Extension for an educational pasture walk with Maryland Solar Grazing Solutions. This pasture walk will feature a unique opportunity to tour an active solar site where sheep are being grazed for vegetation management. Event is free but registration is required. Please visit go.umd.edu/pwjuly to register.

Pasture Walk
Thursday, August 6, 5:00 5:00 PM–8:00 PM
14010 Montevideo Road
Poolesville, Maryland
Join University of Maryland Extension, Future Harvest, and the Million Acre Challenge for an educational pasture walk at Plow and Stars Farm. Participants will have an opportunity to see and discuss several aspects of the operation, including multi-species grazing, virtual fencing, transitioning conventional grain fields to regenerative agriculture, and silvopasture. Event is free but registration is required. Please visit go.umd.edu/pwaugust to register.

New Grant Funds Received to Support Mountains-to-Bay-Grazing Alliance

Chesapeake Bay farmers will get a boost on implementing sustainable practices, like innovative virtual fence collars for livestock, that help their bottom line and support the health of farmland while improving rivers and streams, thanks to a recent grant to the Chesapeake Bay Foundation.

The grant is aimed at promoting regenerative agriculture, or resilient farming. This includes practices like rotational grazing to improve plant health and enhance the ability of pasture soils to absorb heavy rainfall and store carbon. Other practices, like the creation of streamside grass or forested buffers, filter out nutrients and sediment that pollute downstream waters and, ultimately, the Chesapeake Bay.

Among the highlights is promoting the use of virtual fence collars, which allow farmers to use a phone app to draw boundaries and contain livestock without physical fences—essentially a higher-tech version of an invisible dog fence. When used with livestock, though, it can not only contain animals but also help implement rotational grazing and build soil health.

The roughly $1 million grant through the National Fish and Wildlife Foundation's (NFWF) Chesapeake Small Watershed Grants Program was awarded earlier this year. NFWF manages the grant, with major funding coming from the U.S. Environmental Protection Agency (EPA).

The grant is funding sustainable farming efforts in Maryland, Pennsylvania, Virginia and West Virginia for a total of nearly 1,700 acres of farming conservation practices.

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