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NOVEMBER 2024

ENVIRONMENT

FEATURE ARTICLES

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NOVEMBER 2024 / ENVIRONMENT ISSUE

The World of Environment

LORI HARRISON | *Mushroom News*, Editor | American Mushroom | *lharrison@americanmushroom.org*

Environment is one of those terms that encompasses a wide range: it can mean the surroundings or conditions of which a person, animal, or plant lives or operates; it can be a particular geographical area, and according to Webster's Dictionary; it is even used to describe the 'overall structure within which a user, computer, or program operates.'

For purposes of our Environment issue, we'll be focusing on issues and items that impact the environment of mushroom growing. We begin inside the growing house with an update from Dave Beyer, Ph.D., on the SCRI grant: Novel Pest and Disease Management Strategies for U.S. Mushroom Farms, which focuses on improving knowledge of pest biology, improving monitoring and decision-support tools, testing novel control methods for flies and fungal pathogens, improving post-crop steaming, and delivering knowledge to stakeholders through a variety of formats.

Next, we move to composting, where Zoe Warner, Ph.D., of the Grassland Bird Collaboration, along with AMI President Rachel Roberts, walk readers through a partnership that could help save grassland bird populations easily while at the same time using the initiative as an asset to enhance company sustainability and ESG profiles.

Speaking ESG, in her *Food for Thought* on page XX, Rachel cites a recent McKinsey & Company report on the challenges and opportunities that farmers across the country encounter in their ESG efforts.

We switch gears on page 17 with an exciting announcement about *Mushroom News*. We have been busy evaluating ROI for our members and advertisers, benchmarking the magazine, and conducting discussions with members. As a result, we've made the decision to make some changes to ensure the future of the *Mushroom News* publication and to meet our members where they are.

Our August *Compost Analysis and Forecast* can be found on page 22, our *Business Minute* about building a strong leadership presence is on page26, the August *Import Report* is on page 25, and *This Month in Mushroom News History* is from November 1964. Enjoy!

Lori

ENVIRONMENT ISSUE

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FEATURE ARTICLES

PENN STATE RECEIVES FUNDING FOR PEST AND DISEASE RESEARCH AND EXTENSION

Dave Beyer, Ph.D., provides an update on the SCRI grant focusing on Novel Pest and Disease Management Strategies for U.S. mushroom farms.

FOR THE BIRDS: HOW COMPOST CAN AID IN GRASSLAND BIRD CONSERVATION AND SUSTAINABILITY

The number of grassland bird populations are decreasing. Mushroom farms may hold the key to reversing the trend.

WITH CHANGE COMES OPPORTUNITY: CHANGES COMING TO *MUSHROOM NEWS*

Changes are coming to *Mushroom News* to ensure the future and meet members where they are.

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AMI STAFF
Avondale Office
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Lori Harrison • Amy Ducharme
info@americanmushroom.org | 610/268-7483
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DESIGN & PRINTING
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FOR ADVERTISING INFORMATION:
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Eye on AMI

AMI is processing high response rates from its recent 5-year Labor survey and 5-year Inaugural Sustainability survey. If you missed those, click her and here—we are accepting responses through November.

Labor Survey **Sustainability Survey**

AMI signed on to a Letter to Congress on tax cuts and credits that the IRS should maintain for farms: The Stepped-Up Basis, Estate Tax Relief, Making the 2021 Lower Individual Tax Rates and Expanded Tax Brackets permanent; Making the 199A Qualified Business Income Deduction Permanent; maintaining Section 179 Expensing; maintaining 1031 Like-Kind Exchanges; and maintaining the 2022 20% Capital Gains rate.

The PA Short Course, sponsored by AMI, had robust attendance and helpful technical information and education for growers. PSU and AMI partnered to offer the Dean of Agriculture tour of farms that included 12 PSU staff.

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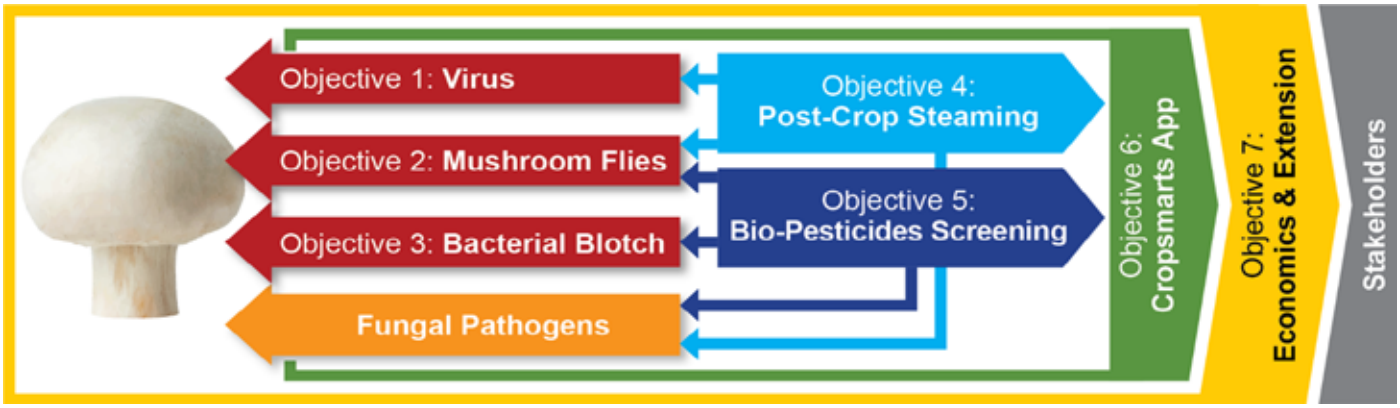
Penn State Receives Funding for Pest and Disease Research and Extension

DAVE BEYER, PH.D | *Professor, Plant Pathology and Environmental Microbiology (PPEM)* | Penn State University

This past September, Penn State was awarded a $7 million Specialty Crop Research Initiative (SCRI) grant by USDA-NIFA, titled "**Focusing on Novel Pest and Disease Management Strategies for U.S. Mushroom Farms**". The 4-year project involves researchers and extension personnel from Penn State University, the University of Delaware, the University of Florida, Lehigh University, and a collaborator at the California State University Monterey-Bay, Seaside. Our team is comprised of diverse professionals with broad expertise across disciplines. The team consists of five pathologists, three computer scientists, two mushroom scientists, two entomologists, a plant geneticist, a natural products chemist, two economists, and one extension educator, all of whom have expertise working with cultivated mushrooms.



Overview of the Project Goals

PROJECT DESCRIPTION

Both the phorid fly *(Megaselia halterata)* and fungus gnat *(Lycoriella ingenua)* are widespread insect pests and Trichoderma Green Mold *(Trichoderma aggressivum)*, Dry Bubble *(Lecanicillium fungicola)*, Hairy Mold *(Syzygites megalocarpus)*, and Cobweb *(Cladobotryum sp.)* are the major fungal pathogens that challenge mushroom farms. Bacterial Blotch and La France Isometric Virus diseases are also re-occurring problems on farms. Conventional and organic growers have an urgent need for new technology, basic science, outreach, and management strategies for mushroom pests and diseases. Improving knowledge of pest biology, improving monitoring and decision-support tools (Cropsmarts), testing novel control methods (biocontrol, GRAS compounds derived from plants) for flies and fungal pathogens, improving post-crop steaming, and delivering knowledge to stakeholders through a variety of formats.

Cropsmarts Apps. Pest and disease monitoring and mapping is an important part of mushroom IPM programs. The availability of a mobile app to enhance an IPM program should reduce the labor and time required to monitor pests and diseases on farms. In previous work funded by USDA-OREI, we developed and started testing two Cropsmarts applications: a web-based application for managing farm and crop configurations, and mobile applications for crop inputs, environmental and cropping measurements, and outputs during crop operations. We have made considerable progress improving the functionality and usability of the two applications. In addition, in 2020-21 we began designing, building, and testing a proof-of-concept sensor suite for automating the capture of key crop variables. ***A central goal of the Cropsmarts development for this project is to create a high-definition information ecosystem in which sensors of various types are deployed in growing rooms to help automate the capture of data related to mushroom pest management parameters, Fig. 1.*** The Internet of Things has made temperature and moisture sensors, data communication, and data analytic capabilities more rugged and available at increasingly higher fidelity and lower cost. While these technologies have been deployed to enable "smart agriculture" for many kinds of crops, so far relatively little work has been done in the mushroom industry. ***We will continue the cycle of design-develop-test with commercial mushroom farms. Substantially better designs can be discovered through usability field testing and pilot studies.***

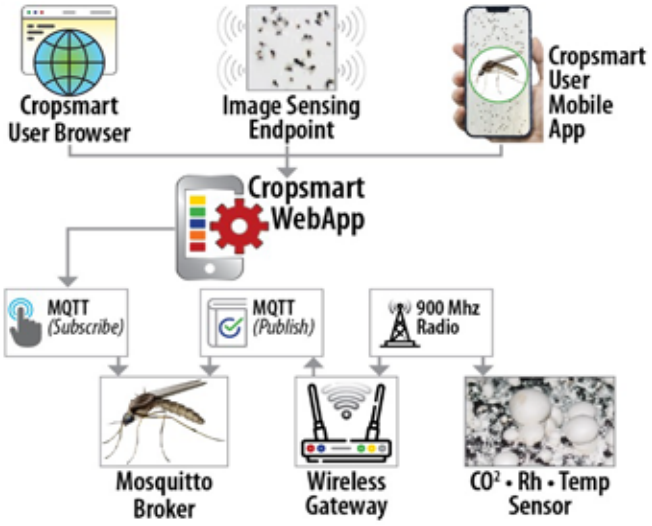


Figure 1. Architecture for routing images and sensors

Mushroom Flies, (fungus gnat, *Lycoriella ingenua*; mushroom phorid fly, *Megaselia halterata*) are the most serious insect pests affecting mushroom crops. Yield losses are due to mushroom fly larvae feeding on the mycelia and by vectoring mushroom diseases. Phorid flies also invade residential neighborhoods near farms, decreasing the quality of life of nearby residents. In work funded by previous USDA, PDA, and industry grants, the PSU mushroom fly research team conducted on-farm and laboratory studies, and determined that mushroom farms are the source of phorid adults invading nearby homes. Therefore, the mushroom fly research team is focused on developing methods on mushroom farms. Importantly, there is an increasing need for OMRI-approved methods due to the increasing demand for organic mushrooms.

There are several conventional insecticide products that were highly effective at killing mushroom flies in our laboratory bioassays. These products are registered for pests on other crops and will require label extension to permit their use on mushroom farms. Preliminary studies identified that Long Lasting Insecticidal Netting (LLINs; nets impregnated with pesticide); may be effective at controlling mushroom flies on farms. LLINs are easy to use because pesticides do not need to be applied, and nets remain effective for years. As part of the new SCRI project, we will screen additional insecticide products to determine the full range of active ingredients that could be deployed to control mushroom flies.

While adult flies can be controlled using attract-and-kill stations, high regional fly populations in the area allow flies from nearby farms to invade and lay eggs on farms

with effective fly IPM programs. IPM strategies to control the larval stages of mushroom flies are necessary to best manage these pests. Natural enemies including predatory mites and entomopathogenic nematodes are promising biocontrol agents to control mushroom fly larvae on mushroom farms because they can kill fly larvae within days. Previous work showed applications of the entomopathogenic nematode *Steinernema feltiae* reduced sciarid emergence, and increased mushroom yields by 18 percent. However, *S. feltiae* could not infest phorid larvae because phorid larvae are smaller and the nematodes were unable to penetrate the fly's body. A smaller species of entomopathogenic nematode, *S. carpocapsae*, may be able to penetrate the body of phorid larvae. Preliminary laboratory studies suggest *S. carpocapsae* infected and killed phorid larvae in compost in petri dishes. We will perform field experiments on farms to determine if *S. carpocapsae* nematodes can control flies on farms.

Predatory mites are another natural enemy that may control mushroom flies. *Stratiolaelaps scimitus* mite applications during casing on mushroom farms significantly reduced L. ingenua emergence in previous work. Preliminary studies from our group found that applications of *S. scimitus* 1 and 5 days after egg laying significantly reduced *M. halterata* emergence in laboratory studies (Fig. 2b). We will plan experiments to assess and optimize the effectiveness of *S. scimitus* applications on farms.

Early and effective monitoring of pests is critical to ensuring proper IPM. However, labor limitations and the continual demands of the mushroom harvest result in most farms not having the capability to monitor flies and quickly deploy interventions. Under these conditions, farmers miss opportunities to target mushroom flies before populations grow to uncontrollable levels. We will develop a tool to monitor these pests that enables automated, real-time counting of mushroom flies on traps that would otherwise be counted manually. Our computer vision-based fly monitoring tool will identify phorids and sciarids from smartphone-captured images of sticky cards obtained from mushroom houses (Fig. 2). Preliminary results suggest that the tool distinguishes phorid flies from other objects on the sticky card 92 percent of the time and that the tool correctly distinguishes sciarid flies from other objects on the sticky card 87 percent of the time. Phorid flies were mistaken for sciarid flies (and vice versa) only 1 percent of the time. While high accuracy with little data is impressive, our tool must be improved before it can be used on farms.

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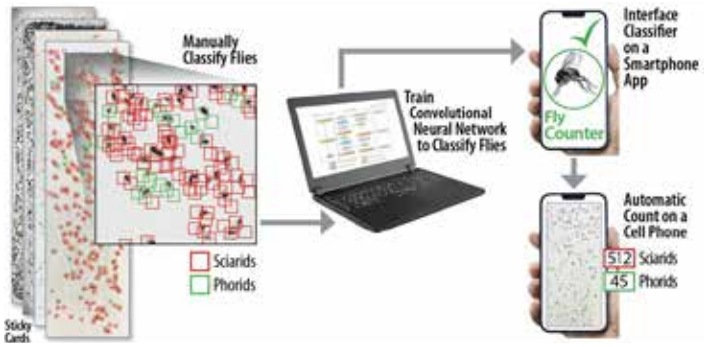

Figure 2. Schematic of automated fly counting app.

Data on pest control costs, materials, equipment, and application labor will be used to determine application costs for each control method used. We will analyze the effects of each pest, as well as its application to establish economic injury levels for each pest relative to its control measure costs. Results will guide the future application of both prophylactic and reactive pest control measures based on established economic injury levels. Economic thresholds will be established in part by using the Net Present Value (NPV) of various pest control methods.

Post-crop steaming is the most energy-demanding practice on a commercial mushroom farm. It is a critical component of any IPM program to prevent disease and fly infestations in subsequent crops. As we continued to investigate the biology of the new pathogen, *Syzygites melocarpus*, the initial source of inoculum is still unknown, but we suspect that the thick-walled spores may survive post-crop steaming on farms. Likewise, a severe LFIV disease outbreak in 2021-22 also emphasized the importance of a comprehensive post-crop steaming procedure. Most farms have developed post-crop steaming procedures based on the placement of very few probes located in what is thought to be the coldest location within a room. The steaming duration and temperatures used vary considerably from farm to farm because farms have different designs, HVAC units, and steam systems. We propose that post-crop steaming will become more efficient by using an array of remote temperature sensors strategically placed around the room and additional information on temperature penetration into the wood. We also propose to set up a lab-based replicate of wood used on farms and the time/temperature needed to penetrate the wood to the thermal death points of *Agaricus* and pathogen mycelium. Any improvement in the process to optimize the time/temperature needed to sanitize a room would help reduce the energy costs associated with post-crop steaming.

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Bacterial blotch is a complex of diseases caused by a variety of fluorescent Pseudomonads and pathogens from other genera that result in a rapid browning or blotching deterioration of healthy mushroom caps. Previous research by our team allows us to now distinguish closely related pathogens in purified cultures and from communities on mushroom samples. The prevalence of pathogens from recent outbreaks in Europe and Pennsylvania differed and new species were isolated. It is critical to understand and target the diversity of pathogens causing blotch in major growing areas to avoid inefficient IPM strategies. Thus, we will describe the diversity of pathogens causing blotch and their prevalence in California and Florida for regional disease management.

Growers manage room irrigation and climate to reduce blotch incidence, which could be monitored with **Cropsmarts** technology. However, there are no effective strategies for managing the disease once it becomes established in a crop. Chlorine is used but isn't permitted in organic production. Evaluation of natural products may allow us to identify materials that reduce the ability of the pathogen to cause disease as specific targets for control, reducing the incidence of blotch on mushrooms. For example, GRAS (Generally Regarded As Safe) compounds polyglycerol and sucrose esters of fatty acids hamper the ability of tolaasin, a chemical produced by the blotch pathogen *P. tolassii*, to cause nutrient release from the cap. However, the virulence factors of other blotch pathogens are largely unknown. Grower-funded surveys and comparative genomic analysis of 30 genomes from Pennsylvania

blotch pathogens identified an additional 17 predicted virulence factors (including tolaasin) distributed specifically or semi-specifically among blotch pathogen species. These compounds could serve as novel targets for control.

Some specialty edible mushrooms are considered medicinal in part because they have antimicrobial activities against human and animal pathogens including *Pseudomonas aeruginosa, Staphylococcus aureus, Escherichia coli, Klebsiella,* and others. Extracts from mushrooms are inhibitory to plant pathogenic bacteria, but the impact of these extracts on mushroom blotch pathogens has not been studied. We demonstrated that blotch pathogens of *A. bisporus* populations were stagnant when inoculated onto *Lentinula edodes* (Shitake) and *Grifola frondosa* (Maitake) and did not cause disease as compared to cultivated mushrooms including *Pleurotus ostreatus* (Oyster) on which disease progressed and pathogen populations increased by 100-fold. Our preliminary results have demonstrated that extraction of bioactive compounds from shitake yields pathogen growth inhibition in culture-based experiments, providing confidence that our approach is sound.

La France Isometric Virus (LFIV). Recently, the U.S. mushroom industry has experienced a significant increase in crop losses due to an outbreak of La France disease. When infected mushrooms mature and are allowed to release spores, the quantity of virus-infected spores around farms increases as most spores carry virus particles. Labor shortages on mushroom farms cause significant challenges for growers to complete daily operations, including harvesting mushrooms before they become overmature. The current labor shortage resulted in the incomplete harvesting of crops and the release of massive amounts of La France spores. This surge in virus-infected spores infected new crops as well as crops on other farms, resulting in a significant increase in La France disease that became epidemic during 2021-22.

A challenge for growers is that virus-infected mushrooms may or may not show disease symptoms. Another challenge is that the first observed symptom is typically reduced yield, followed by a delayed onset of mushrooms produced, which can be mistaken for many cropping problems including but not limited to poor compost (substrate) and improperly managed cropping conditions. Because there are limited laboratories that provide virus testing, few growers send samples out for confirmation of the virus, unless disease development progresses to the point that mushrooms display pronounced virus symptoms (elongated stems and premature cap opening). We know of only two commercial spawn 'mushroom seed' labs that provide services to detect the virus when present at high abundance. Importantly, no methods are currently available to quantify the amount of virus in mushroom tissue, particularly when the virus may be present at moderate or low abundance. Through this project, we will develop a sensitive protocol for detecting and quantifying the virus at lower abundances for incorporation into diagnostic services.

Previous virus symptomology research was conducted with older strains of *A. bisporus*, twenty years before the hybrid strains utilized now were developed. Increased virus inoculum has been recently reported from farms using these hybrids. Currently observed symptoms do not match the disease symptoms previously described. It is necessary to re-investigate virus symptom development and severity in relation to the spore loads and timing of infection using modern *A. bisporus* strains. More accurate and earlier identification of La France disease will help to time control practices and reduce crop losses.

Extension and Outreach. During a previous USDA-OREI project, we developed several extension publications and videos in English and Spanish that are available on the PSU Extension website for free download. We held dozens of on-farm training sessions to underrepresented growers, and presentations at the annual Mushroom Short Course and bi-annual Pesticide Credit meetings. We published trade journal articles on IPM and organic pests and disease control methods and hosted monthly meetings of the Phorid Fly Action Committee (PFAC). We also delivered annual webinars with state and local government officials to update residential stakeholders, and support residents and growers via the Mushroom Fly Hotline. Fact sheets on mushroom flies were developed for both residents and growers. This newly funded project will allow us to continue and expand our outreach to growers, farm owners, residents, and policymakers.

As progress is made each objective team will provide articles in *Mushroom News* and give presentations at future industry conferences, workshops, and extension publications, including grower fact sheets and website updates in English and Spanish. We will conduct on-farm trainings and webinars on a regular basis. Outreach to scientific experts will be through peer-reviewed publications, national and international scientific conference presentations, and the deposition of collected strains and metadata, including whole genome sequences into internationally accessible strain collections for distribution.

AUTHORS FOR THIS ARTICLE AND PERSONNEL ON THE PROJECT

Role	Name	Title	Institution	Email
Project Director (PD)	David Beyer	Professor Plant Pathology and Environmental Microbiology (PPEM)	Penn State University	dmb8@psu.edu
Co-PD	Michael Wolfin	Assistant Research Professor Entomology	Penn State University	mvw5315@psu.edu
Co-PD	John Pecchia	Associate Research Professor (PPEM)	Penn State University	jap281@psu.edu
Project Investigator (PI)	Carolee Bull	Professor (PPEM)	Penn State University	CaroleeBull@psu.edu
PI	Steven Haynes	Teaching Professor College of Information Sciences and Technology	Penn State University	srh10@psu.edu
PI	Surinder Chopra	Professor Plant Science	Penn State University	sic3@psu.edu
PI	Maria Gorgo-Simcox	IPM Extension Educator (PPEM)	Penn State University	mag38@psu.edu
Co-PI	Kevin Hockett	Assistant Professor (PPEM)	Penn State University	kevin.hockett@psu.edu
Co-PI	Joshua Kellogg	Assistant Professor Veterinary and Biomedical Sciences	Penn State University	jjk6146@psu.edu
Co-PI	Shirin Ghatrehsamani	Assistant Professor Agricultural and Biological Engineering	Penn State University	spg5994@psu.edu
Co-PI	Mihail Kantor	Assistant Research Professor (PPEM)	Penn State University	mpk6148@psu.edu
Co-PI	Fabricio Vieira	Post-Doc (PPEM)	Penn State University	fur10@psu.edu
Co-PI	Samuel Martins	Assistant Professor Plant Pathology	University of Florida	sj.martins@ufl.edu
Co-PI	Michael Crossley	Assistant Professor Entomology and Wildlife Ecology	University of Delaware	crossley@udel.edu
Co-PI	Chandra Kambhamettu	Professor Computer and Information Sciences	University of Delaware	chandrak@udel.edu
Co-PI	Phil Coles	Teaching Associate Professor Decision and Technology Analytics	Lehigh University	psc208@lehigh.edu
Co-PI	Todd A. Watkins	Professor Economics	Lehigh University	taw4@lehigh.edu
Collaborator	Jose Pablo (JP) Dundore-Arias	Assistant Professor Plant Pathology	California State University Monterey-Bay	jdundorearias@csumb.edu

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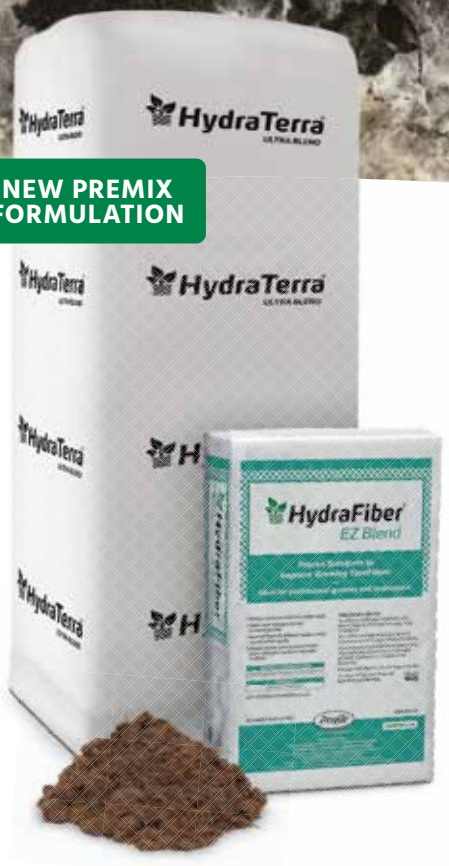

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FOR THE BIRDS:

How Compost Can Aid in Grassland Bird Conservation and Sustainability

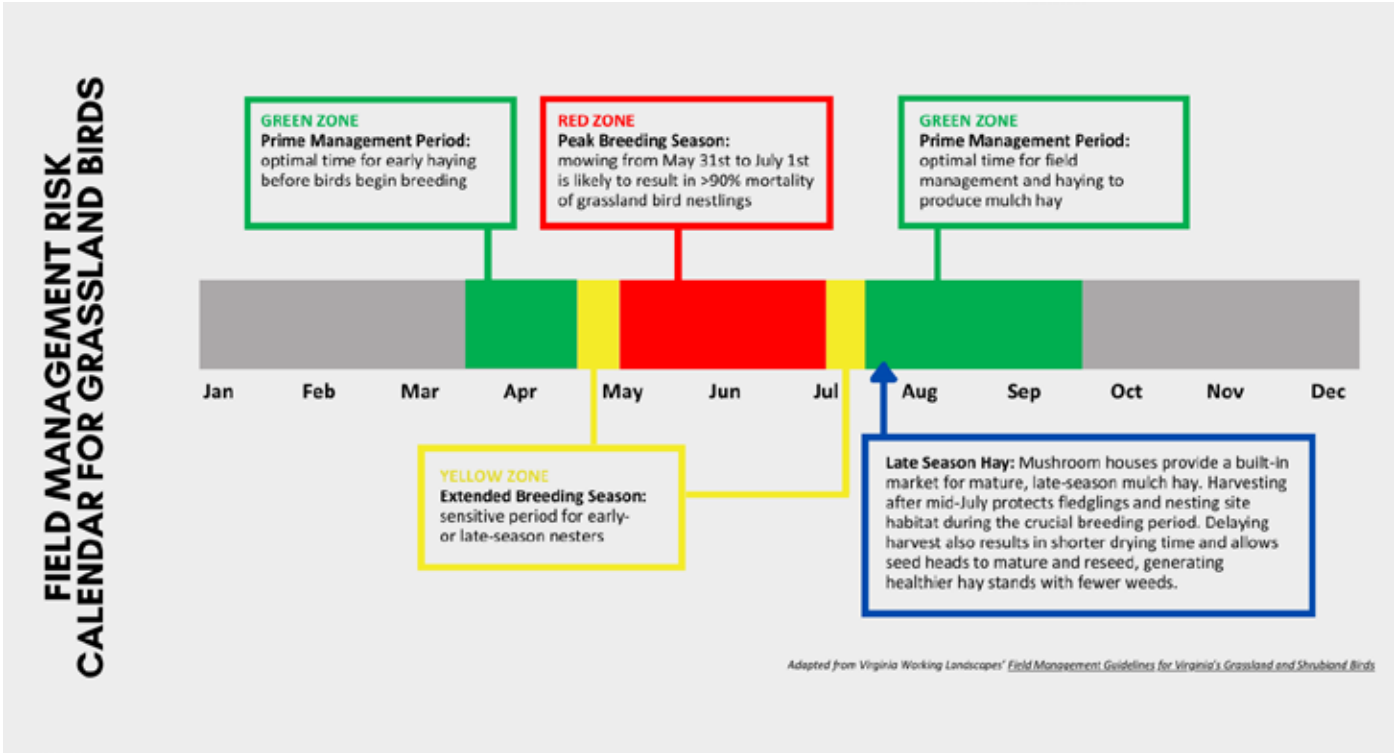
ZOE WARNER, PH.D., | The Grassland Bird Collaboration **RACHEL ROBERTS** | *President* | American Mushroom

In 2022, the Grassland Bird Collaboration (GBC) was launched in Chester County. The GBC, a program of Willistown (PA) Conservation Trust (WCT), works with landowners and farmers to conserve and augment grassland bird populations through conservation land management practices, research, education, and community engagement. The GBC's goal is to create a ***working conservation landscape*** where partners work together to address issues affecting grassland birds. WCT and American Mushroom have secured funding through the Cornell Lab of Ornithology to expand the GBC's reach to mushroom farmers and their hay suppliers.

In the last half-century, the number of grassland birds has decreased dramatically due to changes in farming practices and increased land development. Consequently, grassland birds are experiencing the greatest declines of any habitat group. The mushroom industry can help change the trajectory of these declines. And it can be advantageous for the industry as well.

Several species of grassland birds have adopted hayfields that are managed for late-season mulch hay used in mushroom compost as their breeding grounds. These birds build their nests directly on the ground, and lay their eggs in small cups of grass buried deep beneath the dense, thatched hay. These nests are well-hidden and far from the field's edges to protect them from predators. It is a wise nesting strategy, but it can also make it difficult to protect the nests and their young from field-wide disturbances, like mowing.

To ensure breeding success, the fields should remain undisturbed from the time of nest building until the young fledge, which is a period of about 30 to 40 days. There are several stages to breeding, including: nest-building, egg-laying (usually one per day for several days), incubation, and brooding during which time the babies are in the nest and completely dependent on adults for feeding. This



is a particularly vulnerable time when the survival of the baby birds hinges on what happens in a 6-inch space in the middle of a hayfield.

But that vulnerability doesn't end there. After about two weeks in the nest, they undergo a flightless period in which they move out of the nest, walking and running in the grass, but are unable to fly. Once they leave their nests, it takes about two weeks for the young birds to be able to take short, sustained flights.

When they become strong enough to fly away from the tractors, they are then able to survive the field disturbance caused by mowing. Until that time, the adults have put the future of the next generation into the hands of those who manage the land.

Mowing before birds complete their nesting cycle removes available habitat and can reduce breeding success if birds have already begun breeding. Late-cut, field-cured hayfields used to produce mulch for mushroom farms is ideal habitat during the vulnerable breeding period and provides a better hay product for composting and field maintenance. If hay if allowed to stand in the fields through June, the seed heads have time to mature, which helps maintain denser grass cover that produces higher hay yields and provides safe haven for the developing babies hidden within its protective layers.

In Chester County, PA, the GBC has piloted late-mow agreements with hay farmers. In the fields where these birds are nesting, there is a "no-mow" period until around July 4th. Shifting mowing dates gives young birds time to develop and can increase breeding success among ground nesting birds. Implementing a formal "no-mow" period provides important breeding habitat in which young birds can develop in a secure environment before the nesting grounds are disturbed and can, over time, help boost population numbers.

Jamie Hicks, a Chester County farmer, has always cut most of his hay for mushroom compost. He began participating in the GBC program a few years ago. He said, "Mowing after July 1st works for me. The program gives me more flexibility to space out mowing dates, and it's something the landowner and I agree on before the season. It's also an opportunity for people to see how farmers can be good conservation partners."

To ensure this important grassland habitat remains productive for farmers and the breeding birds that depend on it, AMI and the GBC will provide support for mushroom farms whose suppliers may be able to delay mowing.

Adding to the Mushroom Industry Sustainability Story

AMI's vision for participation in this effort for the industry is to develop more ESG (Environmental, Social, and Governance) assets for the mushroom industry sustainability story. Pointing to ecological benefits adds to the industry's composters and farms' ESG profiles. This grassland birds project, like the mushroom-farm bird colonies for Phorids initiative, expands the economic ornithology

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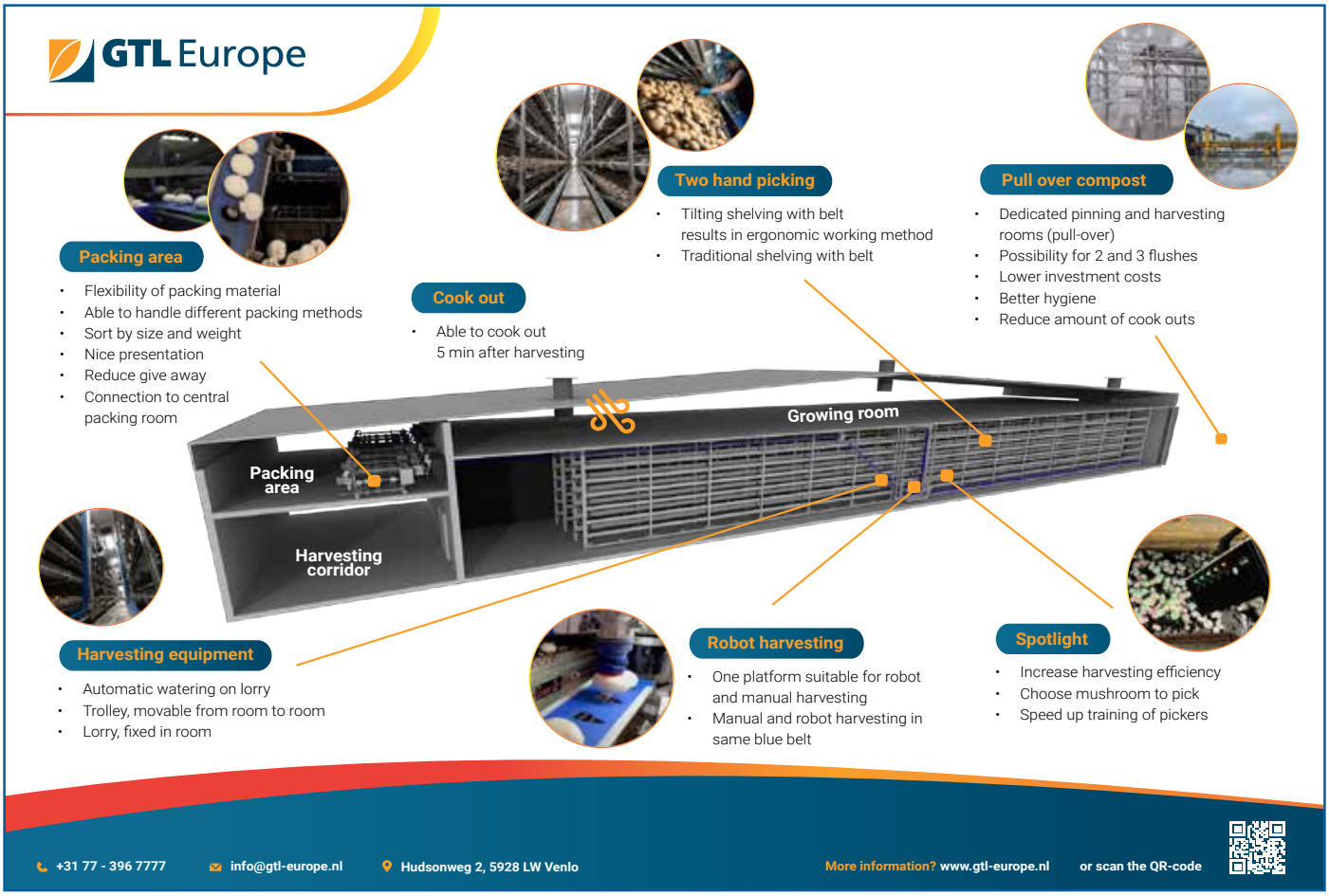
scope for the industry. It fits neatly into ESG efforts, particularly through its focus on environmental conservation and biodiversity. By collaborating with organizations like the Willistown Conservation Trust and the Grassland Bird Collaboration, the mushroom industry is actively working to protect vulnerable bird species while maintaining sustainable farming practices.

By promoting land stewardship, this effort aligns with ESG goals, showing the industry's commitment to responsible land use, biodiversity enhancement, and environmental health. Additionally, it fosters strong governance by encouraging collaboration among farmers, conservation groups, and landowners to address ecological concerns. Such partnerships help integrate sustainability into business operations, benefiting both ecosystems and farming communities.

This approach also demonstrates how businesses can contribute to social good by supporting local wildlife and educating communities about conservation. In essence, this initiative showcases the creative ways by which the mushroom industry can meet its environmental responsibilities through ecosystem services, while achieving broader sustainability goals that appeal to investors and consumers alike.



With Change Comes Opportunity: Changes Coming to *Mushroom News*

LORI HARRISON | *Vice President, Communications* | American Mushroom

I'll get right to the point.

We have some important and exciting news to share about *Mushroom News*. We have been busy evaluating ROI for our members and advertisers, benchmarking the magazine, and conducting discussions with our Board of Directors, members, others. As a result, we've made the decision to make some changes to ensure the future of the *Mushroom News* publication and to meet our members where they are.

Beginning January 2025:

- We're moving *Mushroom News* to digital only. There are a couple reasons for this: One, we benchmarked against other large and small associations, and this tracks more closely with best practices. Two, most of our distribution list receives *Mushroom News* in print and digital form. They are already reading it electronically. This bares out repeatedly each month, as *Mushroom News* enjoys a very high open rate of 70 percent, consistently.
- We are moving the frequency of issues from monthly to bimonthly; 12x to 6x a year. We understand that this is a dramatic change. Here's why we made the decision: We are finding it increasingly difficult to acquire quality content for our readers. A bimonthly format will help alleviate some of that challenge and boost overall quality. Next, printing and distribution costs have increased while advertising has decreased. This will help relieve budget pressures. And finally, the reduction in frequency helps AMI's small but ambitious staff open bandwidth to work on additional advocacy and communication projects to help the industry.

So, what does all this mean for you?

- **For our advertisers**, you'll see favorable changes to your ad budgets and more flexibility with your ads.
- **For our readers**, a digital format allows us to enhance your reading experience by incorporating multimedia elements such as videos, interactive graphics, and links to additional resources. These dynamic features will provide a richer, more comprehensive understanding of the topics that matter most to your business.
- **For our industry**, we're putting our money where our mouth is. We are leaders in growing a sustainable food, and this moves offers another data point in this industry's commitment to sustainable practices.

Change can sometimes be challenging, and we are committed to making this transition as smooth as possible. We are working diligently to ensure the new digital platform is easy to use and provides the same valuable insights and industry updates you've come to expect from us. As we move forward, we'll keep you updated on distribution dates, detailed instructions on how to access the digital magazine and offer support if you need assistance.

I know it's a big change. But this change will help AMI continue to support its members with clear, concise, and informative content.

FOOD FOR THOUGHT:
The Sustainability of Sustainability

RACHEL ROBERTS | *President* | American Mushroom

About Time: McKinsey and Company Ask Farmers about Sustainability

As the agricultural sector faces increasing pressure to scale sustainably, the McKinsey & Company's *Voice of the US Farmer 2023-24: Farmers seek path to scale sustainably* report sheds valuable light on the challenges and opportunities that farmers across the country encounter. McKinsey & Company is a global management consulting firm actively engaged in ESG efforts through research and strategies to help industries, including U.S. agriculture, adopt sustainable practices and meet environmental goals. At American Mushroom, we are committed to staying ahead of ESG trends impacting the industry and ensuring that our industry is aligned with best practices for sustainability, while also remaining unburdened, profitable, and competitive.

Farmers Tell It Like It Is

The McKinsey report's findings show that while 90 percent of U.S. farmers are aware of sustainable farming practices, the adoption of these practices remains limited and inconsistent across different farming operations. Farmers are eager to adopt methods like reduced or no-till farming, cover crops, and variable-rate fertilizer application, but the implementation is typically only on small portions of their land. Many of the barriers preventing full adoption resonate with our own industry. Much like mushroom farmers, other agricultural producers face uncertainty about the return on investment (ROI) from sustainability practices and are looking for more operational and financial support to help scale these efforts.

One key finding from the report is that farmers tend to adopt practices that have a clear and immediate financial benefit. For example, reduced tillage practices and the use of soil-sampling-based fertilizer applications are among the most widely adopted because they deliver noticeable ROI, such as improved yields and lower input costs. At American

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Mushroom, we understand that sustainable farming needs to be economically viable to be embraced by the broader farming community. This is why we need to make sure our sustainability efforts, such as compost optimization and biological controls, are presented in a way that clearly highlights their financial benefits alongside their environmental ones.

Show Me the Money. . . and Technical Assistance

Another critical insight is the role of government programs in encouraging sustainability. Farmers participating in government-backed initiatives like the Environmental Quality Incentives Program (EQIP) are more likely to adopt sustainable practices across larger portions of their acreage. Unfortunately, fewer than 5 percent of farmers are involved in industry-sponsored programs. For the mushroom industry, this represents a huge opportunity. If we can develop stronger industry-led programs, perhaps in collaboration with government support, we could significantly boost adoption of best practices across our network of growers.

The report also points out that smaller farms, which often represent a significant part of our mushroom farming community, face operational challenges in adopting sustainable methods. These challenges range from the upfront costs of new equipment to the complexities of managing day-to-day operations under new systems. At American Mushroom, we recognize the unique needs of smaller mushroom farmers and must ensure that any sustainability programs we advocate for are both accessible and practical for operations of all sizes.

One takeaway from the McKinsey report that directly applies to us is the need to provide reliable information and technical support to our farmers. The report highlights that many farmers are open to adopting new practices but need clearer guidance on implementation and the financial outcomes. Our role as industry leaders is to ensure that we are not only championing sustainability but also getting government to provide the tools, data, and support needed for

these practices to succeed on the ground. American Mushroom provides the sustainability storytelling and promotion tool. At the same time, the data and measures required for operations to adopt practices must be feasible, and American Mushroom fights for them to be just that—with funding attached to assure feasibility and incentive.

As we look toward the future, the lessons from the McKinsey report are clear. Sustainability must make sense both environmentally and financially. By understanding the challenges our farmers face, and promoting the inherent sustainability, circular economy, and ecosystem services of our industry, we can position the mushroom industry as a leader in sustainable agriculture. Hence the work that went into designing the recent sustainability survey conducted by American Mushroom, which dovetails seamlessly with the insights presented in the McKinsey report.

AMI members are providing comprehensive information through this survey, which focuses on understanding how producers view their own ability to implement and achieve sustainability practices within the industry, from composting and water management to energy efficiency and biological controls. Much like the McKinsey report, we are finding that awareness of sustainable practices is high, but full-scale adoption requires overcoming operational challenges and providing clearer financial incentives.

What stands out from both the AMI survey and the McKinsey report is the critical need for greater support—both financial and technical—especially for smaller farms. These smaller mushroom farms that flow into the supply chain, just like many of the small operations cited in McKinsey's findings, need access to tools that make sustainability feasible on a day-to-day basis.

The findings from our survey will be released in the inaugural sustainability report, set for publication in 2025, and set to be updated every five years. The first report will summarize the level of sustainability assessed by the industry, and whether we can move the needle to a higher percentage of members reporting higher levels of sustainability. This report will also provide a comprehensive look at how mushroom farms are adopting practices that align with environmental, social, and governance (ESG) goals and highlight the ways in which the mushroom industry is innovating to meet both economic and environmental objectives, echoing many of the themes explored in McKinsey's research. By aligning these insights, our 2025 report will not only showcase our progress but also set a clear path for the next decade of sustainability efforts and they sustainability story of mushroom farming.

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LOTS TO EAT, ACHING FEET, FIRST MUSHROOM FESTIVAL SCORES A BIG HIT

STORY AND PHOTOS BY DON GRAY

Mmmmmmm. Miss meets mushrooms. These two young ladies were among the 1500 mushroom-munching visitors who helped make the First Annual Mushroom Festival an outstanding success.

The First Annual Mushroom Festival, held in Kennett Square, Pa. in conjunction with the popular Chester County Day, was a resounding success.

More than 2000 persons visited the Festival. And some 1500 of them consumed 15 nine-pound hams, over 11 hundred pounds of barbecued chicken and hundreds of pounds of mushrooms.

The food was an important factor in the Festival's success but another, equally important factor was curiosity about mushroom growing — a subject about as dark to most people as the houses in which mushrooms grow. The Festival offered the public a clear view into every phase of this industry.

A Flood of Questions

Interest and enthusiasm were evident everywhere . . . evident when mushrooms in the sampler section gave out halfway through the affair and more had to be obtained . . . evident in the comments and faces of the people. They may have been tired and their feet aching but there was so much to learn that there was an almost constant flow of questions at every booth and display. The many exhibits offered the visitor everything from do-it-yourself growing kits to a myriad of delectable products ranging from canned goods to fresh mushrooms.

One of the most popular booths was the sampler section. Visitors ambled around a large display of mushroom hors d'oeuvres, sauteed mushrooms and many other mushroom dishes, sampling at will. French fried mushrooms could be sampled at yet another booth.

A Mevie and A Visit

Many people, after viewing a movie depicting mushroom cultivation from start to finish, want to visit a mushroom house to see just what it was like. The plants of Tavoni and Sons of Kennett Square, and Frebro Inc. of Avondale, were made available for this purpose. People peered into the blackness and saw what many thought an astounding sight, pure white mushrooms, thousands of them growing in all that darkness.

The equipment unique to this industry was on display in the large parking lot adjacent to the Sons of Italy Hall, where the festival was held. The local manufacturers of the machinery were on hand to explain the functions of each piece.

With pockets full of brochures and recipe pamphlets, the visitors turned toward their cars for the drive home. They must have had a feeling of a really worthwhile and enlightening visit with a new appreciation of mushrooms, their culture, culinary importance and the importance of the industry to the area and nation.

Credits and Applause

The American Mushroom Institute and the Kennett Square Chamber of Commerce, co-sponsors of the event, with Ernest Bonifacino and Chamber President Benjamin Reynolds acting as co-chairmen, can be complimented on a job well done. A job not only of helping the growers, canners and all others display their products, but of bringing this part of agriculture closer to the consumer.

MUSHROOM WEEK TO BE BIGGEST EVER FOR A.M.I.

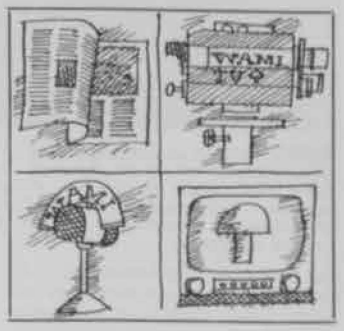
Mushroom Week 1964 finds the mushroom industry ten years down the road of co-operative effort for increasing sales — and what a vast distance this puts the industry ahead of 1954.

Mushroom Week 1964 will find editors throughout the United States waiting for news of the new crop — and for news of the new ways in which the A.M.I. suggests eating them. Ten years ago housewives used mushrooms primarily for garnishing steaks. Since then mushrooms for salads, soups, omlets and with other vegetables have been brought forth by the A.M.I. The best ways to prepare and cook mushrooms have been circularized. And the use of mushrooms as a main dish has been publicized.

Reaching 190,000,000 People

It is impossible to reach every single person in the U.S. with news and views about mushrooms. There are a few hermits who don't read anything or listen to radio or watch TV or talk with other people. But they will have to seal themselves off hermetically this year to keep from hearing news about mushrooms during mushroom week. And chances are if they don't hear about them they'll eat some anyway.

The industry's friends on newspapers, on magazine staffs, and in radio and television studios have helped spread the word about mushrooms each year and this year promises to be the best ever according to the reaction to the year's new recipes. And the industry has some very good friends indeed who have gone ahead on their own and elaborated wonderful new dishes to suggest to America's homemakers.



New Ways of Using Mushrooms

This year's promotional effort is based as always on the delicious taste and texture of mushrooms. It shows the versatility of mushrooms. It shows once again how to prepare and cook mushrooms. And it stresses in its various ramifications mushrooms for teen agers, mushrooms for home cooking, mushrooms for cooking in restaurants and other mass-feeding institutions, mushrooms for those who count their calories and mushrooms for those who couldn't care less about calories, mushrooms for those who fear cholesterol like the plague and those who dote on the stuff. If anyone who eats anything has escaped thought and attention, it will be a group so small as to consist of a single person—or less.

3

ANALYSIS & FORECAST

Mushroom Compost Pricing: August 2024

Agriculture and Bio Fuels (ABF), LLC collects, analyzes, and develops a template cost modeling and forecasting/cost projecting model tool using USDA and other needed available pricing data on compost inputs, including, but not limited to: wheat straw, hay straw, cocoa hulls, soybean straw, coffee pulp, corn stover, cottonseed hulls, coconut fiber, coir, and husks; sawdust, gypsum, chicken litter, and stable bedding. ***Below is the August 2024 data.***

Current Situation

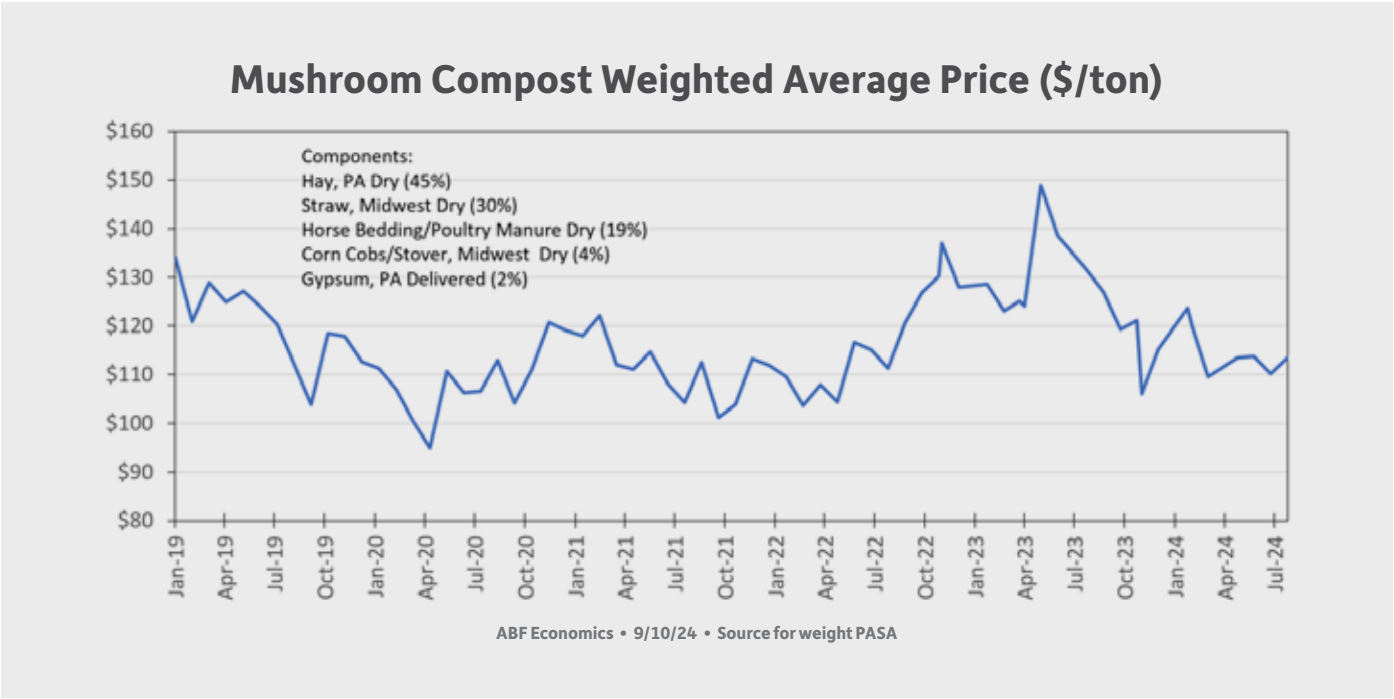
- Weighted average compost prices continue their decline since the beginning of 2024 and are substantially lower than year ago levels in July.
- Market prices for most compost ingredients have posted significant year-over-year declines
- Compost prices averaged $113.42 per ton in June, 13.9% below year-ago-levels. Compost prices for the first seven months of 2024 are 8.6% below 2023 levels with the sharpest declines posted by straw, stalks, and nitrogen which affects poultry manure.

Outlook/Forecast

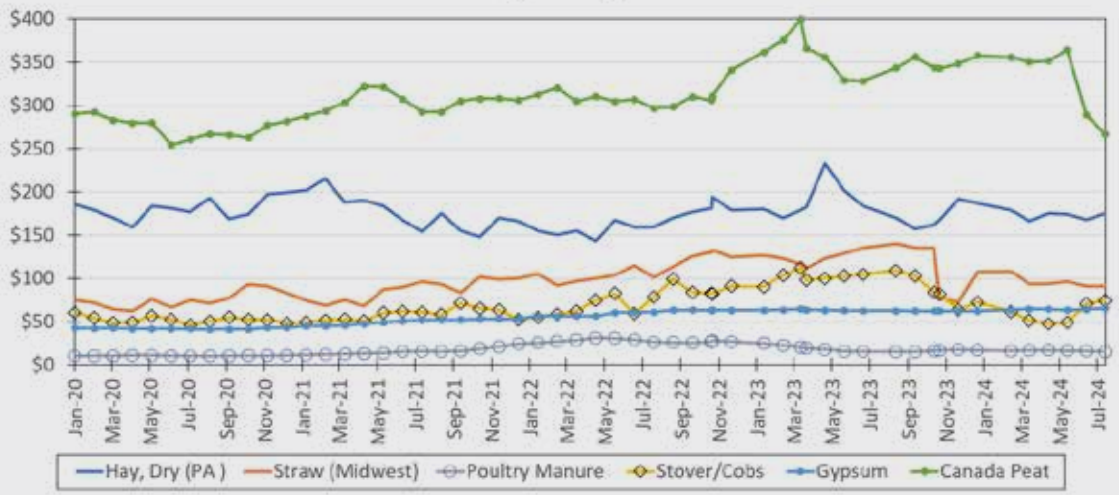
- Our forecast for mushroom compost prices for the remainder of 2024 and 2025 have been revised downward. Prices in the second half of 2024 are expected to show moderate seasonal increases. However, projections of lower raw material prices in 2025 are expected to allow average compost prices to fall an additional 1.8% in 2025.
- Things to watch out for include weather and the impact of lower farm income resulting from higher costs of production on planting for next spring.

Notes

- Prices for cornstalks (cobs and stover), straw and hay are for dry material
- Prices for cornstalks (cobs and stover) are Midwest average market prices quoted by USDA Agricultural Marketing Service in the National Weekly Biomass Energy Report NW-GR310
- Hay price is the average price received by PA farmers for all dry hay published by USDA/NASS
- Gypsum price is calculated using a May 2023 price for gypsum delivered to SEPA mushroom growers quoted by USA Gypsum and increased using the PPI for Gypsum Building Materials PCU3274203274201
- Poultry manure price is calculated using a January 2023 Lancaster PA auction price. Series calculated using the PPI for nitrogen fertilizer PCU325311325311



Mushroom Compost Ingredient Prices ($/ton)



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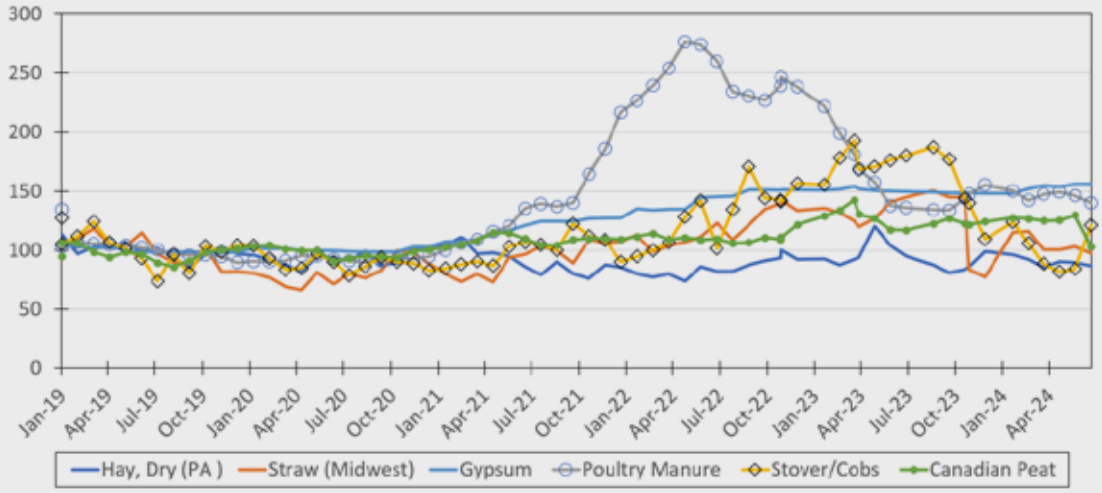
Mushroom Compost Ingredient Prices (Index 2019=100)



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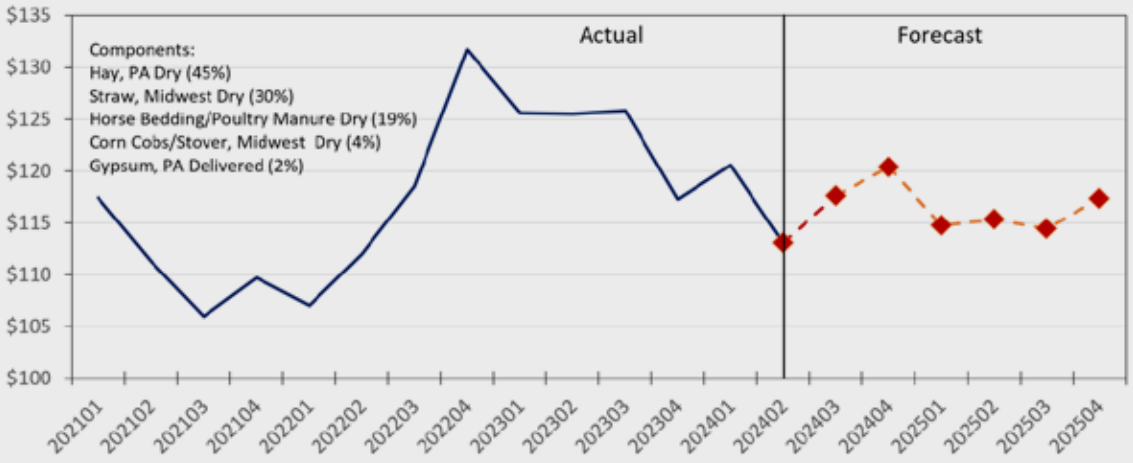
Mushroom Compost Price Forecast ($/ton)



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Mushroom Compost Price Forecast & Assumptions

	Corn Farm Price ($/bu)	PA Hay Price ($/ton)	Mid West Straw Price ($/ton)	Forecast Compost Price ($/ton)
2024 Q1 (actual)	$4.49	$177.33	$103.04	$112.46 (actual)
2024 Q2 (actual)	$4.46	$172.33	$93.53	$113.08 (actual)
2024 Q3	$4.48	$175.05	$103.33	$117.61
2024 Q4	$4.12	$182.85	$102.85	$120.36
2025Q1	$4.93	$175.01	$93.22	$114.81
2025Q2	$5.23	$175.48	$93.99	$115.79
202503	$5.31	$167.14	$103.85	$113.24
202504	$4.89	$175.03	$103.36	$115.98

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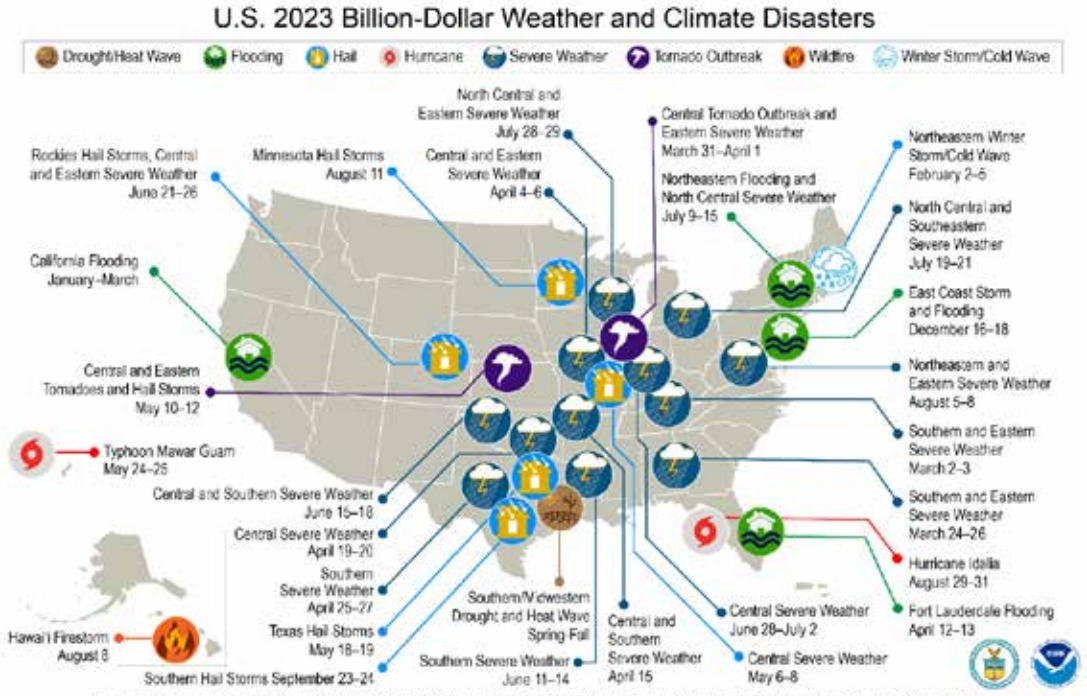
Facts & Figures



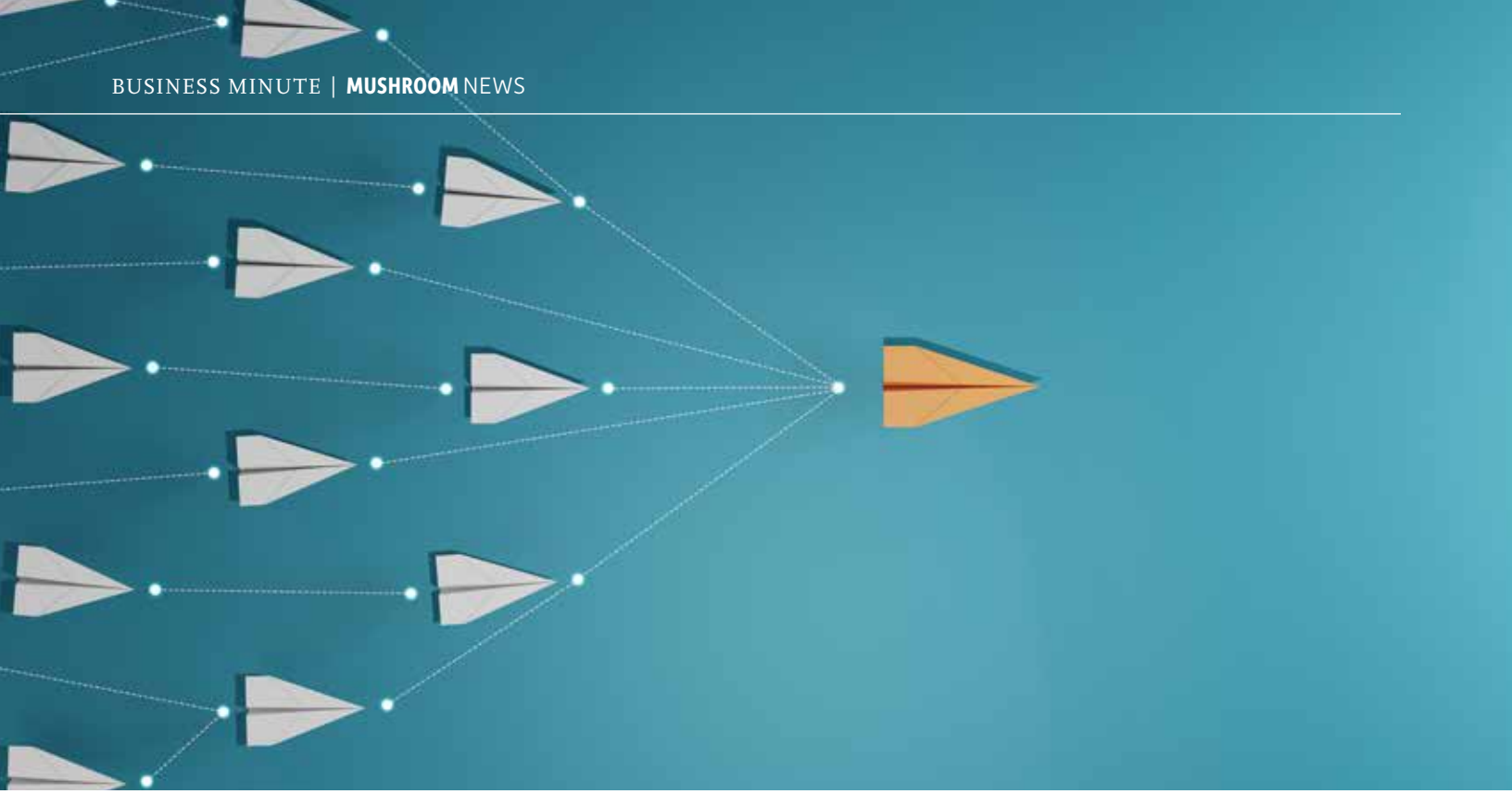
MUSHROOM IMPORT REPORT | AUGUST 2024

Compiled from the Department of Commerce Trade Data Services / Washington, D.C.

IMPORT CLASSIFICATION	AUG 2024 KILOGRAMS	2024 YTD KILOGRAMS	AUG 2023 KILOGRAMS	2023 YTD KILOGRAMS
Fresh, *Agaricus*	6,213,202	51,855,532	6,270,162	50,251,791
Fresh, NESOI*	641,550	7,834,801	706,848	6,387,280
Total Classified by Fresh Weight	**6,854,752**	**59,690,333**	**6,977,010**	**56,639,071**
Whole < 225 g	147,597	1,200,675	145,208	966,032
Sliced < 225 g	387,342	2,208,744	435,808	4,024,908
NESOI* < 225 g	327,112	3,099,172	805,584	5,796,349
Whole > 225 g	252,455	2,630,427	330,242	2,133,280
Sliced > 225 g	234,036	2,590,850	513,451	3,641,003
NESOI* > 225 g	1,460,702	10,689,693	1,143,975	8,830,834
Total Classified by Container Weight				
< 225 g	862,051	6,508,591	1,386,600	10,787,289
> 225 g	1,947,193	15,910,970	1,987,668	14,605,117
Total by Container Weight:	**2,809,244**	**22,419,561**	**3,374,268**	**25,392,406**

Full import reports available at http://americanmushroom.org/industry-resources

** Not Elsewhere Specified or Indicated*



BUSINESS MINUTE

Building a Strong Leadership Presence

Some folks call it the "X factor," while others think of it as a special gift only a lucky few possess. But when it comes to being an outstanding leader, there's one undeniable ingredient that sets them apart: a killer leadership presence. Whether you're running a small team, heading up a massive corporation, or teaching, this quality acts like a magnet, drawing people's attention in.

In their book ***Leadership Presence***, authors Belle Linda Halpern and Kathy Lubar define it as "the ability to authentically connect with the thoughts and feelings of others in order to motivate and inspire them to achieve a desired outcome." A simpler definition goes a little like this: It is a unique combination of gravitas, basic savvy, and the ability to make others feel both safe and inspired.

Furthermore, it is not something you are born with; it is something you learn.

The first piece of advice? Don't fake it before you make it. There is an irony that comes with leadership presence, which is that you should never pretend to be something you are not. There are people who put on a facade and shout orders to appear as leaders, when in reality, they are not leaders. However, you do need to present yourself differently to build leadership presence. When you are more junior, you can be silly. As you advance in seniority, you must remember that a whisper becomes a shout.

A few tips for building your own leadership presence:

1. You Need Constant Situational Awareness

Never underestimate the power of being really, really good at reading the room at work. It's like being a parent; roughhousing with your kids is fun, but a good parent knows when to stop, and when it's going too far. Good leaders have to have constant situational awareness.

Leaders suffer when they lose this focus. They allow people to say things that shouldn't be said. You're managing the room; watch the room constantly. If someone is struggling to get a word in, step in and say something like, 'Hold on one second. Bob, you're trying to say something?' Be aware of those who are struggling to speak and those who are speaking too much.

2. Always Remember: Everything You Say Carries Weight

If you're in a position of authority, it's important to remember that everything you say is magnified and car-

ries weight. A compliment can make someone's week. On the other hand, a little offhanded comment can destroy someone. Everything is just exaggerated. Remember that everything that comes out of you is louder, bigger, more sensitive, spotlighted, and more exaggerated. A whisper becomes a shout, and you have to be ultra-sensitive to compliments and criticisms.

3. Yes, Fashion and Body Language Are Important

In a world filled with hoodies, it's simply a fact that how you present yourself—both in terms of appearance and body language—impacts your leadership presence. Take a tip from Ronald Reagan. He always wore a jacket and tie in the Oval Office. It was out of respect for the office, and it largely set the tone.

Also, remember that human beings don't just communicate with words. We send powerful messages with our bodies even if we don't know we're doing it. Posture matters. You can't sit in a meeting hunched over and expect that people will think that you're the leader. You should sit up straight.

4. Always Protect the Group

Fact: Leaders are leaders because they, well, *lead*. As hierarchical animals, we kind of want to know who we can trust and who we can follow, and we're constantly assessing and judging each other. When you have all of these leadership presence skills, what you're communicating to the room is I'm aware and I'm going to protect the team.

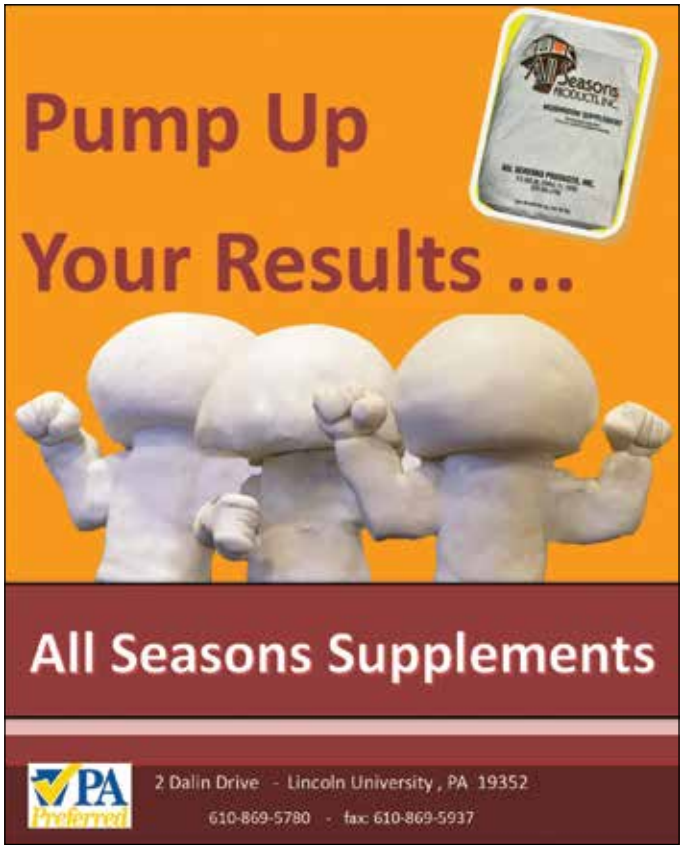
While leaders should project safety and protection, it doesn't mean stronger or louder. What you're communicating with good leadership presence is that the leader goes first. That's why we call you a leader. You *lead*. You go first towards the danger. You speak truth to power.

5. Embrace Your Inner Idiot

One of the best ways to build leadership presence is to ask the questions that everyone is thinking but no one else is asking. You're willing to be stupid; you say, 'I don't understand.' No one understands, but leaders are the first to say it.

At the end of the day, this will build the trust and respect that comes with leadership presence. If you're willing to go first into danger and discomfort and help ideas move forward, what that communicates is trustworthiness and protection.

Reprinted in part from Simon Sinek's Optimism Company. Sinek is a trained ethnographer, but fascinated by the people and organizations that make the greatest and longest-lasting impact. Over the years, he has discovered some remarkable patterns about how they think, act, and communicate, and also the environments in which people operate at their natural best. He may be best known for his TED Talk on the concept of WHY, which has been viewed over 60 million times, and his video on millennials in the workplace—which reached 80 million views in its first week and has gone on to be seen hundreds of millions of times.



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South Mill Mushroom Sales, Inc.
To-Jo Mushrooms, Inc.

CONSULTANTS
Agari-Culture Consulting
Eichman Law, PLLC
Fischer-Ridge Associates LLC
Innovative Financial Results, LLC
Longwood Biological Labs, Inc.
Mowery Environmental, LLC
PA Department of Agriculture
Phillip Coles, Lehigh University
Serca BV

EQUIPMENT SUPPLIERS
A&A Lumber Supply, LLC
AEM BV
Agro-Projects Exports
AirMaster
Arco-Solutions bv
Central Life Sciences
Christiaens Engineering & Development
Concept Plastics Ltd.
Dutch Mushroom Projects
Fancom B.V.
Foley Cat
GICOM b.v. Composting Systems
Goodwin's Refrigeration
GTL Europe B.V.
Hoober, Inc.
Hoving Holland International B.V.
J F McKenna Ltd.
Jenkins & McMahon Supply, Inc.
Jim's Commercial Service, Inc.
Lubing Systems
M Construction
Midlantic Machinery
MushComb
Mushroom Central Supply
Mushroom Supply & Services, Inc.
Mycoguard Inc.
Omori North American Inc.
Pannell Mfg., Corp.
Penske Truck Leasing
Redwood Mushroom Supply
Richard M. Crossan Inc.
Satrise Industry Co.
Sherwin Williams
Stateline Truck and Trailer Center, LLC
Stengel Welding Shop, Inc.
T. M. Fitzgerald & Associates
Tague Lumber
Techmark, Inc.
Total Indoor Air Quality
Viking Pure
V.P. Electrical Contracting, Inc.
Wolfe Supply & Services
XENON Corporation

MUSHROOM COMPOST
H.M.R. Associates, Inc.
Hy-Tech Mushroom Compost
Laurel Valley Farms, Inc.
Ontelaunee Farms, Inc.

PACKING SUPPLIERS
Berry Global
Culture Plasti-Tech 2005 Inc.
East West Label Co., Inc.
EcoBioPlas Inc.
Envirotex Products, Inc.
Evolupak
L K Packaging
MFG Tray Company
Omori North American Inc.
Packaged Cooling Systems
Packaging Corporation of America
Spartech
Viscon, Inc.

PEAT MOSS & COMPOST INGREDIENT SUPPLIERS
Aurora Peat Products, a div. of Hydrofarm
Bio-Fungi Ltd.
BVB Substrates
E & H Conveyors, Inc.
Fastrak Express, Inc.
Full Circle Mushroom Compost LLC
Hillendale Peat Moss, Inc.
Hi-Tech Peat Moss, Inc.
Hooymans Substrates BV
Juniper Farms Peat Moss & Growing Media
Kadant GranTek
Keystone Bio-Ag, LLC
Lambert Peat Moss
Legro Mushroom Casing Solutions
Mushroom Conveyors
Pittmoss LLC
Premier Tech Horticulture
Profile Products
S & P Conveyors, Inc.
Sargent Docks and Terminal Inc.
Sun Gro Horticulture
Sussex Landscape Supply Co., Inc.
USA Gypsum
Vallorani Casing Material, LLC

PROCESSORS
L.K. Bowman, Co.
Manfredi Mushrooms, Inc.
R.L. Irwin Mushroom Co.
Scelta Mushrooms
South Mill Mushroom Sales, Inc.
The Mushroom Company

SPAWN/SUPPLEMENT DEALERS
All Seasons Products, Inc.
Amycel/SpawnMate
Black Dirt Organics
ChampFood International
Lambert Spawn
Havens Graanhandel NV
Mushroom Spawning Services, Inc.
Nature's Fynd
Silo Farms, LLC
Sylvan America, Inc.

Classified

WANTED / FOR PURCHASE
Used growing nets wanted, 24-36 growing bed nets, 65 ft or longer. Compost Turner still operational wanted. Self-feeding or choke feed. Call 630-774-9783

FOR SALE
Stainless Steel Mushroom Basket Washer, two stage. Call 610-496-4787

HELP WANTED
Laurel Valley Farms, a large composting and Phase II facility in Southeastern Pa., is seeking an experienced maintenance foreman. Good benefits and pay commensurate with experience. Send inquires to Alan Fella, Laurel Valley Farms, P.O.Box 70, Landenberg, Pa. 19350 or email them to *alanfella@hotmail.com*

HELP WANTED
Phillips Mushroom Farms, a large *Agaricus* and specialty mushroom farm headquartered in Kennett Square, PA, is looking for an experienced Head Grower/General Manager to oversee its PA *Agaricus* growing operations. Salary and benefits commensurate with experience. Send inquiries and/or resume to Bill Steller, PO Box 190, Kennett Square, PA, 19380-190, or email *stellerw@phillipsmushroomfarms.com*

HELP WANTED
Giorgi Mushroom Company, a large, integrated farm in Berks County, PA, with Phase I bunkers and Phase II tunnels, is seeking applicants for grower and management positions. Ideal candidates would have both growing experience and a strong management background. We offer competitive salaries and a comprehensive benefits package. Applicants may forward a letter of interest and resume to Giorgi Mushroom Co., P.O. Box 96, Temple, PA 19560 or e-mail them to *recruiting@giorgimush.com*

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American Mushroom Institute

American Mushroom Institute
1284 Gap Newport Pike, Suite 2
Avondale, PA 19311