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**HOUSE DEMOCRATIC POLICY COMMITTEE**

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**HOUSE OF REPRESENTATIVES**

COMMONWEALTH *of* PENNSYLVANIA

*House Democratic Policy Committee Hearing*

**Agriculture and Jobs of the Future**

Tuesday, July 20, 2021

2 p.m. to 4 p.m.

Representative Christina Sappey

2:00 p.m. HEARING PARTICIPANTS

Glenn Cote, General Manager  
Laurel Valley Farms

Stephen Allaband, Township Supervisor  
New Garden Township

Rachel Roberts, Executive Director  
American Mushroom Institute

*Q & A WITH LEGISLATORS*

# LAUREL VALLEY FARMS

House Policy Committee Meeting July 20, 2021

## House Policy Committee Meeting

July 20, 2021

Laurel Valley Farms was incorporated in 1979 for the express purpose of producing mushroom compost substrate for its member owners. At the time 12 growers banded together to purchase an existing composting operation to have direct control of the manufacturing of their most important ingredient... the compost that was essential to seed and grow mushrooms in their individual houses.

Forty-two years later Laurel Valley has grown into the largest single site mushroom composting operation in North America. The company is currently owned by 5 mushroom farms representing 3 of the largest packing operations in Pennsylvania. Basciani Foods, Phillips Mushrooms and Giorgi Foods. Mushroom production on LVF compost accounts for roughly 25% of local mushroom production and 12% of the national production of mushrooms.

In the past 21 years, Laurel Valley has invested over \$20 million dollars to modernize our composting operations. Our investments have reduced our environmental footprint while increasing our capacity and biological efficiency. In addition to providing our owners with consistent high-quality substrate, Laurel Valley is the only area composting operation the recycles the post-harvest mushroom compost into a series of value-added soil products for the horticulture and landscape industries. So, Laurel Valley Farms is comprised of two divisions: The Substrate division making high quality mushroom compost to grow mushrooms and The Soils Division making high quality soil products.

With the help of the USDA Natural Resource Conservation Service, the Pennsylvania Department of Environmental Protection, the Chester County Conservation District and New Garden Township we have designed and built a state-of-the-art recycling facility for used mushroom substrate. In this way, Laurel Valley Farms has taken responsibility for its products from cradle to grave.

The economic impact of an operation our size is significant in the local economy, the regional economy and more importantly I feel in the farming community. Our numbers are astounding. Each year we purchase the following amounts of material of which 80% is from Pennsylvania farms located throughout the commonwealth.

- 45,000 tons of mulch hay
- 50,000 tons of wheat straw
- 47,000 tons of straw-based horse stable bedding
- 8,000 tons of corn stover
- 35,000 tons of chicken manure
- 6,000 tons of corn cobs
- 2,000 tons of cocoa bean shells
- 6,000 tons of ground and recycled gypsum
- 7.0 million dollars in spawn and supplement usage from Pa industries

In 2020, we spent 20.5 million dollars on raw materials most of it going directly to the many family farm operations that depend on us for their livelihood. As a result of our purchases, we are responsible for sustainably maintaining over 40,000 acres of open land needed to grow these products.

We currently employ 75 people between our two divisions. We support countless individuals in trucking, maintenance repairs, equipment sales, the health care industry, electrical contractors, consultants etc. in the operation of our businesses. All told we contribute another \$15 million dollars per year into the local economy, dollars that are made and spent right here in Chester County. Our compost is the foundation for our 5 owner farms who employ over 2,000 staff in their operations.

For the past 15 years we have focused our energies on producing value added soil products for the horticulture and green roof markets. At that time, the industry faced the challenge of managing leftover compost from the growing process. With no viable markets in site for the large amount of left-over substrate we produced, we pioneered the manufacturing of topsoil, premium compost, and green roof mixtures as a way of recycling and selling our materials. No such markets existed at the time but because mushroom compost is such a fantastic soil amendment, we have been able to drive and develop a market for a wide range of products. Currently we manufacture and sell 300,000 cubic yards of soil products annually within a 350-mile radius of our facility. Our main product is topsoil. Recently, however we have been working with state and landscape architects to produce a specialized bio retention basin substrate for use in storm water management BMP's mandated by the DEP. We are the go-to facility for this product selling over 65,000 cubic yards of material this year for state mandated BMP's. Our current project is along the Northeast Extension where we are making 35,000 yds of bio retention soil to capture the storm water coming off the road.

Sixteen years ago, we became involved in a process to produce green roof substrate for the newly developing green roof industry. Green roofs are environmentally favorable ways of managing storm water in cities. Our company, Skyland has provided soil for over 11 million sq ft of roof space. Using processed mushroom compost as a base we have completed several major projects in the state and across the country. Local roof projects we have produced soil for include The Children's Hospital of Philadelphia, The Free Library of Philadelphia, Carnegie Mellon in Pittsburgh, and the planters on the State Capitol East Wing Plaza. In total, both soil companies generate greater than 11 million dollars in local economic activity annually.

The challenges we face going forward will require additional investment in infrastructure and technology. Labor costs and equipment repair costs are skyrocketing this year as the state recovers from the pandemic. The margins we are experiencing as growers were already slim prior to the pandemic and are now threatening the viability of our business. Unfortunately, this leaves us with little ability to reinvest in our businesses.

We are currently capable to process and sell 65% of the used mushroom compost we generate into value added products. This is the near the maximum our current infrastructure can produce. The rest is land applied on agricultural fields for corn and soybeans. As housing developments increase in our area the amount of available farmland to utilize is decreasing. We need to act now to develop a plan to further utilize our leftover material or find ways to economically truck the substrate out of the region like they are currently doing with poultry manure with state funded programs in Delaware and Maryland.

All the farms in this area are experiencing extreme labor shortfalls and we are no exception. It is nearly impossible to find skilled mechanics, welders, and machine operators since the end of the pandemic. What was a 10% deficit in skilled labor before the pandemic has increased to a 20% shortage of labor this year. Labor costs are rising, and the shortage of personnel has stunted further growth in our company and our industry. We desperately need a reliable program to recruit and hire people willing to work in agriculture.

I have included in the packet examples of shovel ready projects we have identified as important in the continued development of our company. These projects address our needs to modernize our processes, increase our ability to economically manufacture and sell our products, continue to manage our environmental impact, and mitigate the concerns of residents and township officials.

In the past we were able to rely on grants from the state and federal government to help us improve our environmental footprint and low interest loans with help from the economic development council to expand and modernize our infrastructure. Similar programs are needed now to help sustain the economic impact my company and our industry has on the southeast region of Pennsylvania.

## Shovel Ready Projects

### **Trees and Sound Fence along the back of Laurel Valley Property**

The barrier and screening will reduce odors and reduce noise for the neighbors in Landenberg Hunt. The sound attenuated fence will reduce the noise and the trees will grow to be a prettier screening. Any occasional odors will rise along the screenings.

Cost:           \$50,000  
Timeline:       Now

### **Soil Screener purchase**

Mushroom Compost can be screened onsite for a value-add product that can be sold locally. The benefit of the machine allows us to handle the material only once instead of dumping at 1 location and then moving it to another location so no need for additional water collection from spent. In addition, the material can be sold locally instead of the need to truck the material over 50 miles away. Environmental benefits are less ag water collection and spraying (so better water quality), less carbon emissions from trucking the material and more carbon sequestration from applying more processed compost locally. Labor benefits are less labor to handle mushroom compost and less labor to truck material.

Cost            \$225,000  
Timeline       Now

### **Additional Roofing over Concrete pad for processing Mushroom Compost**

The ability to operate year-round under cover of rain and snow allows us to process dryer material. Customers need material that is not wet so if Laurel Valley can operate more weeks a year, then we can move more screened compost locally. The Mushroom industry has a small window in the spring and fall when we can sell mushroom compost and weather plays a large role making that window smaller. If we can meet the customers' requirements more weeks a year, then we can sell material locally more weeks leading to less of a spent compost issue in the future. Benefits include less ag water collection and spraying (so better water quality), less handling of the mushroom compost so less truck carbon emissions and more carbon sequestration from applying more processed compost locally. Labor benefits are less labor to handle mushroom compost and less labor to truck material.

Cost            \$200,000  
Timeline       Now

### **Expand and Repair Concrete for Fresh Compos and Mushroom Compost**

Making compost on concrete allows us to produce the best quality material as well as direct the water to the collection basin. Laurel Valley will be able to process or store more material, so we have our

repeatable process 12 months per year. Benefits include collection of water in the correct way to meet our Mushroom Farm Environmental Management plan thus improving water quality.

Cost                \$180,000

Timeline           6 months

**Repair the Pre-wet Machine.**

The high-tech equipment allows us to mix the material and add water at the correct time. Our processing time will be reduced so we can process more material on less space. In addition, the correct mixing reduces odor by not allowing the compost to go anerobic. There will also be a labor savings and that is critical as there is a shortage of labor currently.

Cost                \$300,000

Timeline           Now

**New entrance and tire wash station**

The entrance is needed to access the property from a less traveled road as well as keeping the road cleaner. Laurel Valley will reduce truck traffic and be able to reduce the amount of dirt that may get on the road. There will also be a labor savings and that is critical as there is a shortage of labor currently.

Cost

Timeline

**Blending line**

This European designed machine will allow us to get a better mix of our material, shorten the time of the process and may lead to better yields. Laurel Valley will be able to reduce the number of loaders to move the material which will reduce the carbon footprint and save labor. This equipment is standard around the world will allow Laurel Valley to produce better compost with less odor in a more efficient way. Benefits include reduction of carbon footprint, labor savings, less space to process material, higher yields, and ability to grow the business.

Cost                \$1,500,000

Timeline           1 year

**Add Crop land, Clear wooded Land, install erosion controls for Mushroom Compost and soils and add some roofing.**

A project that is currently approved by Ag Lands preservation and supported by the New Garden Township. We plan to upgrade some unused land to crop land, clear an area for soil processing and storage, install erosion controls and increase storm water containment for soils and substrate. This will help make Laurel valley the leader in handling and processing of Mushroom Compost. Benefits include

not needing to double handle the material which saves labor and reduces the carbon footprint. Water quality will be improved per yard as we are able to handle more of the material onsite and local instead of needing to truck the material over 50 miles away.

Cost	\$1,800,000
Timeline	9 months





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Introduction:

Good afternoon, my name is Steve Allaband. I am a Township Supervisor in New Garden Township. I also serve as the President for CCATO, the Chester County Association of Township Officials. I have been involved in local government in New Garden Township since 1998. I have served on the Township's Zoning Hearing Board and Planning Commission and currently am in my third six-year term as an elected supervisor.

Throughout my tenure in New Garden Township, the increase in agricultural demand and impact in our community has been apparent. The industry has provided an increasing number of both direct and indirect industry-related jobs, along with a beneficial economic impact for the Township. However, with that positive impact, there have been some issues that we are hoping to resolve with proactive planning and engagement, along with the help from our government officials.

I have worked in New Garden Township in the private sector for 42 years in various jobs in and around our community and I have seen a lot of changes. Currently, New Garden Township is 16 square miles and we are responsible for maintaining 61 miles of roadway. The remaining roads are the responsibility of PennDOT. We are a population of 12,500 residents and we have an overall total valuation of \$814 million. The median household income in New Garden Township is \$116,000 a year. The 2018 Comprehensive Plan Update indicated that not only do we have the highest household incomes, but we also have the lowest. We are a very diverse Township.

New Garden Township currently has a local enabling tax, earned income, of approximately 3 million dollars. That is the largest generator of revenue that the Township receives for its annual operating budget. Approximately 60% of the jobs in New Garden Township are mushroom agriculture related. There are also many jobs indirectly related to this industry as well, such as plumbing, heating, HVAC contractors, mechanics, welders, etc.

In 2006, the Township Historical Commission took a physical inventory and counted over 760 double mushroom houses at approximately 8,000 square feet of growing space, per double, that were filled four times annually. At the time, it was noted that New Garden Township produced more mushrooms than any other municipality in the United States. Sixty-seven percent of the mushrooms in the United States were grown in Pennsylvania, and 26% of the mushrooms in the U.S. were grown in New Garden Township specifically. We believe those production percentages are accurate for 2021.

In the most recent inventory done by our Township Code Officer, the current number of mushroom houses is 900 double mushroom houses or growing rooms. Advancements in technology and techniques with composting have also increased production by adding opportunity for use of Phase 2 compost, which increases the filling schedule to approximately six times per year. So, not only are there 140 more standing structures, but there is also an increase in crop production by approximately 3,600 fills/crops per year due to the new composting facilities and techniques for Phase 2 composting.

All of the raw materials that arrive, such as hay, manure, straw, corn cobs, etc., first have to be transported to the compost facilities. After being composted, it needs to be transported to the mushroom growing rooms. After a crop of mushrooms, that same material is then transported again as mushroom substrate to our fields. After that product is leached, or seasoned, that material is again hauled to a bagging facility and processed as potting soil and the like. After it is bagged, it is then transported again to retail stores. The mushroom compost/substrate is transported a total of five times on our roads before it leaves the area.

Mushroom growers are master recyclers. They take waste products, blend them together to make compost, which eventually yields a crop of mushrooms. They then take the waste product after growing food and turn it into valuable soil.

#### Composting:

In our municipal boundaries we currently have seven composting wharfs, six of which are located within one square mile, all within the White Clay Watershed and one in the Red Clay Watershed. These composting facilities produce approximately 130 doubles of compost per week. Each double of compost needs to be transported to a growing room from the composting facility. Depending on the size of the vehicle transporting, it could result in anywhere from 3-6 trips for each growing room. That is just one aspect of the transportation. This does not take into account the initial delivery of the raw materials to each composting facility as well. Also, keep in mind that farming is a 24/7, 365 days a year operation.

Some of the negative impacts and complaints that we experience are: inadequate road and bridge infrastructure that need improvement due to the large vehicles in and out of these facilities, traffic, dust, noise, odor, air quality and water quality. Noting that we are mandated to have a compliant Municipal Separate Storm Sewer, or MS4, permit and even though the composters are very cooperative with the municipality, the burden falls back on New Garden Township to remain compliant.

Growing:

Currently having over 900 mushroom houses within the municipal boundaries, many of them backing up to new residential communities, we have several impacts from the growing process. The complaints are in a general nature of water runoff from the growing, traffic, noise, and Phorid Flies. The harvesting crop cycle is approximately three weeks of picking, during which there is an increase in traffic and truck usage due to the increase in the labor force and hauling the mushrooms to a repacking facility. Additional complaints are received when they are filling or loading the double growing rooms with compost and when they are cleaning out. During both of these processes, there is additional truck traffic, which increases dust and noise and heavily utilizes the road system.

Spent Mushroom Substrate:

We have a number of facilities within our municipal boundaries that process mushroom substrate, the waste product of each crop, of which there are approximately six truck loads per growing room 4-6 times a year. They haul the spent mushroom substrate primarily to fields where they leach out or weather the compost for a season. Once it is weathered, it is again hauled



to a processing facility such as Scotts, Laurel Valley, or other facilities for packaging. Scotts is a national company that has landed one of its facilities in New Garden Township. It packages and bags soils for gardening under three names - Earthgro, Hyponex and Miracle-Gro. These are all common products that can be found in any garden center or hardware store throughout the country. Laurel Valley's focus has been to distribute soils in bulk delivery.

In the late winter/early spring there are convoys of Walmart and other transport company trucks that line up and block traffic to enter the Scotts facility to get the bagged product for national sale for spring planting. These trucks drive through residential areas, restricted roads and affect local traffic and neighborhood landscaping. With the distribution, there are serious impacts and inadequate infrastructure, mainly on PennDOT roads. Some of the traffic overflows onto prohibited local roads.

#### Distribution and Sale of Mushrooms:

Currently within New Garden Township, we have eight repacking and distribution facilities that prepare and package fresh mushrooms for distribution in all parts of the United States. These facilities operate seven days a week. Not only do these repacking facilities distribute mushrooms grown in New Garden Township, they also receive fresh mushrooms from our neighboring municipalities. Most of the facilities are very large, refrigerated warehouses. We receive minimal complaints about the repacking facilities as they operate under strict guidelines. Again, the biggest impact we have is truck traffic bringing the fresh product in for repacking as well as distribution from these sites.

Conclusion:

As a Township, we have experienced a significant increase in residential growth and mushroom production, which is creating dissonance between the residential and agricultural communities. The majority of these complaints are filtered through the Township offices.

In summary, New Garden Township has a very good working relationship with most of the mushroom-related facilities within the municipality. However, under current state laws, agriculture is exempt from permit fees and we cannot enforce or impose more stringent regulations on agriculture, such as setbacks, buffers, mushroom farm environmental plans, etc. Mushroom farming has been a part of New Garden Township since the early 1900s. Some of the earliest mushroom farms were located in Toughkenamon, New Garden Township, Pennsylvania. In later years, mushroom farms were being constructed all over the Township.

Mushroom farming is vital to New Garden Township's local economy and beyond. There are thousands of families whose livelihoods depend largely upon the mushroom growing operations. We need assistance from the Commonwealth to continue with grant funding for the farmers and to help the Township with infrastructure improvements.

Respectfully Submitted,



Stephen Allaband



**Testimony before the Pennsylvania House Democratic Policy Committee**

**On the Pennsylvania Mushroom Industry**

**Submitted by Rachel Roberts, July 20, 2021**

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# Mushroom Farmers of Pennsylvania

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TESTIMONY BEFORE THE PENNSYLVANIA HOUSE DEMOCRATIC POLICY COMMITTEE

ON THE PENNSYLVANIA MUSHROOM INDUSTRY

SUBMITTED BY RACHEL ROBERTS, JULY 20, 2021

Rachel Roberts, MSS, MLSP

President

American Mushroom Institute (AMI)

Mushroom Farmers of PA Committee, Meghan Klotzbach, Chair

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The American Mushroom Institute (AMI) is pleased to provide testimony on the economic challenges and opportunities of the Commonwealth of Pennsylvania's mushroom industry in 2021.

AMI is the national trade association representing commercial U.S. mushroom growers, processors, shippers and related service companies, which produce and haul more than 1 billion pounds of mushrooms annually. Production of *Agaricus Bisporus*, the most popular variety, is concentrated in Pennsylvania with 64 percent, followed by California with 12 percent, with the remaining farms located in 15 states. Enclosed in this packet are sales and other figures for Pennsylvania and the nation—across which many Pennsylvania growers operate with satellite locations, subsidiaries and distributions centers, generating even more revenue back to Pennsylvania.

In our Commonwealth, AMI participates in and sponsors on behalf of the Mushroom Farmers of Pennsylvania (MFPA) countless community activities, country fairs, of course the Farm Show—where MFPA won best educational booth in the last in-person show. MFPA's close partnership with the Pennsylvania Department of Agriculture gives voice and agency to some of the state's most pressing rural issues that affect those of us who live, shop, and educate our children all in the same schools. An important example includes the need for improved rural broadband, cable reach and more cell towers so that farms can have reliable systems on site to use software that depend on the cloud and download speeds, which they rely on to manage their growing processes.

## **Labor**

The mushroom industry in Pennsylvania was started by Pennsylvania Quakers, and in the 1920s began employing Italian immigrants. Eventually many of these immigrants assumed ownership positions and started their own farms. In the 1940s and 1950s, farms employed local youth, both white and African-American. In the 1950s, rural Puerto Ricans began to fill the jobs left by workers who moved out of the industry as their economic standing grew. For many traditionally seasonal workers, mushrooms were an opportunity for better pay and year-round work. As that group then also experienced upward economic mobility, Mexican immigrants gradually replaced the Puerto Rican workforce in the late 1970s. Today, approximately 98% of the Eastern workforce is composed of Mexican (the largest group), Central



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American and other international immigrants, and are recruited through what are known as “kinship networks” — family and friends who spread the word about the need for workers.

Mushroom production is unique in that it occurs indoors in climate controlled growing rooms, which makes our industry’s jobs more desirable for many who otherwise have to work seasonal jobs under difficult conditions. Many are surprised to learn that the average length of a mushroom worker—from a harvester to a supervisor or manager—is currently 16, that’s right, 16 years. Further, the management, ownership and start-ups of diverse owned mushroom operations grow and continue to inform our industry’s success and work ethic. The country’s largest mushroom producers are Persian-immigrant and Italian-immigrant-descendant owned, and Mexican-American ownership is on the rise.

While every mushroom harvested in the U.S. is picked by hand, there isn’t one job on a mushroom farm that isn’t technical in nature. From the harvester whose precision and eye are relied on to the sanitizer to the carpenter to the HVAC maintenance position, there are very few mushroom farm jobs that can be picked up in less and a few months within the many food safety and employee safety and health guidelines required. In fact, the mushroom industry was one of the first in the pandemic—if not the first—to quickly adapt all best practices to social distancing, PPE, health monitoring check ins, etc. Mushroom farms are inspected routinely, often unannounced, and comply every day with food safety and worker protection laws under U.S. Department of Agriculture (USDA), Food and Drug Administration (FDA) and other federal, state and local regulators. With these myriad safety procedures already in place, mushroom operations quickly incorporated COVID-19 guidelines.

Although the work performed by our hundreds of mushroom farms is indisputably “agricultural labor,” the Department of Labor’s operation of the H-2A temporary agricultural worker program has categorically excluded mushroom farms from participation. Our members are finding it increasingly difficult to meet their labor needs, reporting shortages of 20% or more on a daily basis. Fully 85% of our members reported labor shortages as moderate-to-severe, with 45% rating the problem as “severe.” The problem is exacerbated by the fact that two-thirds of the nation’s mushroom production is based in two counties just outside Philadelphia, meaning that the labor shortage here in the Commonwealth is felt that much more acutely. At best, this prevents them from expanding their operations to meet existing domestic demand for mushrooms. At worst, these critical shortages jeopardize their ability to remain in operation; many family farms have been forced out of business in recent years.

As this problem worsens, foreign competitors are able to flood U.S. markets with their mushrooms, further harming our Pennsylvania growers. Imports of foreign mushrooms increased by more than 50% between 2014 and 2018, from 80 million pounds to more than 120 million pounds. Imports of mushroom spawn increased by more than 800% over the same period from China alone. The demand for mushrooms in the United States is strong; persistent labor shortages and exclusion from the H-2A program are the only limits on the potential growth of U.S. farms to meet this demand.

Given the current lack of collaboration in Washington, how can Pennsylvania support the mushroom industry? When we look at how mushrooms are grown—see information in this packet—it is clear the opportunities for more hauling efficiencies, cost-savings and marketing of mushroom compost could use some of the traditional government-led R & D, modernization,



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hauling subsidies, and other tax breaks to facilitate the economic ecosystem of the industry. Opportunities range from shovel-ready facilities expansions or improvements to Pennsylvania department of Environmental Protection agreements to coproduct determination of mushroom compost. Innovation in packaging and in environmental best practices are also important to the future of the mushroom industry and dovetail with many of the State's initiatives.

## **Mushroom Compost**

Mushroom compost is an important secondary line of revenue for mushroom growers. It is used to improve crop yields for food crops such as corn when used as a soil amendment, adding organic matter and structure to soil with plant nutrient content and soil microbial activity. It is also the choice ingredient by companies making potting mixtures sold in supermarkets or garden centers. Because of mushroom compost's other beneficial organic properties that have proved to stabilize nitrogen and reduce nitrate leaching (2005, Beyer & Fidanza) as well as absorb and hold water, mushroom growers and food crop farmers alike would be negatively impacted by a restriction on spreading mushroom compost. Research is proving and being conducted on how best to transport and use mushroom compost for remediation of everything from oil spills, toxins, acid mine drainage, and even PFAS. The only challenge is getting compost—which also sequesters carbon and enhances pasturelands—into more areas in need of remediation and revegetation in transportation.

## **Phorid Flies**

With mushrooms, the primary control for pests and disease is exclusion. Monitoring also plays a critical role in growers' integrated pest management strategies. Phorids and mushroom production odors have been around for decades and as the industry gets more research and application investment, these issues have steadily improved over time—although the continued increase in residential density in areas such as New Garden make progress difficult to “feel.” See the attached *Mushroom News* study from 1997. The AMI Research Committee of mushroom industry members coordinates the PSU mushroom endowment, founded in the 1980s; the annual selection of Giorgi grant awards; annual grants from Pennsylvania Department of Agriculture; and other initiatives to innovate and improve Phorid fly mitigation.

## **Sustainability**

While consumer demand is rising, retailers are pushing for accelerated change as well. For example, Walmart in 2016 “announced a goal to more sustainably source at least 20 key commodities by 2025, including produce.” Mushroom farmers are considered the “original recyclers” because they use the byproducts of other agricultural commodities to grow mushrooms. While today's mushroom farms are highly technical operations, the process of growing mushrooms includes using and reusing raw materials, water and other ingredients, making mushroom farmers leaders in agriculture recycling.

Mushrooms are grown on nutrient-rich material called substrate. The mushroom compost discussed above is the secondary compost product that comes out of the mushroom houses after the substrate has produced the mushrooms. From the beginning of the process – substrate compost preparation – to post harvest mushroom compost to be purveyed, mushroom farmers are great stewards of the earth,



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using and reusing the natural materials needed to grow mushrooms. In creating substrate for mushroom crops, the mushroom farm community also provides a valuable service to other farmers by recycling their byproducts.

One of the main components of mushroom substrate is straw horse stable bedding, considered an agricultural waste byproduct. Many mushroom growers use compost made with the stable bedding from horse farms, also use hay that is not suitable or has been rejected as feed hay. Simple grass hay, a renewable resource, is also a common ingredient, and can be grown on land and soils not suitable for other crops. In central and western states, local wheat straw is the main component of mushroom substrate, which provides a market for this byproduct and a secondary source of income for wheat farmers.

In addition to the recycling of stable bedding and waste feed hay, mushroom substrate may include crushed corn cobs, cottonseed hulls, soybean hulls, peanut hulls, leaf litter, or cocoa shells, providing a solution for byproducts that would otherwise pose waste management challenges for other agricultural operations or go straight to landfills. In many cases, mushroom farms are often strategically located near local sources of these materials.

The industry also sustains these secondary and ancillary suppliers—which is why AMI has over 200 Pennsylvania-based businesses as Associate members.

I want to close with this. Fresh mushroom consumption is on the rise—consumers are turning to mushrooms for their versatility, nutritional and health benefits. That’s a good thing. Our industry—especially here in Pennsylvania—wants to grow with demand. But capital costs, input sourcing, residential sprawl and other issues are stifling the industry which supports more than 9300 direct and indirect jobs here in Chester County and surrounding areas, with nearly \$315 million in employee compensation and an economic impact of \$1.2 billion. Any support from the state would be helpful in continuing this thriving economy here in the Commonwealth.

I’m happy to answer any questions that you have and thank you for the opportunity to speak with you today.

Thank you.

MUSHROOMS MATTER

# Economic Impact

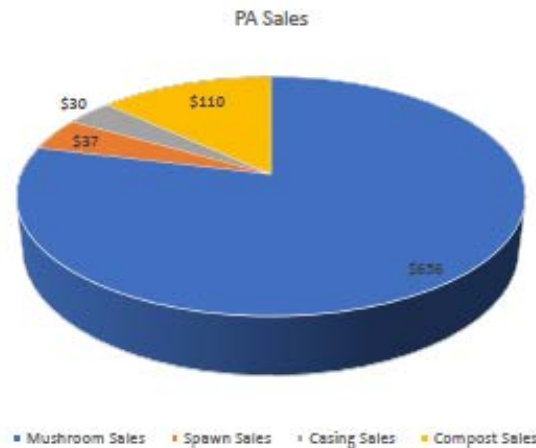


A NATIONAL ASSOCIATION

## TOTAL MUSHROOM INDUSTRY SALES, COMMONWEALTH OF PENNSYLVANIA, 2020 (\$M)

In 2020, the mushroom industry had a footprint of some \$833 million in Pennsylvania. Sales of Pennsylvania mushrooms and of the inputs to produce mushrooms – including spawn, casing, and compost – bring money from around the country to Pennsylvania and supports local firms and jobs.

Inputs	Pennsylvania
Mushroom Sales	\$656
Spawn Sales	\$37
Casing Sales	\$30
Compost Sales	\$110
<b>Total Industry Sales</b>	<b>\$833</b>



## ANNUAL ECONOMIC IMPACT OF THE MUSHROOM INDUSTRY, COMMONWEALTH OF PENNSYLVANIA

Pennsylvania's \$833 million mushroom industry creates significant economic impacts through the Commonwealth. The industry generates \$351 million in indirect and induced spending. In total, **the economic impact of the mushroom industry is \$1.2 billion**, supporting some 9,300 jobs with \$313 million in employee compensation—not including the hauling industry, which directly relies on and serves the industry.

Economic Impact	Pennsylvania
Direct Output (\$M)	\$833
Indirect & Induced Output (\$M)	\$351
<b>Total Impact (\$M)</b>	<b>\$1,184</b>
Total Employment Supported (FTEs)	9,374
Employee Compensation (\$M)	\$313

### PA Mushroom Jobs

9,374  
Total Employment:

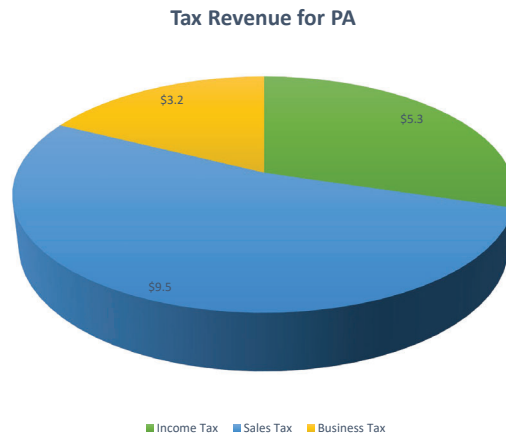
### Worker Income

\$313  
Employee Compensation (\$M)

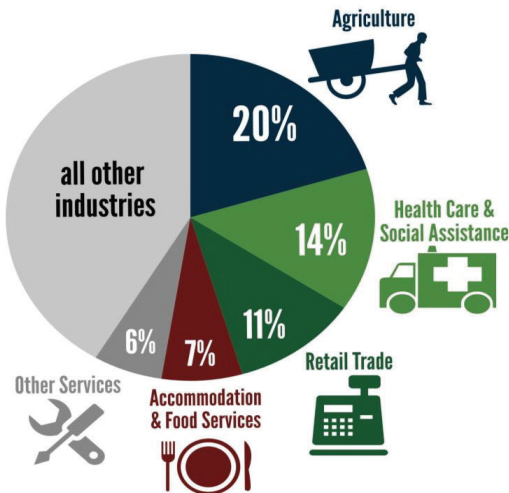
**ANNUAL FISCAL IMPACT OF THE MUSHROOM INDUSTRY IN PENNSYLVANIA (\$M)**

In addition to the direct, indirect, and induced impacts, the mushroom industry also generates considerable tax revenue to the Commonwealth of Pennsylvania. This includes income tax from direct, indirect, and induced jobs. Business taxes are generated from mushroom firms and the additional firms they support through indirect and induced impacts. This direct, indirect, and induced economic activity also generates significant sales tax revenue for the Commonwealth. In total, the mushroom industry in Pennsylvania generates some \$18 million in tax revenue for the Commonwealth annually.

<b>Fiscal Impact</b>	<b>Pennsylvania</b>
Income Tax	\$5.3
Sales Tax	\$9.5
Business Tax	\$3.2
<b>Total Tax Revenue</b>	<b>\$17.9</b>



**ANNUAL INDIRECT AND INDUCED JOBS SUPPORTED BY THE MUSHROOM INDUSTRY, PENNSYLVANIA**

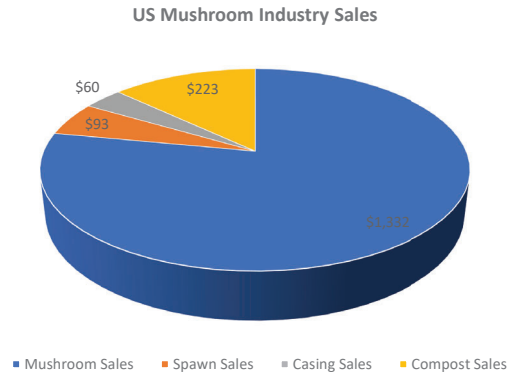




## TOTAL MUSHROOM INDUSTRY SALES, UNITED STATES, 2020 (\$M)

The direct economic impact of the mushroom industry nationwide is more than \$1.7 billion. Mushroom sales generated more than \$1.3 billion in impact in 2020. The inputs for mushroom production – spawn, casing and compost – generated an additional \$375 million in impact.

Inputs	United States
Mushroom Sales	\$1,332
Spawn Sales	\$93
Casing Sales	\$60
Compost Sales	\$223
<b>Total Industry Sales</b>	<b>\$1,707</b>



## ANNUAL ECONOMIC IMPACT OF THE MUSHROOM INDUSTRY, UNITED STATES

Nationally, the \$1.7 billion mushroom industry generates an additional \$1.6 billion in indirect and induced spending, for a **total impact of over \$3.4 billion**. The industry supports over 22,000 jobs nationally with at least \$942 million in wages.

Economic Impact	United States
Direct Output (\$M)	\$1,707
Indirect & Induced Output (\$M)	\$1,681
<b>Total Impact (\$M)</b>	<b>\$3,388</b>
<b>Total Employment Supported (FTEs)</b>	<b>22,890</b>
<b>Employee Compensation (\$M)</b>	<b>\$942</b>

### US JOBS

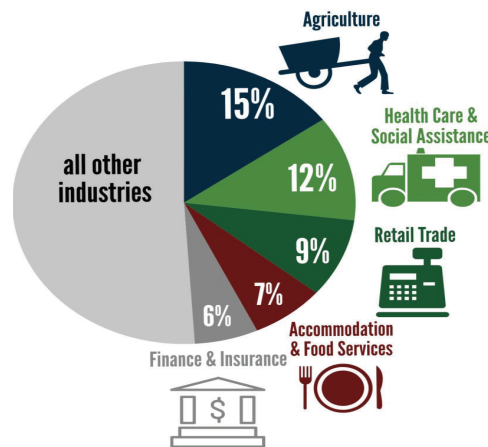


### EMPLOYEE INCOME



## ANNUAL INDIRECT AND INDUCED JOBS SUPPORTED BY THE MUSHROOM INDUSTRY, UNITED STATES

The mushroom industry supports jobs throughout the economy. Nationally, 60 percent of the total jobs impact is direct. The other 40 percent of indirect and induced job creation is felt across numerous sectors. The top sectors include agriculture, health care, retail, accommodation and food services, and finance and insurance.



\*Sources: Econsult (2018), USDA (2019), American Mushroom Institute (2020), IMPLAN



## MORE THAN MUSHROOMS

### An Ecosystem of Businesses (AMI Associate Members)

Bio-Fungi Ltd.  
ACCU Staffing Services  
Bergey's Truck Centers  
Mushroom Central Supply, Inc.  
Bentley Truck Services, Inc.  
AEM BV  
Aloha Medicinals  
A&A Lumber Supply, LLC  
Airmaster  
Amycel/SpawnMate  
ChampFood International  
All Seasons Products, Inc.  
BB&T  
Bell's Welding & Mechanical Repair Service, LLC  
Berry Global  
BVB Substrates  
Central Life Sciences  
Christiaens Engineering & Development  
Costa Mushroom Category  
Culture Plasti-Tech 2005 Inc.  
DiMatteo Financial Group  
Direct Energy  
Dutch Mushroom Projects  
E & H Conveyors Inc.  
East West Label Co., Inc.  
EcoBioPlas Inc.  
Eichman Law, PLLC  
Envirotext Products, Inc.  
Fancam B.V.  
Fastrak Express, Inc.  
Faulkner Buick GMC Isuzu Truck  
Fenstermacher & Company, PC  
Foley Cat  
Full Circle Mushroom Compost LLC  
Fulton Bank  
GICOM b.v. Composting Systems  
Goodwin's Refrigeration  
Greenwood Mushroom Farm  
GTL Europe B.V.  
H.L. Yerkes & Sons, Inc.  
H.M.R. Associates, Inc.  
Havens Graanhandel NV  
Highline Produce Ltd.  
Hillendale Peat Moss, Inc.

### National Packing, Shipping and Distribution Businesses

Buona Foods  
CF Fresh, LLC  
Giorgio Fresh  
Grifco, Inc., Griffonetti's  
J-M Foods, Inc.  
L. Pizzini & Son, Inc.  
L.K. Bowman, Co.  
Manfredi Mushrooms, Inc.  
Market Fresh Farms, Inc.  
MJB Sales, Inc.  
Mother Earth LLC  
Phillips Mushroom Farms, LP  
R.L. Irwin Mushroom Co.  
South Mill Mushroom Sales, Inc.  
Sunny Dell Foods/Specialty Packaging  
The Mushroom Company  
To-Jo Mushrooms, Inc.



## MORE THAN MUSHROOMS

Hillendale Services LLC

Hi-Tech Peat Moss, Inc.

Hoffman Equipment

Hokto Kinoko Company

Hooper, Inc.

Hooymans Substrates BV

Hoving Holland International B.V.

J F McKenna Ltd.

Jenkins & McMahon Supply, Inc.

Jim's Commercial Service, Inc.

Kadant Grantek Inc

Kennett Square Specialties LLC

Lambert Peat Moss, Inc.

Laurel Valley Farms, Inc.

Legro Mushroom Casing Solutions

M G Asset Management

M Construction LLC

M. F. Irvine, an AssuredPartners Company

McGriff Insurance Services

Mid Atlantic Power Partners LLC

MidAtlantic Farm Credit, ACA

Midlantic Machinery

Monaghan Mushrooms Ltd.

Murray Securus

Mushroom Central Supply, Inc.

Mushroom Conveyors Inc.

Mushroom Festival, Inc.

Mushroom Spawning Services, Inc.

Mushroom Supply and Services, Inc.

Omori North America Inc. - B.W. Cooney & Associates (Div.)

Ontelaunee Farms, Inc.

Orkin Pest Control

Pannell Mfg., Corp.

Penske Truck Leasing

Phillips Gourmet, Inc.

Plasterer Equipment Co., Inc.

Premier Tech Horticulture

Profile Products

Progressive Systems Inc.

Richard Enterprises, Inc.

Richard M. Crossan, Inc.

S & P Conveyors, Inc.

Sargent Docks & Terminal Inc.

Scelta Mushrooms

Scotts (Acadian Peat Moss)

## MORE THAN MUSHROOMS

Sigma Information Group, Inc.  
StateLine Truck & Trailer Center, LLC  
Stengel Welding Shop, Inc.  
Sun Gro Horticulture  
Sussex Landscape Supply Co., Inc.  
Sylvan America, Inc.  
T.M. Fitzgerald & Associates  
Tague Lumber  
Techmark, Inc.  
TechSolutions, Inc  
The Occupational Health Center  
Tufpak, Inc.  
UGI Energy Services, Inc.  
USA Gypsum  
V.P. Electrical Contracting, Inc.  
Vallorani Casing Material, LLC  
Western Pest Services  
Westfield Insurance  
Wilhelm's Service Center, Inc.  
Wolfe Supply and Services  
WSFS Bank  
XENON Corporation  
Mushroom Central Supply, Inc.  
Equipment Depot  
Mushroom Central Supply, Inc.  
Ascendant Partners, Inc.  
PA Dept. of Agriculture  
American Protective Products, LLC  
The Land Conservancy for Southern Chester County (TLC)  
Packaged Cooling Systems, LLC  
SALAI International Japan Co., Ltd.  
Concept Plastics Ltd.  
Arco-Solutions bv  
Bajaj Petroleum  
MushComb  
GreenAI LLC  
Silvana Trucking, Inc  
Nutra-Soils, Inc  
PA Certified Organic  
Delaware Valley University Agribusiness Department

MUSHROOMS MATTER

# Mushroom Facts



A NATIONAL ASSOCIATION

## How *Agaricus* Mushrooms Grow

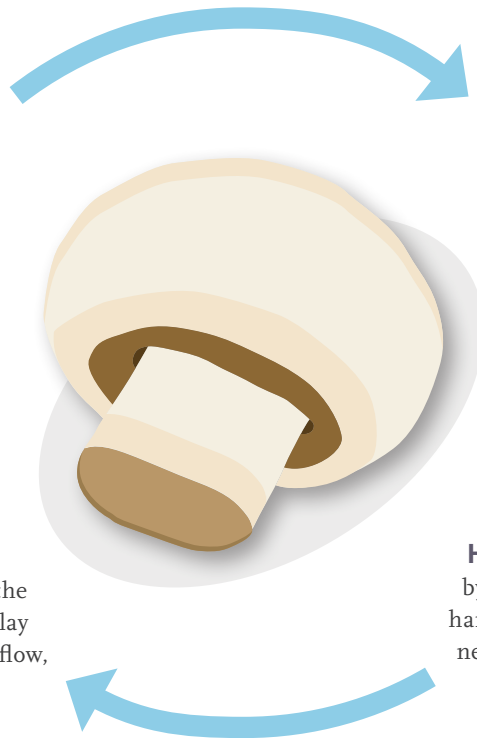
*Ever wonder how those white and brown button mushrooms you love so much are grown?*

**Spores:** In a lab, cereal grains are inoculated with mushroom spores and incubated until they develop into spawn or 'mushroom seeds.'

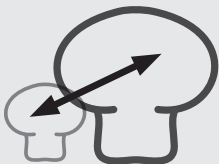
**Compost:** At the farm, growers carefully prepare the growing medium for mushroom production. Farmers combine materials like hay, straw, corn cobs, cocoa shells, and horse or chicken manure and place them in stacked wooden beds mixed with the spawn.

**Growing Process:** It takes about three weeks to produce the first mushrooms for harvest. Throughout the growing period, mushroom farmers play Mother Nature, manipulating water, airflow, temperature fluctuation and more.

**Harvesting:** Each mushroom is harvested by hand. They mature at varying times, so harvesting the various sizes to fit customers' needs is continuous for two to three weeks.



### DID YOU KNOW



Mushrooms double in size every 24 hours.



Mushrooms do not need sunlight to grow.



Mushrooms are made of 90% water.



A single Portabella mushroom contains more potassium than one banana.

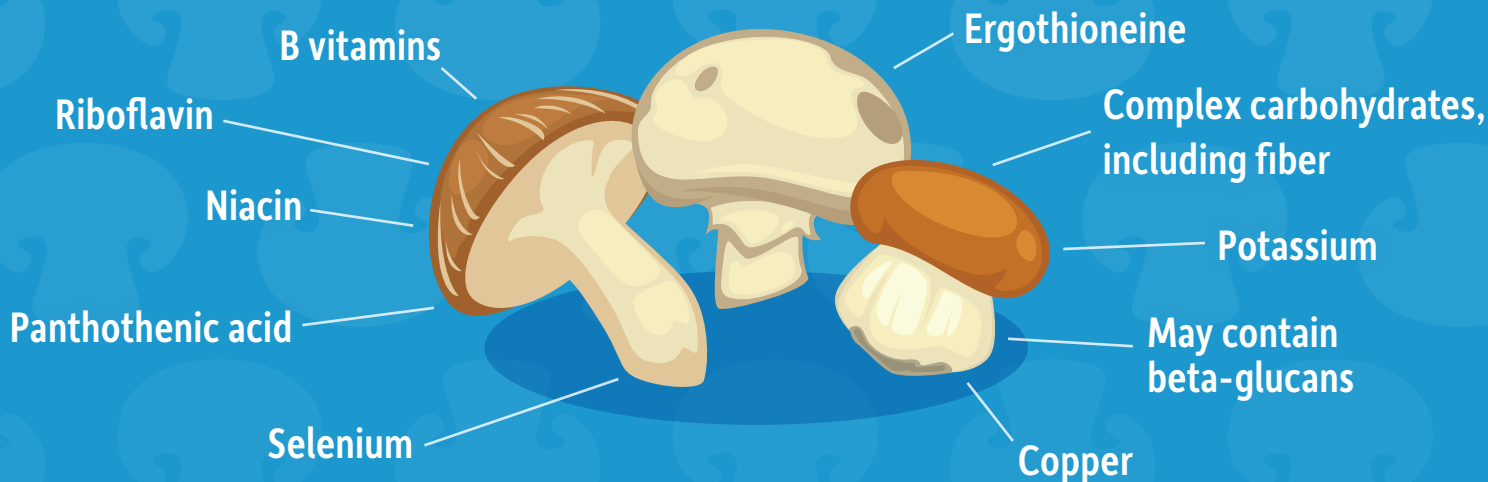
MUSHROOMS MATTER

# Nutrition

Full of powerful nutrients, mushrooms are increasingly being named as a must-have on healthy plates, providing many of the same nutritional benefits as vegetables, as well as attributes commonly found in meat, beans, and grains.



A NATIONAL ASSOCIATION



## Mushrooms, Research, & Health

When it comes to health, researchers are increasingly turning to mushrooms.

**Fight against cancer:** early studies show mushrooms might be a factor in reducing levels of PSA in prostate cancer patients and help prevent recurrence of hormone-dependent breast cancers.

**Anti-aging:** mushrooms contain ergothioneine and glutathi-

one antioxidants which work to protect the body from stress that causes visible signs of aging and may also help prevent symptoms of Parkinson's and Alzheimer's.

**Cognitive decline:** Researchers are finding that less than one cup of cooked mushrooms twice per week can help to reduce the odds of mild cognitive decline.

## Mushroom Industry Labor



**Unemployment rate for counties/states where there are mushroom farms:**

Compare the mushroom industry labor shortage with general unemployment. 2019 unemployment rates in mushroom growing counties:

- Chester (PA): 2.7%**    **Berks (PA): 3.8%**
- Cecil (MD): 4.5%
- New Castle (DE): 3.0%
- Santa Cruz (CA): 3.9%

**Labor shortage information from Penn State University Sociological Research report on percentage that farms are short of workers:**

- On average, in a typical week, farms are short 20% of the ideal number of workers required to fully operate the farm.
- On average, farms receive 0 non-immigrant applicant applications per week for harvester position employment.
- Most employers describe labor shortage as severe (45% reported) and moderate (40% reported).
- PA Mushroom Jobs
  - 10,000 in 1993 (PA DOL)
  - 9,600 in 2017 (MFPA)
  - 8,600 in 2018 (Econsult)

**Labor shortage impact information from American Mushroom Institute survey of grower members:**

**Mushroom Farmer Ag Labor Impact Survey Results**  
**23% of AMI Grower Members Reporting Representing over Half of US Mushroom Production**



Impact	Average	High End	Low End
Percentage of Ag Labor Shortage at Farm	19%	86%	15%
Daily amt. of pounds produced per harvester	605	840	390
Starting wage	\$ 9.15	\$ 20.25	\$ 7.25
Average wage	\$ 13.42	\$ 15.65	\$ 10.10
Range of hourly pay for harvesters when base wage and piece rate are considered	\$ 15.37	\$ 24.00	\$ 9.00
Number of harvester applications received per week	1.52	3	0
Amount lost per crop when third break is not picked	\$ 11,938	\$ 20,000	\$ 2,500
Times per year farms elect not to pick a third break		All year	15
Increased cost of putting in a new crop when the third break is not picked	\$ 31,666	\$ 50,000	\$ 2,500





# Land of Opportunity: A Legislative Primer on Agriculture Immigration

RACHEL ROBERTS | American Mushroom Institute

The U.S. mushroom industry workforce continues to experience an average 25% shortage on a daily basis across the country. But mushrooms are not alone: the fresh produce industry struggles to keep their share of the market while produce allies continue to work for legislative relief to the issue.

In 2021, we anticipate a major policy shift as the Biden Administration is expected to address improving border management. The perceived chaos at the border would be replaced by a renewed commitment to professionalizing the systems in place to deal with illegal immigrants through deportation or eligibility for asylum, as in years past. The Administration is expected to deal with immigration policies in three ways 1) allowing documentation to be established for Dreamers—adults brought to the U.S. as children, many of whom didn't know they weren't legal until becoming adults; 2) legalizing current agriculture workers without citizenship and 3) future flow business needs. Here's a look at these policies.

## DACA

Deferred Action for Childhood Arrivals (DACA) is a policy that can give some people brought to the country as children eligibility to get a renewable two-year period of deferred action from deportation, as well as a work permit. According to Americans for Progress, hundreds of thousands of DACA individuals, or Dreamers, are employed in food and agriculture—from restaurant servers to cooks, from harvesting to packing and more, and DACA could create opportunities for fresh produce workforce expansion.

DACA does not prevent recipients from being deported if convicted of a crime, and approval and renewal are granted only for individuals who have not been convicted of a felony, significant misdemeanor or three or more other misdemeanors and who do not pose a threat to national security or public safety. DACA recipients (and undocumented immigrants) are NOT eligible for welfare benefits like cash assistance, food stamps or Medicaid. Dreamers are required to be enrolled “in

school, have graduated or obtained a certificate of completion from high school, have obtained a general education development (GED) certificate or are an honorably discharged veteran of the Coast Guard or Armed Forces of the U.S.” In 2018, reports showed that 91% of DACA recipients have jobs, and removing them from the workforce would cost the U.S. GDP \$460 billion over 10 years. This would mean that employers—many in food and agriculture—would experience \$3.4 billion in turnover costs to replace workers. Removing DACA individuals would also create loss in contributions to Medicare and Social Security that would result in losses of nearly \$24.6 billion over 10 years. (Sources: *Cato Institute*; *U.S. Census Bureau*)

### Legalizing Agricultural Workers

The Farm Worker Modernization Act (FWMA) bill passed with bipartisan support in the House in 2019 and was focused on creating a category of Certified Agriculture Workers (CAWs) who would be required to work in agriculture, filling jobs that no domestic worker has. Three hundred agricultural organizations, with AMI, such as United Fresh Produce, Western Growers and US Apple, as well as farmworker groups, such as Farmworker Justice and United Farm Workers, endorsed the Act. Because of a requirement for proven experience in agriculture work and not filling a job a domestic worker has, CAWs would receive preference over foreign agriculture workers. The Act was successful because each side compromised: the left accepted workers' requirements to stay in ag, and the right accepted the immediate legalization under a certification that is not a green card or other path to citizenship.

The FWMA would also create year-round access to the H2A program for dairy and other agricultural sectors that desperately need workers but have previously been unable to utilize the program. This addresses the future flow needs of agriculture, and without this bill, year-round agriculture has no access to a legal immigrant workforce. Contrary to rumor, there would be no new funding in FWMA for the Legal Services Corporation and would not establish a new complaint/investigation process that allows anyone to file a complaint.

Advocates and lobbyists see a version of this bill being the right balance to again bring bipartisan support to immigration reform focused on agriculture.

### Future Flow: Visa Programs

From 1942 to 1964, the “Bracero Program” allowed for over 4 million guest workers to come in from rural, poor areas in Mexico because of agricultural worker shortage in the U.S. In 1964, the program was terminated and replaced by

the H2 Temporary Guest Worker program with H2A being agricultural workers and H2B being those guest workers who do non-agricultural work. Today, one of the greatest challenges in immigration reform is the need to continually assess our future employment-based immigration needs to fill market-driven labor demand with permanent and temporary visas for high-skilled and low-skilled workers. Economic and immigration experts agree that the current legal immigration flow does not meet America's labor needs. Further, economists are signaling that in order to come out of the pandemic and to thrive in the even more globalized economy, employment-based immigration must be seen as a strategic resource that can both meet labor market needs and foster economic growth and competition. (Source: *American Immigration Council*)

As a year-round crop, mushrooms have been unable to access the H2A visa program for seasonal agriculture workers. The case has been made for “seasonal demand” occurring over 90 days around Thanksgiving through Christmas, but this opens a door for interpreting seasonality that legislators have assessed could allow allow for misuse and abuse in framing what “seasonal” means.

### What to Expect

Some advocates are pushing for getting “pieces” of immigration reform through the legislature rather than comprehensive immigration reform, and the mushroom and produce industry fall into that strategy through their work on legislation for Certified Agriculture Workers and H2A flexibility. The FWMA would solve the mushroom industry's problem of needing current workers to stay, keeping institutional knowledge and training and re-training costs lower. However, some sort of visa program or H2A flexibility is needed to assure that immigrant workers who want to join the mushroom workforce in the future, can. Others fear that by sending smaller pieces of a bill or provisions to deal with immigration, it will create a queue that would not have the necessary timeline to get each done.

Along with heated rhetoric, anti-immigrant politicians are expected to focus on the dangers of “caravans” of migrants, while immigrant advocates will focus on the dangers of “exploitation” through continued illegal status. Down the middle, pro-documentation and pro-measured-legalization politicians will continue to seek common ground and make the factual business case for heeding the market's labor demands. It will also be wise to highlight for politicians on both sides of the aisle that immigrants have historically been an opportunity to expand political bases on the left and the right. 🍄



# Compost

# HOW MUSHROOMS ARE GROWN

Grown indoors on a year round cycle, mushrooms always pack a nutritious punch into your favorite meals. Before making their way to your plate, mushrooms go through a growing process in a highly controlled environment unlike that of any other produce. Get a behind-the-scenes look into the growing process for *agaricus* mushrooms.



## RAW MATERIALS

The substrate provides a nutritional balance of organic material to serve as a growth medium for mushrooms.



## SPAWN & SUPPLEMENT

Mushroom spawn, purchased from commercial labs, is mixed with the substrate. Mushroom supplements may also be added to the substrate at this time.



## BEDDING

The mushroom spawn mixture is transferred to several hundred “beds” or “trays.”



## CASING & PINNING

Casing, made of peat moss, is spread over the mushroom bed serving as a reservoir to hold in moisture. During the pinning stage, “pins” of mushrooms push up through the casing.



## HARVESTING

Mushrooms are harvested by hand throughout a 16-35 day cycle.

Visit [www.americanmushroom.org](http://www.americanmushroom.org) to learn more about the local cultivated mushroom industry.







## What is Mushroom Compost?

Often referred to as Pasteurized Mushroom Compost is the composted result of a rich organic growth medium for mushrooms. It is made from agricultural materials, such as hay, straw, straw horse bedding, poultry litter, cottonseed meal, cocoa shells and gypsum. Sphagnum peat moss adds to the organic nature of the substrate, providing a consistent, stable, formulated and homogeneous product.

After mushrooms are harvested, the Mushroom Compost is steam treated prior to removal to eliminate any pest, pathogens and weed seeds resulting in a PDA accepted fertilizer product and soil amendment.

Mushroom Compost has high water and nutrient holding capacity and exhibits no nitrogen draw down problems. As a fertilizer and organic soil amendment, Mushroom Compost supports plant growth in a variety of applications to the lawn and landscape, and also inhibits the Artillery Fungus.

## Using Mushroom Compost for Lawn Establishment

**New Lawns:** Fall is the best time to seed new lawns and the best time to incorporate Mushroom Compost into your seeding plan. Prepare the seed area by covering uniformly with 1–2 inches (or 3–6 cubic yards per 1,000 feet) of Mushroom Compost, and till into the soil to a depth of 4–6 inches for maximum benefit.

Sow the grass seed uniformly over the soil surface at a rate recommended for your seed. Cover the grass seed with another ¼ to ½ inch layer of Mushroom Compost (approximately 1–2 cubic yards per 1,000 feet). Rake the area lightly to ensure good seed-soil contact. Water well.

Post seeding care only requires daily watering to keep the soil uniformly moist until new grass seedlings have reached 1 ½ inches in height, which is typically about three weeks after emergence.

## What Essential Plant Nutrients are in Mushroom Compost?

Dr. Michael Fidanza, Professor of Plant & Soil Sciences, The Pennsylvania State University (Reading, PA), published these results.

### Mean of Parameters Measured/Calculated On a Wet Volume Basis:

bulk density	575 lbs/yd <sup>3</sup>	
pH	6.62	
C:N (carbon-to-nitrogen) ratio	12.79 : 1	
soluble salts (1:5 w:w)	13.27 mmhos/cm	
	<b>lbs/yd<sup>3</sup></b>	<b>%</b>
solids	243.37	42.35
moisture	331.47	57.67
organic matter	146.73	25.53
carbon (C)	81.13	14.12
total nitrogen (N)	6.40	1.12
organic nitrogen (Organic-N)	6.19	1.08
ammonium nitrogen (NH <sub>4</sub> -N)	0.21	0.04
phosphorus as P <sub>2</sub> O <sub>5</sub>	3.82	0.67
potassium as K <sub>2</sub> O	7.10	1.24
calcium (Ca)	13.17	2.29
magnesium (Mg)	2.01	0.35
sulfur (S)	4.91	0.85
iron (Fe)	1.07	0.19
manganese (Mn)	0.12	0.02
copper (Cu)	0.04	0.01
sodium (Na)	0.67	0.12
<b>sodium absorption rate (SAR)</b>	<b>2.4</b>	<b>0.9</b>
aluminum (Al)	0.05	0.01
zinc (Zn)	0.89	0.15



### Sod

The soil preparation should be prepared as for new lawns. The soil should be moistened before sod is laid. After laying sod, uniformly apply ½ inch Mushroom Compost on the seams for improved rooting.



### Established Lawns

Renew an older lawn using Mushroom Compost. Spike the lawn for aeration, uniformly spread about ½ inch layer of Mushroom Compost over the lawn's surface, spread seed and work into the lawn. A flexible rake is a perfect tool. Water thoroughly and often until the seed germinates.



### Flowers Shrubs & Trees

Use Mushroom Compost as a soil amendment when planting flowers, shrubs and trees. No other fertilizer is needed in the first year.



### Artillery Fungus

Artillery Fungus lives in wood mulch and shoots black spores toward light surfaces, such as buildings, siding and cars. According to research studies at Penn State University by Dr. Donald Davis, when mushroom compost is mixed with mulch in proportions of just 20 to 40 percent, the Artillery Fungus is inhibited.

quality will be improved per yard as we are able to handle more of the material onsite and local instead of needing to truck the material over 50 miles away.

Cost                \$1,800,000

Timeline           9 months

**Good to Know**

MUSHROOMS MATTER

# Sustainability



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**G**rowing mushrooms is a unique blend of recycling, science and efficacy. This powerful combination makes them one of the most sustainably produced foods in the United States. Mushroom growers are known as the "ultimate recyclers" for their ability to convert byproducts

and waste from other sectors of agriculture into the compost or medium used to grow mushrooms. Because of this recycling of other agricultural crops and byproducts, mushroom farms have a smaller environmental footprint than almost any other farms.

*Mushrooms are an incredibly efficient food.*



Today's growers use smart management and production practices that use less than 2 gallons of water to produce one pound of button mushrooms – that's about 32 (8 oz) glasses of water to grow, harvest, and process an entire pound of mushrooms, compared with an average of 50 gallons of water per pound of other fresh produce items.



Mushrooms are grown year-round, across the nation, and don't require much land. On average, one square foot of space in a mushroom bed can produce 6.55 pounds of mushrooms. One square foot is 144 square inches, or 4.5 red bricks in a patio – that's a lot of production power in a small space.



Mushrooms are a fairly low-energy footprint crop. Producing one pound of button mushrooms takes 1.0 kilowatt hour (kwh) of electricity. This is the same amount of energy (1 kwh) as it takes to run a coffeemaker for one hour each day.



One acre of land can produce 1 million pounds of mushrooms annually. In recent years, mushroom growers have produced just over 900 million pounds of *Agaricus* mushrooms each year. Put another way, one acre of land can produce enough mushrooms in a year to fill the length of nearly 4,700 football stadiums. Even more, 900 million pounds of mushrooms is enough to circle the circumference of the globe – mushroom cap to mushroom cap – 19 times!



From the compost recipe all the way through to what you purchase in the store, one pound of mushrooms generates just 0.7 pounds of CO<sub>2</sub> equivalents. By comparison, using one gallon of fuel emits nearly 20 pounds of CO<sub>2</sub>.

By any measure of water and energy inputs, and the low CO<sub>2</sub> emissions, mushrooms are a nutritious food that have a very small environmental footprint. More than being the 'ultimate recyclers,' mushroom growers are providing a sustainable, smart food source for a growing world population.



## MUSHROOM COMPOST FOR PFAS REMEDIATION

PFASs are a class of compounds that include perfluoroalkyl and polyfluoroalkyl substances. They are known as “forever chemicals,” because many of them persist for months when ingested, and some are believed to be permanent. PFAS are not yet highly regulated, and are produced for use in several product fabrications and industrial applications.

Because PFASs have been shown to interact with blood proteins, they are suspected of causing a number of pathological responses in humans and animals, including cancer. Given this, researchers are conducting broad reviews of possible sources of PFASs and their potential accumulation in agricultural plants, from where they can transfer to humans through the food chain.

In agriculture, potential sources of PFASs are polluted water and biosolids. For mushrooms, recent research suggests that the compost actually breaks down PFAS. Researchers have been doing trials and experiments to extend the use of mushroom compost to bioremediate not just acid mine drainage, oil, metals, and other toxins, but also PFAS. There is a growing body of evidence that mushroom compost is an effective application to remediate PFAS. Because of the scale of production of mushroom compost, major sites in need of remediation can be serviced by mushroom farmers and mushroom compost soil distributors using existing transportation capacity and routes. AMI is working with Congress to secure national funding to further investigate the application of mushroom compost for PFAS remediation projects at scale. Some of the exciting research already conducted by the US National Institute of Health and other remediation studies are listed here:

Asemoloye, M.D., Chukwuka, K.S. and Jonathan, S.G. (2020) Spent mushroom compost enhances plant response and phytoremediation of heavy metal polluted soil . J. Plant Nutr. Soil Sci., 183: 492-499.

Asemoloye Michael Dare, Segun Gbolagade Jonathan, Adeniyi A. Jayeola, Rafiq Ahmad, Mediatonal influence of spent mushroom compost on phytoremediation of black-oil hydrocarbon polluted soil and response of *Megathyrus maximus* Jacq, Journal of Environmental Management, Volume 200, 2017, Pages 253-262

Chang BV, Fan SN, Tsai YC, Chung YL, Tu PX, Yang CW. Removal of emerging contaminants using spent mushroom compost. Sci Total Environ. 2018 Sep 1;634:922-933.

Gómez-Sagasti, M.T.; Anza, M.; Hidalgo, J.; Artetxe, U.; Garbisu, C.; Becerril, J.M. Recent Trends in Sustainable Remediation of Pb-Contaminated Shooting Range Soils: Rethinking Waste Management within a Circular Economy. Processes 2021, 9, 572.

Lau KL, Tsang YY, Chiu SW. Use of spent mushroom compost to bioremediate PAH-contaminated samples. Chemosphere. 2003 Sep;52(9):1539-46. doi: 10.1016/S0045-6535(03)00493-4.

Liu X, Kiwanuka S, Cleary K, Ryan D, Dowling DN, et al. (2016) Use of Copiling to Remediate PAH- Contaminated Storm-water Lagoon Sediment. J Bioremed Biodeg 7: 355.

Menaga, D., Rajakumar, S. & Ayyasamy, P.M. Spent mushroom substrate: a crucial biosorbent for the removal of ferrous iron from groundwater. SN Appl. Sci. 3, 32 (2021).





## AMI STATEMENT ON MUSHROOM COMPOSTING DEGRADATION OF POTENTIALLY GMO INPUTS

To the extent that mushroom compost inputs may be genetically modified, there is no evidence that any of the components of that modification persist or are taken up by mushrooms grown on the compost. Researchers investigating compost inputs generally conclude that the process of composting likely biodegrades any genetically manufactured seed or plant material.

A landmark 2006 study by the National Institutes for Health (NIH), *Composting: a potentially safe process for disposal of genetically modified organisms* (Singh, Billingsley & Ward), concluded:

“The conditions created in a properly managed composting process environment may help in destroying GMOs and their genes, thereby reducing the risk of the spread of genetic material.”

Another NIH study in 2010, *Biodegradation of genetically modified seeds and plant tissues during composting* (Reuter, Alexander, Xu, Stanford, & McAllister), concluded:

“Composting GM and non-GM plant materials. . . rendered seeds non-viable, and resulted in substantial, although not complete, degradation of endogenous and transgenic plant DNA. This study demonstrates that composting could be effective for disposing of GM crops in the event of their inadvertent entry into the food or feed chain.”

As researchers provide more evidence about mushroom compost’s ability to degrade GMO components, AMI will continue to share with the industry this additional positive information.

With the many diverse inputs required to form mushroom compost, consistently managing the composting process that produces substrate is extremely important—both from environmental and economic standpoints, not just to produce the nutritious mushroom, but to extend and mitigate the impact of the agricultural byproducts used to create mushroom compost. The mushroom industry therefore continues to support research on the beneficial functions and uses of mushroom compost.

Researchers continue to investigate ways to reuse mushroom compost that has been removed from beds after the completion of the mushroom growing and harvest cycle. This mushroom compost is applied in various way for environmental benefit: runoff mediation and riparian buffer projects, green roofs, artillery fungus suppression, evergreen farms, environmental improvement and creation of athletic fields, landfill caps for establishing vegetation, restoration of degraded coal mine lands for wildlife vegetation, myco- remediation, and neutralizing acid mine drainage, metals in soils, and oil contamination, among others. *In addition, one cubic yard of SMC sequesters some 10 pounds of CO2e when used instead of a traditional fertilizer in the Northeast, some 5 pounds in the Western US.*

In the highly controlled mushroom composting process, those in the mushroom farm community are also providing a valuable service by recycling byproducts from other agricultural sectors:

- One of the main components of mushroom substrate is straw byproduct.
- Each new crop of compost is comprised of approximately 60 tons of wheat straw byproduct.
- Mushroom compost also includes, but is not limited to including, various mixtures of poultry litter, brewers grain, stable bedding, crushed corncobs, cottonseed hulls, soybean hulls, peanut hulls, and cocoa shells, providing a useful solution for byproducts that previously posed waste management challenges for other agricultural operations.

Mushroom farms extend the value of agricultural byproducts by decreasing their direct application on the land, as well as reducing the need to handle or store these items, especially important to watershed protection.



## MUSHROOM COMPOST AND CARBON SEQUESTRATION

Researchers continue to investigate ways to reuse mushroom compost after the completion of the mushroom growing and harvest cycle. This mushroom compost is applied in various way for environmental benefit: runoff mediation and riparian buffer projects, green roofs, artillery fungus suppression, evergreen farms, environmental improvement and creation of athletic fields, landfill caps for establishing vegetation, restoration of degraded coal mine lands for wildlife vegetation, myco- remediation, and neutralizing acid mine drainage, metals in soils, and oil contamination, among others. In the highly controlled mushroom composting process, those in the mushroom farm community are also providing a valuable service by recycling byproducts from other agricultural sectors.

Over the past year, AMI partnered with Mowery Environmental Services (MES) to develop and conduct a carbon sequestration study of mushroom compost. **The result:**

- **One cubic yard of SMC sequesters some 10 pounds of CO<sub>2</sub>e per year when used instead of a traditional fertilizer in the Northeast, some 5 pounds in the Western US.**
- **This generally comes to 240 pounds sequestered per acre spread in PA and 120 per acre in California.**
- **Studies in California have found that compost sequestration from one application can last up to 10 years.**

These geographically representative calculations can be modified for other states where production and geography affect sequestration.

MES developed a consistent calculation and guidance for application by which carbon sequestration can be predicted based on square foot per mile hauled. This assessment of the environmental benefits of spent compost to carbon sequestration can assist the states in which mushrooms are grown and mushroom compost is used by sectors to achieve their green house gas emissions goals. This can provide incentives for other horticultural and agricultural industries to haul and utilize mushroom compost, especially where there is a high concentration of mushroom growing. The sequestration result is based on the following calculations.

In Pennsylvania, Mowery used 2019-20 NASS data regarding the total fillings in PA to calculate the cubic yards of mushroom compost generated in PA per year. Nine samples of fresh Mushroom Compost (MC) were taken to measure the bulk density, the average of which was bulk density was 822 lbs/cy. With this figure, the total tons of MC generated in PA per year were calculated.

Two assumptions were applied: 1) that MC can be land applied in PA 8 months out of the year due to either crops going in the fields or winter conditions (i.e. snow covered ground) so I divided the total MC generated per year by 66% and 2) that a certain percentage of the MC is applied on crop fields and a certain percentage is applied on pastures.

The MC samples collected were analyzed for nutrient content as well, and, using those values, Mowery developed Nutrient Balance Sheets to determine the appropriate application rate. On average, an application rate of 10 tons of MC per acre applies what the crop needs, without overapplying for Phosphorus. Given an application rate of 10 tons/ac and knowing how much MC is generated, the total number of acres MC could be applied on per year was determined.

Next, using the COMET Planner tool (<http://comet-planner.com/>) was used to figure out the total CO<sub>2</sub>e that are sequestered through the land application on crop fields and pastures as a replacement for a synthetic N source. COMET Planner provides two options--10:1 and 15:1 CN ratio--whereas MC has a CN ratio of 12.5, so both scenarios were run determine the average. The CO<sub>2</sub>e value was then converted to US tons.

In California, the 5 lbs of CO<sub>2</sub>e sequestered in western US was determined by running the COMET Planner for California, including the land application and usage of the MC variations there, generally.

As part of the research, Mowery factored in data from "A life cycle assessment of *Agaricus bisporus* production in the USA," which determined that MC provides a 'credit' of  $-7.94 \times 10^{-3}$  kilograms of CO<sub>2</sub>e per kilogram of mushrooms produced. This converts to 2.86 lbs CO<sub>2</sub>e sequestered per cubic yard of MC. One inconsistency in that article that had to be corrected was an assumption that MC contains 0.29% Phosphorus, likely because they did not convert it to P<sub>2</sub>O<sub>5</sub>, which would have shown that the value is actually closer to 0.55%, which is what was determined taking actual samples. When Mowery multiplied their value (2.86) by 1.89, he came up with 5 lbs of CO<sub>2</sub>e sequestered per cubic yard of MC land applied, which was aligned with the COMET Planner results.

## Shovel Ready Projects

### Trees and Sound Reduction Fence along the back of Laurel Valley Property

The barrier and screening will reduce odors and reduce noise for the neighbors in Landenberg Hunt. The sound attenuated fence will reduce the noise and overtime the trees will grow to be a prettier screening. Any occasional odors will rise up along the screenings.

Cost: \$60,000

Timeline: Now

### Soil Screener purchase

Mushroom Compost can be screened onsite for a value-add product that can be sold locally. The benefit of the machine allows us to handle the material only once instead of dumping at one location and then moving it to another location so no need for additional water collection from mushroom compost. In addition, the material can be sold locally instead of trucking the material over 50 miles away. Environmental benefits are less ag water collection and spraying (so better water quality), less carbon emissions from trucking the material far away and more carbon sequestration from applying more processed compost locally. Labor benefits are less labor to handle mushroom compost and less labor to truck material.

Cost \$225,000

Timeline Now

### Additional Roofing over Concrete pad for processing Mushroom Compost

The ability to operate year-round under cover of rain and snow allows us to process dryer material. Customers need material that is not wet so if Laurel Valley can operate under cover more weeks a year then we can move more screened compost locally. The Mushroom industry has a small window in the spring and fall when we can sell mushroom compost and weather plays a large role making that window even smaller. If we can meet the customers requirements more weeks a year then we can sell material locally. This will correct a problem of too much mushroom compost in Chester County. Benefits include less ag water collection and spraying (so better water quality), less handling of the mushroom compost so less truck carbon emissions and more carbon sequestration from applying more processed compost locally. Labor benefits are less labor to handle mushroom compost and less labor to truck material.

Cost \$200,000

Timeline Now

### Expand and Repair Concrete for Fresh Compost and Mushroom Compost

Making compost on concrete allows us to produce the best quality material as well as direct the water to the collection basin. Laurel Valley will be able to process or store more material so we have our

repeatable process 12 months per year. Benefits include collection of water in the correct way to meet our Mushroom Farm Environmental Management plan thus improving water quality.

Cost                \$180,000  
Timeline           6 months

### **Repair the Pre-wet Machine**

The high tech equipment allows us to mix the material and add water at the correct time. Our processing time will be reduced so we can process more material on less space. In addition the correct mixing reduces odor by not allowing the compost to go anerobic. There will also be a labor savings and that is critical as there is a shortage of labor currently.

Cost                \$300,000  
Timeline           Now

### **New entrance and tire wash station**

The entrance is needed to access the property from a less traveled road as well as keeping the road cleaner. Laurel Valley will reduce truck traffic and be able to reduce the amount of dirt that may get on the road. There will also be a labor savings and that is critical as there is a shortage of labor currently.

Cost  
Timeline

### **Blending line**

This European designed machine will allow us to get a better mix of our material, shorten the time of the process and may lead to better yields. Laurel Valley will be able to reduce the amount of loaders to move the material which will reduce the carbon footprint and save labor. This equipment is standard around the world will allow Laurel Valley to produce better compost with less odor in a more efficient way. Benefits include reduction of carbon footprint, labor savings, less space to process material, higher yields and ability to grow the business.

Cost                \$1,500,000  
Timeline           1 year

### **Add Crop land, Clear wooded Land, install erosion controls for Mushroom Compost and soils and add some roofing**

A project that is currently approved by Ag Lands preservation and supported by the New Garden Township. We plan to upgrade some unused land to crop land, clear an area for soil processing and storage, install erosion controls and increase storm water containment for soils and substrate. This will help make Laurel valley the leader in handling and processing of Mushroom Compost. Benefits include not needing to double handle the material which saves labor and reduces the carbon footprint. Water