

NORTHEAST OHIO AGRI-CULTURE NEWSLETTER

Your Weekly Agriculture Update for
Ashtabula, Portage and Trumbull Counties

December 14, 2022



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Hello Northeast Ohio Counties!

We hope everyone has been enjoying the warmer weather this past week. Colder weather is expected later this week.

OSU professionals were attending our annual Pesticide Inservice this week. We will have a few updates for all of you this coming pesticide training season.

Have a great week and stay safe!

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Starting Small to Better Understanding Key Steps in the Carbon Cycle

By Adityarup “Rup” Chakravorty

Source: <https://www.agronomy.org/news/science-news/starting-small-better-understand-key-steps-carbon-cycle>

Earth's carbon cycle works on a global scale. But it can be affected by the tiniest of organisms: soil microbes. These microbes decompose organic matter like plant litter and dead organisms, and create simple carbon compounds. These simple carbon compounds can then be used by other organisms, or turned into gases (like carbon dioxide) and released into the atmosphere.

Much like us, soil microbes can be picky about where they live and work. “Just as we may prefer a certain range of temperature and humidity, soil microbes have their preferable conditions too,” says Alyssa Kim, a researcher at Cornell University.

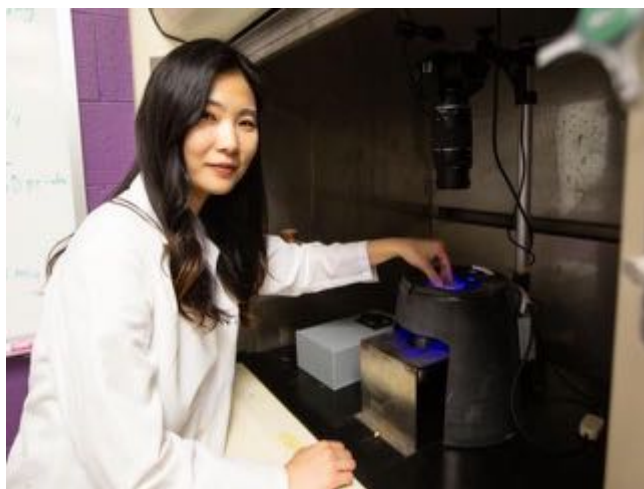


Figure 1 Researcher Alyssa Kim Showing Florescent substrate solution under UV light. The method is called zymography, which is used to map the enzyme distribution. The “substrate” is the chemical that can be decomposed by the target enzyme. When it is decomposed, it shows florescence (only under UV light). Credit: Chelsea Mamott, Great Lakes Bioenergy Research Center.

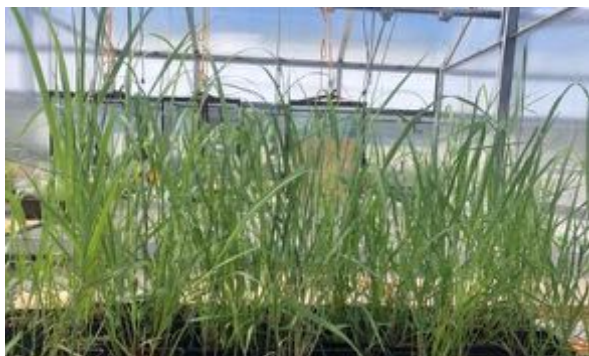


Figure 2 Switchgrass growing at Michigan State University's greenhouse facility. The leaves of these plants were used for the experiment. Soil moisture levels were higher near corn litter, and decomposing corn litter released more carbon dioxide quicker than switchgrass litter. Credit: Alyssa Kim

Kim is the lead author of a new study that explores how soil conditions, like moisture level and pore size, can affect soil microbes. Understanding how different soil conditions impact microbial activity can give researchers a better handle on ways to increase soil health and fertility, and help combat climate change. For example, “it can be a critical part in reducing greenhouse gas emissions from agricultural fields after harvests,” says Kim.

Kim [recently presented](#) her work at the 2022 ASA-CSSA-SSSA annual meeting, held in Baltimore, Maryland.

Kim and her colleagues at Michigan State University compared microbial activity near corn and switchgrass leaf litter. Corn is a vital crop, and farmers in the United States planted nearly 90 million acres in the 2022 growing year. Switchgrass is a promising bioenergy crop with an expanding footprint. “Also, corn and switchgrass have different litter characteristics,” says Kim. “Litter chemistry affects how easily microbes can decompose different litters. The physical characteristics like texture can affect the water and air environment near litters.”

Kim and her colleagues found that corn and switchgrass litters differ in how they change moisture levels in the soil near them. “We found distinct moisture depletion 0.1 to 1.5 millimeter away from switchgrass residues,” says Kim.

To study this moisture distribution, Kim used a method called X-ray and Neutron computed tomography. This method works very similarly to medical CT scans. “It’s a very promising, non-destructive way to study soils and water in them,” says Kim.

It turns out, moisture content is one of the most important factors influencing soil microbial activity.

That’s because one way that microbes decompose organic material, like leaf litter, is by releasing chemicals called enzymes. Different enzymes break down different materials. For example, an enzyme called beta-glucosidase can break down plant cell walls. Another enzyme called chitinase can break down the exoskeletons of insects and some fungi. Once the enzymes break down their target materials into simpler chemicals, soil microbes can feast.

“When soil moisture levels are optimal for microbes, they tend to produce more enzymes,” says Kim. That can lead to faster decomposition of leaf litter and the release of larger amounts of carbon dioxide. That’s exactly what Kim and her colleagues

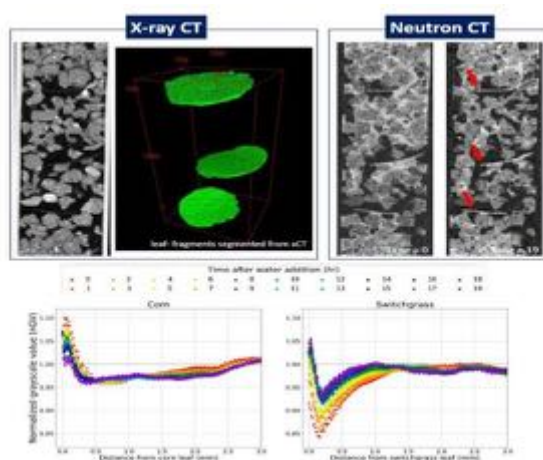


Figure 3 Images of X-ray and Neutron computed tomography. Green disks (leaves, also indicated by red arrows) were identified using machine learning, and moisture proxy (the brightness in neutron images) were calculated by distance from the leaves, and by time. The graphs below show the moisture content proxy by distance from the leaves (x-axis) and by time (color). Credit: Alyssa Kim

observed. Soil moisture levels were higher near corn litter, and decomposing corn litter released more carbon dioxide quicker than switchgrass litter.

Although the study focused on millimeter-scale observations, it has large-scale implications. “Studying these microscale dynamics can help us to understand what is actually happening in our vast corn fields, and also, in promising bioenergy cropping systems like switchgrass,” says Kim.

Kim also tested how soil pore size affects microbial enzyme activity. These pore sizes ranged from 10 to 30 micrometers, slightly smaller than the thickness of a single strand of most human hair. “It is crucial to study soil pore structures because that’s where soil microbes live,” says Kim. Kim used a method called Zymography, to map the activity of different enzymes. “We add some chemicals onto the soil surface. Such chemicals show fluorescence when decomposed, and that is how we detect the location of enzymes.”

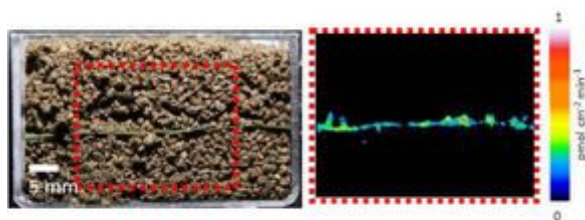


Figure 4 Example of the soil sample packed with the leaf residues. Red dotted box on the left is the region of interest (where zymogram was taken), and the right is the result of calculation. Colored map shows the intensity of enzyme activity. Credit: Alyssa Kim

Soil pore size affects different enzymes differently. Beta-glucosidase – the enzyme that breaks down plant cell walls – worked more efficiently in soils with smaller pores. On the other hand, chitinase enzyme activity was higher in soils with larger pore sizes. “These contrasting results tell us that what is decomposed in soils can depend on soil pore architecture,” says Kim. “That’s because there are different microbes living in pores of different sizes, producing different enzymes.”

Soils in farm fields have a mix of large and small pores, which indicates a mix of moisture levels and different microbes. “In the future, I would like to look at soil pores and moisture levels on larger scales and test

how differences in moisture distribution affects the decomposition process,” says Kim.

This research was supported by Great Lakes Bioenergy Research Center, U.S. Department of Energy, Office of Science, Office of Biological and Environmental Research (Award DE - SC0018409); National Science Foundation Long-term Ecological Research Program (DEB 1832042) at the Kellogg Biological Station; Michigan State University AgBioResearch; and special thanks to Dr. Sasha Kravchenko and Kravchenko Lab at Michigan State University, as well as Anders Kaestner at Paul Scherrer Institute in Switzerland.

USDA Releases Nationwide Farmer, Rancher and Forest Manager Prospective Customer Survey

Source: <https://u.osu.edu/ohioagmanager/2022/12/10/usda-releases-nationwide-farmer-rancher-and-forest-manager-prospective-customer-survey/>

As a farmer, rancher or forest manager, your on-the-ground contribution to American agriculture is vitally important. Your efforts are key to the Nation's production of food, fuel and fiber, and your feedback is essential in helping the U.S. Department of Agriculture (USDA) improve government programs and services to support you. Please consider taking this very important nationwide farmer, rancher and forest manager survey by March 31, 2023.

USDA has released a nationwide survey asking for feedback from all farmers, ranchers, and forest managers. USDA would like to hear from existing customers, and they hope to also reach a new audience of prospective customers, specifically those that don't know about USDA, have yet to work with USDA, and those who were unable to participate in the past.

Please visit www.farmers.gov/survey by March 31, 2023, to access the survey online in multiple languages! The survey will take approximately 10 minutes to complete, and responses are anonymous.

Background

USDA works hand in hand with farmers, ranchers, forest managers, and agricultural partners to help mitigate the risks of farming through crop insurance, conservation programs, farm safety net programs, lending, and disaster programs. From helping farmers recover after natural disasters and market fluctuations, to providing financial and technical assistance to improve operations through voluntary conservation, USDA's Farm Service Agency (FSA), Natural Resources Conservation Service (NRCS), and Risk Management Agency (RMA), work together to protect and enhance the natural resources vital to our Nation.

Feedback Benefits

USDA works to improve services, making government agricultural programs more accessible, equitable and easier to use. Survey feedback will assist these agencies, specifically the FSA, NRCS and RMA, in learning about ways to enhance support and improve programs and services, increase access and advance equity for new and existing customers. One of the ways the USDA works to engage landowners to improve

services is by regularly asking for their valuable input. USDA takes that feedback and works directly with agencies to streamline processes, programs, paperwork and much more, making it easier for customers to access programs and services. Your input will help shape FSA, NRCS and RMA policies and programs going forward. The more participation, the better data USDA will have to inform future agency and program decisions to benefit the nations producers and landowners.

Act Now

USDA really needs your help! If you are a farmer, rancher or forest manager, don't delay! Please take the survey now, and share the link or QR code with farmers, ranchers and forest managers you may know, and in farmer networks you have access to. USDA looks forward to hearing your feedback!

Registration Open for our Planning for the Future of Your Farm Workshop

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

Source: <https://farmoffice.osu.edu/blog/fri-12092022-1100am/registration-open-our-planning-future-your-farm-workshop>

We're happy to announce our popular "Planning for the Future of Your Farm" webinar series for 2023. The four-part online series will be on January 23 and 30 and February 6 and 13 from 6:30 to 8:00 p.m. This workshop will help farm families learn strategies and tools for transferring farm ownership, management, and assets to the next generation.

Workshop topics

Here's what the webinar will cover:

- Developing goals
- Planning for the transition of management
- Planning for the unexpected
- Communication and conflict management during farm transfer
- Legal tools and strategies
- Developing your team
- Getting your affairs in order
- Selecting an attorney

Workshop faculty

You and your family will learn from two of Ohio's top farm transition experts:

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- Robert Moore, Attorney with our Agricultural & Resource Law Program. If you didn't already know, Robert was in private practice for 18 years before joining our program. He provided legal counsel to farmers and landowners across Ohio on business, farm transition, and estate planning.
- David Marrison, OSU Extension Field Specialist in Farm Management. David has been with OSU Extension for 25 years and is nationally known for his teaching in farm succession. He has a unique ability to intertwine humor when speaking about the difficulties of passing the farm on to the next generation.

Registration

Because of its virtual nature, you can invite your parents, children, and grandchildren to the webinar, regardless of where they live in Ohio or across the United States. The webinar offers an easy way to include all family members in learning about how to develop a plan for the future of your family farm.

Families must pre-register for the workshop by January 16, 2023 at go.osu.edu/farmsuccession. We appreciate the support of the Ohio Corn & Wheat Growers Association in sponsoring the workshop and helping us keep the cost at \$75 per farm family. The registration includes one printed set of materials that we'll mail to a family member, and other members will have access to electronic copies of the materials.

In-person workshops planned also

Several of our OSU Extension county educators are also hosting day-long in-person versions of the workshop on these dates:

- December 15, 2022 in Auglaize County at The Palazzo in Botkins. [Find more information here.](#)
- January 19, 2023 in Fairfield County at the Fairfield County Agricultural Center in Lancaster. [Find more information here.](#)

Don't miss out

We hope you'll join us for this important series! Even if you already have an estate plan or have begun one, this workshop should help you learn more and ensure that you're effectively addressing your goals for the future of your farm and farm family.

For additional information David Marrison at marrison.2@osu.edu or 740-722-6073.

In Defense of Animal Agriculture

By Dr. Francis Fluharty, Professor and Head of the Department of Animal and Dairy Science at The University of Georgia and Ohio State University Professor Emeritus

Source: <https://u.osu.edu/beef/2022/12/14/in-defense-of-animal-agriculture/>

When I read online media stories that blame animal agriculture for being a large part of the environmental problems we have, it troubles me that people are so far removed from agriculture and food production that they don't realize how connected to nature farmers are. I'm thankful for animal agriculture, from the producers who raise the livestock, to the grain farmers who grow grains and other crops whose byproducts we feed to livestock and companion animals, to the companies who produce, and distribute byproducts, to the feed companies who formulate products so that animals receive the proper nutrition, to the companies and people involved in delivering high-quality animal-based products to consumers around the world. I have often considered speaking up in defense of animal agriculture, because globally protein-energy malnutrition is the largest cause of human deaths; and in 2020, the World Health Organization estimated that more than 149 million children under the age of five were too short for their age, and another 45 million were too thin for their height. In fact, 45% of deaths of children under five years of age are attributed to undernutrition (<https://www.who.int/news-room/fact-sheets/detail/malnutrition>).

The agricultural system in the United States is the most efficient, sustainable food production system in the world, and is looked up to by developing, and developed, countries around the globe. It wasn't, however, something that just happened! In 1862, Justin Smith Morrill's Land-Grant Act was passed to provide affordable, accessible higher education for the children of the working class. Then, in 1887, the Hatch Act was passed to provide public funding for science-based research directed to the needs of farmers in order to provide a plentiful food supply to the burgeoning urban population. This was followed in 1890 with the Second Land-Grant Act, whose purpose was to provide a means for providing affordable, accessible higher education for African-Americans in the then-segregated Southern states. The increase in knowledge gained from research required the dissemination of information, and this was assured in 1914 with the passage of the Smith-Lever Act, which established the Cooperative Extension Service to disseminate the information learned in agricultural research. In the last 108 years, the Cooperative Extension Service, a branch of Land Grant University colleges of Agriculture, which now include Food and Environmental Sciences, has trained scientists and millions of farmers, young people involved in 4-H, nutritionists, and consumers in everything from vegetable and fruit production to animal production to poultry production, horticulture, plant pathology, crop and soil sciences, agricultural economics, consumer sciences, rural sociology, and agricultural education. In many states, there are county-level Extension agents in agriculture, youth development, and consumer sciences. This network of people providing training on things such as pesticide

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application, responsible herbicide use, animal welfare, animal production, natural resource management, and food safety is unparalleled in other parts of the world.

As companies are switching to more food items made without animal products, I can't help but think that with fewer Americans involved in food production at the farm level, we are increasing our social challenges in explaining how nature impacts our food supply and our global climate. I am not saying that there is anything wrong with being a vegetarian. In fact, of the 7.8 billion people on earth, approximately 22% are vegetarians <https://dealsonhealth.net/vegetarian-statistics/>; meaning we have approximately 1.7 billion vegetarians around the world. In countries like India, approximately 40% of the population are vegetarians. Unfortunately, many parts of the planet are too dry, rocky, or hilly, or the soil is too poor for crop production. Depending on the definition of "grasslands", approximately 20% to 40% of the earth's land is in grasslands, which when grazed by ruminant animals (cattle, sheep, or goats) they not only provide high-quality protein for human consumption, but also sequester carbon in the grass. In fact, carbon sequestered by grasses goes primarily into the soil, instead of going into the leaves or wood of trees, and is more stable when stored in the soil, as forest fires release the carbon stored in leaves and wood back into the atmosphere <https://climatechange.ucdavis.edu/climate/news/grasslands-more-reliable-carbon-sink-than-trees>. With a growing world population, providing high-quality animal-derived protein to prevent malnutrition, while simultaneously sequestering carbon, should be viewed as a positive, instead of a detriment to ensuring a sustainable human future.

In the United States, farming and ranching families are less than 2% of the population, and due to our practices which are based on science, each farmer feeds 166 people worldwide; more than any country <https://www.fb.org/newsroom/fast-facts>. In 2021, even with widespread inflation, U.S. consumers only spent 10.3% of their disposable personal income on food, with 5.2% being spent on food prepared away from home and 5.1% being prepared at home. In contrast, in 1960, 17% of Americans disposable income was spent on food <https://www.ers.usda.gov/data-products/ag-and-food-statistics-charting-the-essentials/food-prices-and-spending/?topicId=2b168260-a717-4708-a264-cb354e815c67>. Increased food production efficiency accounts for this improvement. The low percent of disposable income in the U.S. stands in stark contrast with other countries, many of which spend more than 40% of their household income on food including: Nigeria (58.9%), Kenya (52.2%), Cameroon (45.5%), Kazakhstan (42.8%), Philippines (41.9%), and Pakistan (41.9%). As a result, Americans enjoy a higher standard of living, because we have money left for things other than food and housing. We have a lot to be thankful for, much of it due to these unsung benefits of our agricultural productivity.

Activists often criticize animal production as competing directly with humans for food crops; however, most people do not realize that over 40% of the feeds we use for

livestock production are byproducts of other industries. For instance, 45% of our U.S. corn crop now goes to ethanol production <https://www.ers.usda.gov/topics/crops/corn-and-other-feedgrains/feedgrains-sector-at-a-glance/#:~:text=Much%20of%20this%20growth%20in,percent%20of%20total%20corn%20so> that our vehicles can be driven with less nitrous oxide production. Ethanol production leaves 32 million (M) tons of dried distiller's grains as a waste product, but these are high in fiber and protein. The beef industry uses 13.9 M tons, while dairy production utilizes 7.9 M tons, broiler chickens use 2.8 M tons, egg laying hens consume 1.6 M tons, and pigs eat more than 4.5 M tons. Soy oil is also produced by soybean processing, which produces another byproduct high protein feed, soybean meal and soyhulls which are a great source of fiber (cellulose) which can only be digested by ruminant animals. Each year, beef and dairy cattle consume almost 3.8 M tons of soyhulls; and cattle eat more than 3.4 M tons of soybean meal, whereas chicken production consumes 20 M tons, and pigs use more than 7 M tons. Cotton production produces a byproduct (cottonseed) of which more than 3.2 M tons are fed to beef and dairy cattle. High-fructose corn syrup production leaves behind byproducts as corn gluten feed and corn gluten meal, which are both high protein and high fiber byproduct feeds of which more than 5 M tons are fed. Many other byproducts from many industries, such as potato peels, with the beef industry using more than 437,000 tons <https://www.afia.org/feedfacts/feed-industry-stats/animal-food-consumption/>. The impression that all feeds used in modern animal production practices are grown solely for animals, and takes food away from humans is simply incorrect. If vegetable crop production were more profitable and feasible from the standpoints of production requirements, climate and soil in a geographic area, herbicide and pesticide usage, equipment requirements, and labor availability, then farmers would switch their production to those crops. In fact, more than 900 feedstuffs are used in both food animal and companion animal (dog and cat) diets, many of which are byproducts of other industries, and the use of these feeds by animals makes our entire food and energy systems more efficient, reduces the waste stream reaching landfills, and improves sustainability. This should be seen as a positive impact on society.

The U.S. EPA estimates that 27% of greenhouse gases (GHG) come from transportation, 25% from electric power, 24% from industrial production, 13% from residential and commercial sources, and 11% from all of agriculture (including field crops, vegetable, and fruit production) <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions>. However, beef and dairy cattle, and all other ruminants account for just 3.9% of all greenhouse gases produced in the United States, and Dr. Frank Mitloehner from U.C. Davis found that beef cattle accounted for just 2 percent of direct emissions <https://www.ucdavis.edu/food/news/making-cattle-more-sustainable>. In 2020, the U.S. EPA reported that 7% of greenhouse gas production was nitrous oxide and methane was 11%. However, even though we don't hear this on the news, methane comes from sources other than agriculture including the production and transport of coal, natural gas, and oil, and by the decay of organic waste in municipal solid waste

landfills (Source: <https://www.epa.gov/ghgemissions/overview-greenhouse-gases>). Another underreported fact is that nitrous oxide is 265 times more potent than carbon dioxide, CO₂, (the baseline value of one), whereas methane is only 28 times more potent than CO₂. However, the really scary thing is that fluorinated gases, which are manufactured gases used in refrigerants and air conditioners, aerosols, such as hair care products, and some foam products account for 3% of greenhouse gases, but are 23,500 times more potent than CO₂ (Source: <https://scied.ucar.edu/learning-zone/how-climate-works/some-greenhouse-gases-are-stronger-others>).

Contributions of Major Greenhouse Gases on a Carbon Dioxide Equivalent Basis				
	CO ₂ Equivalents	Percentage of All GHG	Multiples of CO ₂	Percent Contribution on a CO ₂ Equivalent
Carbon Dioxide	1	79	1	0.001%
Methane	28	11	308	0.424%
Nitrous Oxide	265	7	1855	2.553%
Fluorinated Gases	23500	3	70500	97.022%
Total Multiples of CO ₂			72664	100.000%
Percentage of GHG from: https://www.c2es.org/content/u-s-emissions/				

It's an increasing human population, and the products we use daily along with the vehicles we drive that are causing global warming. The math is irrefutable, even though the 'news' only reports facts that don't make us uncomfortable about our personal role in climate change, so it is much easier to blame farmers for the food they produce for all of us. However, when put on a percentage basis of CO₂ considering potency, methane only accounts for a little over 0.4% of Green House Gas production. There are no easy answers as a rapidly increasing human population places more stress on the natural resources, including available land, for food production. However, all food production requires inputs that most people don't understand. Sufficient crop production to meet the demands of the growing world population takes nitrogen, phosphorus, and potassium fertilization, along with herbicides, and pesticides. The fact is that humans are responsible for greenhouse gas production, and blaming animal agriculture for methane and carbon dioxide production by ruminants pales in comparison to the nitrous oxide and fluorocarbons that arise from human populations in industrialized societies. Blaming cattle, and the use of feed byproducts from industries that produce energy, clothing, and human foods such as oils and sweeteners is not only incorrect, but dangerous, as it focuses unwarranted attention on efficient and sustainable agricultural and food systems that are making use of byproducts of other industries rather than dealing with societal problems that are, unfortunately, complex and for which we all bear responsibility.



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