2025 SFC Poster Descriptions

Novel Biodegradable Cellulose Mulch Enhances Crop Performance While Eliminating Plastic Waste

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Agricultural plastic mulch, while effective for crop production, creates persistent environmental challenges through microplastic pollution and disposal issues. We present a breakthrough Janus cellulose mulch (JCM) technology that offers a sustainable alternative while improving key agricultural metrics. Field trials conducted at Purdue University's Meigs Horticulture Research Farm demonstrated JCM's superior performance in moisture management, temperature control, and crop yield. The mulch enhances soil moisture retention by 32% compared to conventional options and can harvest up to 1.59 liters of ambient water per square meter. Through its engineered asymmetric wettability and multiscale fiber networks, JCM maintains soil temperatures approximately 5°C cooler than bare soil during summer conditions while redirecting 66.7% of solar radiation to increase lower canopy photosynthesis by 23%. In bell pepper trials, crops grown with JCM achieved higher average fruit weights (4.9% increase) and significantly better quality, with 26-32% fewer small or deformed fruits compared to traditional mulch treatments. The material achieves 90% biodegradation within 8 months and can be tilled directly into the soil after harvest.

Compatible with existing mulch deployment equipment, JCM integrates seamlessly into current farming operations while eliminating microplastic pollution concerns. These results suggest that JCM technology represents a viable solution for growers seeking to maintain or improve productivity while transitioning away from plastic mulch use in sustainable agriculture systems.

High Tunnel Sweet Pepper Variety Selection Update

Petrus Langenhoven & Sofia Catucuamba
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Colored sweet bell-shaped and tapered pepper is a summer crop grown by many small and medium-sized farming operations in Indiana. Growers can choose to grow peppers out in the field or plant them under a protective structure. Sweet peppers, in particular, benefit from the unique growing environment created by a high tunnel. Planting of peppers can start at least 2-4 weeks earlier in the spring, and production can continue into the fall until the first hard freeze. Pepper variety performance data for Indiana is not readily available. We are working hard to change that. To date, Dr. Langenhoven and his team have evaluated forty pepper varieties, and each variety is assessed in two production cycles. This poster reports on five sweet bell and five tapered pepper entries evaluated in 2024 at the Purdue Student Farm, West Lafayette, Indiana.

From Caribbean Heat to Heartland Harvests: Cultivating Scotch Bonnet Peppers in the Midwest

Petrus Langenhoven & Sofia Catucuamba
Purdue University

High-value specialty crops present significant opportunities for small and medium-sized farms in the Midwest to diversify their operations and increase profitability. Scotch Bonnet peppers (Capsicum chinense), traditionally grown in the Caribbean and integral to its cuisine, represent an untapped potential for Midwestern agriculture. This study evaluated eighteen Scotch Bonnet varieties at Purdue University's Meigs Horticulture Facility near Lafayette, IN, during the 2024 growing season. The research assessed production potential, Scoville Heat Units (SHUs), and fruit characteristics across varieties. These findings demonstrate that Scotch Bonnet peppers can be successfully cultivated in the Midwest, though careful attention to planting dates and growing conditions is essential. The research provides valuable insights for farmers considering Scotch Bonnet production as a diversification strategy, particularly given the expanding hot sauce market and increasing demand for specialty peppers in the United States.

Dairy x Beef Crosses - A New Opportunity

Kylie Bedel
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U.S. dairies increasing reliance on beef genetics to breed dairy cows has led to an increase in the value of dairy producers' male calves. Male calves from dairy cows bred with beef genetics provide a higher quality beef carcass than straight dairy crosses while also benefiting from more efficient feed conversions. The shift in the dairy industry's breeding program has created a business opportunity for Indiana farmers seeking a new enterprise to augment their family's income since many dairy operations are seeking a market outlet for their dairy X beef cross bottle calves. Farm operators can raise bottle calves and market them as feeder cattle or retain ownership of the cattle and market them as finished cattle.

This poster will highlight the potential for increasing income by integrating a dairy X beef bottle calf feeding enterprise into an Indiana farm operation. The poster will provide a series of questions for producers to consider which will help them decide if a bottle calf feeding operation will be a good fit for their farm. Additional information will focus on facility, labor and management requirements necessary for success. Finally, data from a current Indiana operation will be reviewed to help producers better understand the financial requirements and possibilities. Evaluating opportunities to diversify on a small farm is no easy undertaking. This poster will help producers with the information to make an informed decision for their farm operation.

Hydroponics: Flood & Drain System, Community-Based Agriculture & Education

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The Purdue University's Engineering Projects in Community Service (EPICS) program Urban Farming consists of seventeen undergraduate students with a mission to promote food security in the Indianapolis area through urban agriculture. The team has partnered with Jovial Family Farm to design and develop three indoor hydroponics systems for a laboratory space on their property. Hydroponics is a method of growing plants in nutrient-rich water instead of soil. Because water is recirculated throughout the system, it uses less water than traditional growing methods. The hydroponics systems will provide fresh produce on a year-round basis as well as engagement and educational opportunities for all community members regardless of age, mobility, or experience level. The laboratory space will allow for research and

testing of optimal conditions for growing greens and other specialty crops hydroponically. Jovial Family Farm is a nonprofit organization founded by Drs. Bobbie and Brian Jellison with the mission to provide senior citizens, their families, and their communities with meaningful engagement opportunities on an intergenerational scale through urban agricultural activities. By increasing accessibility to fresh produce and distributing healthy recipes, Jovial Family Farm works to promote a healthy lifestyle amongst the community. Their continued support and involvement in this project have created an environment focused on experimentation, experiential learning, and hands-on engagement that reveals the invaluable experience of service-learning.

Cache Valley Virus (CVV) in Indiana Goats: Evidence and Successful Prevention Methods

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Sirocco Ridge Farm and Farmstead Creamery

Cache Valley Virus (CVV) is an illness causing congenital defects and death in small ruminant fetuses and newborns. The CDC reports that it occasionally infects people, and is spread by mosquitoes. There are no reports of evidence of CVV in animal hosts, livestock or humans in Indiana, but reports are found in surrounding states and to the north in Canada. Birthing seasons 2022 and 2023 had significant increases in kid deaths, and the presence of aborted and deformed kids. Two 2023 kids with enlarged heads, abnormal posture, paresis and poor coordination were necropsied (Purdue ADDL) revealing the neurologic deficiencies were due to hypomyelination. Serological assays were positive for CVV, indicating the kids and/or their dam had been infected. Since CVV is passed by mosquitoes, all does being bred in 2023 (starting in September) were treated regularly with UltraBoss, an insect repellent approved for goats. Treatment ended December 2023 when mosquitoes were expected to be minimal and risk of infection low. Analysis of death rates for the years 2020 to 2024 showed the differences to be significant. In addition, it showed that the high female death rate in 2023 was significantly higher than other years (analysis of males alone did not show significance). Kidding in 2024 had a significantly lower rate of loss, and only 2 animals showed morphology related to CVV infection. Anecdotal evidence of successful preventive treatment by UltraBoss was also found in an Illinois goat farm.

When Blue is Green: Sustainable Blue Food Systems Driven by Integrated Aquaponics

Anna Catherine Yerian, Jen-Yi Huang
Purdue University

When Blue is Green (BiG) is a USDA-funded, five-year, $10 million project led by Purdue. The goal of the BiG project is to sustainably increase seafood (blue food) production and consumption in the Midwest through aquaponics innovations. We develop an integrated system that combines aquaponics with microalgae cultivation and biorefinery to achieve zero-waste food production.

Since the BiG project started in 2023, we have commissioned a pilot-scale aquaponic system on Purdue's campus with a total operating volume of 600 gallons. We have produced over 300 lb of microbialy safe tilapia and 500 lb of lettuce. We have also built a 168-gal microalgal cultivation system to grow six different strains of microalgae using aquaculture wastewater. This wastewater treatment process is not only technically feasible but also effective in reducing the environmental footprint of the blue food produced. We found the algal biomass produced has great potential for biogas generation through anaerobic co-digestion with other agriculture wastes.

We are dedicated to engaging with stakeholders and have built a Midwest working group to identify barriers and opportunities for

aquaponics and blue foods. We have created a virtual reality tour of our aquaponics facility and conducted consumer sensory testing on our aquaponic products, aiming to increase consumers' willingness to pay.

To prepare a future workforce, we have included different aspects of the BiG project in several Purdue courses. We also held two Indiana 4-H events in 2024 and hosted over 30 middle and high school students to help them explore aquaponic and blue food.

Addressing Knowledge Gaps in Animal Traction for Vegetable Production and Forest Management on Midwest Farms

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Despite not well studied within the sustainable agriculture research community, there is evidence that animal traction could be a regenerative power option for small farms. Animals cause minimal compaction, appreciate, and can regenerate. Fuel can be grown on farm, some animals are multi-purpose, and there is social benefit for those that interact with them. However, opportunities for aspiring teamsters to gain knowledge are limited. Extension materials and programming from public Universities are also not widely available. To help remedy these gaps an NCSARE partnership project was developed. Preliminary results from year one are presented: Two farmer collaborators along with their teenage aspiring teamsters traveled to Tillers International for hands-on teamster training. As a result of this grant one of collaborator has purchased a team of oxen which he and his son are training for use in their market garden.

We began the side-by-side tractor animal traction comparison at the Meigs Horticulture Facility in Lafayette IN (Meigs). There were two treatments potato production with animal traction (AT) and potato production with small tractor traction (TT). During the study all field activities related to potato production were performed with animal power or tractor power in the two treatments, respectively. Data collection included: cost of equipment, time for each field activity to be used in future LCA analysis, potato yield, and comprehensive soil health assessment including penetration resistance. Potato yield did not differ between AT and TT. Preliminary results reveal that similar yields to tractor power can be achieved when using animal power.

An Overview of Container Farming at Purdue University

Barrett Wilson
Purdue University

This poster is intended to provide an overview of the operation of the Overbeck Controlled Environment Agriculture Facility located at the Purdue Student Farm. It will highlight the technology within the two Freight Farms containers, crop production, and student involvement in the daily operational activities.

Performance Evaluation of Eight Distinct Eggplant Varieties for Commercial Production

Petrus Langenhoven
Purdue University

This study evaluated the performance and yield characteristics of eight eggplant (Solanum melongena) varieties at Purdue University's Meigs Horticulture Facility in Lafayette, Indiana,

during the 2024 growing season. The trial aimed to provide regional growers with evidence-based variety recommendations for open-field production in Indiana. The evaluated varieties included traditional Italian types, Asian varieties, and specialty cultivars to assess market diversification opportunities. This evaluation provides valuable insights for growers seeking to optimize their eggplant production systems while meeting diverse market demands.

Aphid Parasitoids Communities in High Tunnels

Cristhian Ochoa, Laura Ingwell
Purdue University

High tunnels are semi-closed structures that allow farmers to extend their production season and are more affordable than a greenhouse. Because of the structure design, during summer production the high tunnels are vented by opening side curtains and end walls, allowing the indiscriminate entrance of insects and becoming a perfect shelter for them that provides resources and protection against weather conditions. Among the principal pests encountered in high tunnels, aphids are one of the most common and their populations build throughout the summer season, often persisting in winter if crop production continues. One of the main biological control agents that attack aphids are parasitic wasps which naturally appear along with established colonies of the pest. This research aimed to characterize the natural aphid parasitoid community in high tunnels, discover the principal actors in the community, and how effective these symbiotic relations are in managing aphids in this micro-environment.

Advancing Agricultural Resilience Through Purdue Applied Research and Extension

Pin-Hsueh Lee, Laura Ingwell, Christian Krupke
Purdue University

Agroecology, defined as the application of ecological principles to agricultural systems, offers a sustainable alternative to conventional agriculture (Gliessman, 2020). One key concept within agroecology is agricultural resilience, which refers to the ability of farming systems to adapt to environmental, social, and economic stresses (Meuwissen et al., 2019). This emphasis on resilience aligns with the growing need for farming practices that are not only ecologically sound but also capable of increasing resilience to shocks. However, the shift towards agroecological farming is progressing slowly, with an estimated 30% of global agricultural land currently being managed according to agroecological principles (Gräub et al., 2016). To explore the practical implications of this transition, we propose a comprehensive, long-term study that directly compares conventional farming methods with resilience-focused practices.

This study will not only develop specific metrics to track progress toward resilience but will also evaluate current farming efforts to adopt resilient approaches through social science methods. Surveys will be used to assess the types of support needed and the barriers to adopting resilience practices across Indiana, providing key insights into what drives adoption or resistance at the farm level. By focusing on key metrics such as carbon sequestration, soil health, and biodiversity, our research will provide farmers with concrete evidence of the benefits and trade-offs of adopting these practices. We aim to disseminate research findings through extension efforts, engaging with farmers and agricultural stakeholders while using these interactions to continuously refine our approach.

Insecticide Use and Not Rye Cover Crop Causes Spider Mite Outbreaks in Watermelon

Zeus Mateos
Purdue University

Cucumber beetles and mites are important pests in Midwest cucurbits. They are commonly managed with broad-spectrum pesticides (e.g., pyrethroids and neonicotinoids). However, mite outbreaks are associated with broad-spectrum insecticides. Indiana melon growers extensively use grass cover crops (e.g., rye), to act as a windbreak and protect seedlings from sand-blasting damage. However, there are reports claiming that mite outbreaks are caused by rye using it as a "green bridge" to colonize the crop.

We conducted a trial in four year-sites in Indiana, 2023-TPAC, 2024-TPAC, 2024-SWPAC and 2024-SEPAC to test the combined impacts of insecticide and rye on mites in watermelon. We compared a standard insecticide and an IPM program (threshold-based recommendations) and presence of rye, resulting in four treatments: i) standard insecticide + rye presence, ii) standard insecticide + rye absence, iii) threshold + rye presence, and iv) threshold + rye absence. We randomly allocated treatments to plots and replicated them five times per year-site. We released mites 3-4 times to ensure high levels and scouted all plots weekly, counting cucumber beetles, mites and natural enemies.

Cucumber beetles and natural enemies were more abundant with the threshold while mites with the standard insecticide program. Rye did not affect pests or natural enemies. These data implicate broad-spectrum insecticides can trigger mite outbreaks. Thus, growers should adopt IPM and limit insecticide applications to manage primary pests, minimize secondary pest outbreaks and protect natural enemies. Importantly, we show that mites do not seem to use rye as a bridge to move into the crop.

Survey of Entomopathogenic Nematodes in Indiana Specialty Crops

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Entomopathogenic Nematodes (EPNs) are an important generalist predator of soil-dwelling arthropods, including the immature stages of many beetle species, thrips, and lepidopteran pests. Understanding the presence and abundance of nematodes in different agricultural settings, such as high tunnels and open fields, can inform management practices to enhance soil health and crop production. This study aims to compare the presence and abundance of EPNs in soil samples collected from high tunnels and open fields growing specialty crops using a lab bioassay protocol. Soil samples were collected from specialty crop farms throughout Indiana, including high tunnels and open field plots. In the laboratory, waxworm larvae were used as the host to evaluate the presence and abundance of EPNs in each sample. Through the use of white traps for EPNs extraction from infected waxworms, we determined the presence/absence and relative abundance of EPNs from each soil sample. We will use this information to explore the patterns of EPN presence and abundance across the different production systems from which the samples were collected. This study provides valuable information on the presence and abundance of EPNs in high tunnels versus open fields, highlighting the importance of incorporating management practices that improve soil health and crop production in different agricultural environments. Future work will identify the species of EPNs that were recovered in our samples. Lastly, we will discuss the opportunities for integrating EPNs into pest management plans.

Converting organic waste into agricultural products using Hermetia illucens

Tucker LaRue, Milena Agila, Laura Ingwell
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Black Soldier Flies (Hermetia illucens; BSF) are a species of insect native to the neotropics but distributed globally. They are of economic value because of the high protein content in the immature stages, contributing to sustainable feed production. Additionally, they are voracious decomposers, consuming vast quantities of organic matter as they mature from egg to adult. In this study, we report on the capacity of BSF composting to reduce organic waste, create a valuable protein feed source, and provide an organic soil amendment in the process. We found that one gram of BSF eggs consumes 23.52 ± 6.81 kg of organic food waste to reach the prepupal stage. In addition, this process also generates 3.1 ± 0.99 kg of BSF digestate (compost) and 2.41 ± 0.75 kg of BSF prepupae (feed).

Assessing drivers of storage decision-making to prevent postharvest loss among smallholder ginger farmers in Palpa district, Nepa

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Ginger is a vital crop in Nepal, particularly in the mid-hill region, where it significantly contributes to smallholder farmers' incomes. Despite Nepal being the fourth-largest global producer, postharvest losses hinder its full potential. Farmers use storage methods like sack, pit, and bamboo storage, but challenges persist.

This study assesses factors influencing postharvest losses and farmers' storage decisions based on data from 256 households in Palpa district. Using linear and logit regression analyses, the study identifies key determinants of losses and storage adoption. Findings show that education and access to agricultural extension services significantly reduce losses, as informed farmers apply better storage practices. Experience, involvement in women's associations, and off-farm storage access positively influence storage adoption, while subsidies and immediate sales discourage it. Moreover, group savings enhance farmers' ability to invest in better storage, while experience and participation in women's associations support knowledge sharing and adoption of improved practices. The study recommends targeted interventions, including training programs, enhanced extension services, and affordable storage solutions. Promoting group savings and cooperative associations can improve financial access, reducing premature sales. Strengthening extension services to provide training on modern storage techniques can help farmers minimize losses and increase revenues. Addressing these factors through policy interventions can significantly improve Nepal's ginger sector.

Evaluating the impacts of biorational pesticides on twospotted spider (Tetranychus urticae K.) and predatory mites in high tunnels

Leslie Alejandra Aviles Lopez, Laura Ingwell
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High tunnels (HT) provide a protected environment for specialty crop farmer to grow crops. Cucumbers (Cucumis sativa L.) thrive in HT systems due to their vertical growth and continuous flowering, which allows for efficient use of space and multiple harvests. However, the twospotted spider mite (Tetranychus urticae Koch; TSSM) poses a significant threat to cucumbers in these settings. Often, farmers fail to detect TSSM infestations until substantial damage has occurred, making control difficult. Current management recommendations, derived from field or greenhouse systems, predominantly involve conventional miticides, which do not meet the needs of HT growers seeking organic pest management solutions.

Growers face challenges in selecting the most effective and economical methods for TSSM management due to the lack of research tailored to HT environments. This study aims to fill this gap by evaluating biorational products and their compatibility with biological control in a series of laboratory assays. We used eight different products Azera®, AzaGuard®, Bioceres®, Captain Jack's Neem Oil Concentrate®, Grandevo®, Insecticidal soap® Pyganic®, Venerate®. First, we examined the oviposition deterrent effects on TSSM adults. Second, we examined the mortality effects on both TSSM nymphs and adults, as well as beneficial predatory mites, including Amblyseius andersoni, Neoseiulus californicus, N. cucumeris, N. fallacis, and Phytoseiulus persimilis. The findings will help growers in choosing biorational products that effectively manage TSSM populations while minimizing adverse impacts on predatory mites. This research provides valuable insights into sustainable pest control strategies in HT cucumber production.

Tomato pinworm (Keiferia lycopersicella) distribution and location analysis in Indiana high tunnels

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High tunnels provide shelter for plants as well as lengthen the growing season, making them advantageous for growers, and resulting in an increase in their implementation. Additionally, the use of high tunnels in urban agriculture has increased, due to their efficient use of space and the security they provide crops. However, plant pests that dwell in warmer areas, such as the tomato pinworm (Keiferia lycopersicella), may find the shelter and warmth that the high tunnels provide beneficial. As a result, their populations flourish in these spaces, making them difficult to manage. This study investigates the distribution of tomato pinworm in high tunnel environments over the growing season in Indiana. Through month-long trap counts, we will analyze the density of tomato pinworms found in locations throughout Indiana, comparing their distribution over time as well as comparing their density across location types. This study will provide new insights into tomato pinworm activity in high tunnels, with implications for the effects they have on farms of differing communities.

Can Silage Tarps, Mowing, and Roller Crimping Effectively Terminate Cowpeas?

Josue Cerritos-Garcia, Stephen Meyers
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Silage tarps are reusable black plastic sheets used as ground covers between crop rotations or to keep fields weed-free. They serve as a no-till termination method for winter cover crops like cereal rye. Exploring how silage tarps could terminate late summer cover crops like cowpea in reduced till systems, alongside mowing, cultivation, or roller crimping may be interesting. In 2024, we explored this at Meigs Horticulture Farm in West Lafayette, IN, to see if tarping could effectively terminate cowpeas with other mechanical methods. The experimental design used a randomized complete block design (RCBD) with six treatments: mowing, roller-crimping, tarping, tarping plus cultivation, and herbicide termination with glyphosate, each replicated four times. Cowpeas were planted at a rate of 30 lbs/acre and then terminated using various methods. Tarps were applied for 3 weeks, with data collected each week by removing the tarp and placing it back on the ground. Data collection included visual termination (0% to 100%), weed control (0% to 100%), weed density per plot, and chlorophyll measurements of cowpea leaf tissue. In visual termination, treatments involving tarping demonstrated the highest termination rates, followed by glyphosate. On their own, mowing and roller crimping resulted in the lowest termination

percentages among all treatments. The same trend was noted in weed control, where tarping treatments achieved the highest percentage of weed suppression. These methods outperformed glyphosate and mowing or roller-crimping used alone for weed control. Again, tarping treatments had the least weeds/m2 for weed count compared to glyphosate, mowing, or roller-crimping alone. Finally, for chlorophyll measurements, we found that the treatments with the lowest chlorophyll concentrations were those that involved tarping, as there was less living tissue. Silage tarps hold potential for use with other termination methods. This could offer new opportunities for small farmers to manage weeds and terminate summer cover crops like cowpeas.

The role of weeds as a non-crop habitat for aphid pests in high tunnel systems

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High tunnels have become an increasingly common tool on specialty crop farms in Indiana and throughout temperate regions. Their structure protects crops against the elements while capturing solar radiation to maintain higher temperatures to facilitate winter and spring crop production. However, the environment within the high tunnel provides conditions that are ideal for soft-bodied pests, such as aphids, leading to higher populations on high tunnel crops compared to the open-field. Aphids are a diverse group of insects that vector plant diseases and secrete a sugary substance called 'honeydew' that can drop on leaves and fruit, harboring sooty mold growth that reduces crop marketability. Our research investigated the species complex and host association of aphids in high tunnels. Data on aphid species and abundance on crops and weeds was collected from more than 15 farms across Indiana during the months of December-April across two growing seasons. Myzus perisciae, or the green peach aphid, was and was found on a wide variety of crops and weeds. Macrosiphum pallidum, or wild rose aphid, was also a common aphid species found on cut flowers but appeared to prefer the weed species Lamium amplexicaule "henbit deadnettle" as a non-crop habitat. This study provides information regarding the role of non-crop weeds on aphid dynamics in a high tunnel cropping system, allowing farmers to determine pest risk, and potential alternative prey for beneficial insects and supports targeted weed management to reduce aphid pest pressures.

Early American Colonial period grave insects as a tool for understanding changes to beneficial and pest species over time

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Entomology analyses applied to investigating historical graves and other past funerary sites can provide proxy data about the subject and the landscape they lived in. This paper presents an interdisciplinary investigation of the arthropods found in the Philip Calvert coffin at Historic St. Mary's City, Maryland. Our analysis focused on rove beetles (Coleoptera, Staphylinidae), ants (Hymenoptera, Formicidae), true flies (Diptera) and suspected crop pests. Assuming an archaeological assemblage is a partial historical snapshot, the occurrence of thrips (Thysanoptera, Thripidae) and leafhoppers (Hemiptera, cf. Cicadellidae) may indicate pest challenges. A year-long survey of ground-dwelling and carrion associated arthropods was completed to compare historical and modern taxa with shifts in agronomic land use at the rural coastal site. The rove beetle Creophilus maxillosus was the most frequently occurring beetle in the modern survey but was absent from the coffin insects. This supports previous hypotheses that C. maxillosus became naturalized to its current North American range through the Columbian

Exchange. In a post-workshop survey farmers and Master Gardeners were more likely to agree the project is valuable for agricultural research compared to other community members who attended the same archaeoentomology workshop. Survey respondents encouraged experiment-based approaches, highlighted ways to navigate pitfalls, suggested incorporating eco-ethnography, and requested more outreach programming. The project objective is to better understand the impacts of introducing synthetic agricultural inputs on a local entomofauna community. Ultimately the goal is to develop sustainable farmscaping strategies specific to native natural enemy species while continuing to engage agricultural communities on novel archaeoentomology applications.

Insect-derived byproducts as amendments in specialty crop production

Milena Agila, Laura Ingwell
Purdue University

Urban farmers face several challenges, including low-quality soil in urban spaces. A common approach currently implemented involves the application of amendments, which can be derived from various processes such as aerobic or anaerobic composting, manure, insect-derived waste from protein production facilities, and composting with insects. Some of the most promising amendments include composting with black soldier flies (Hermetia illucens; BSF) and recycling waste from cricket production facilities. The advantages of utilizing amendments include improving soil fertility, increasing water hold capacity, and stimulating soil microbial community. This study aimed to assess the application of three insect-derived soil amendments on specialty crop production. Through field experiments, we evaluated the effects of the three insect-derived soil amendments on yield in two cropping systems: carrots and bok choy. Additionally, we assessed the impact of the three insect-derived soil amendments on soil health metrics, particularly soil aggregate stability, bulk density, and microbial activity. The findings of this study will provide valuable insights into the application of insect-derived amendments and enhance soil health in urban agriculture.

Impact of Grazing on Soil Health in Integrated Crop-Livestock Systems: A Comparative Study of Sheep-Grazed Cover Crops Across Two Unique Sites

Hannah Robalino, Moriah Bilenky
Purdue University

Integrated crop-livestock systems (ICLS) provide a sustainable approach to increasing food production while minimizing environmental impact. These systems utilize the natural relationship between crops and livestock by recycling agricultural residues, enhancing soil fertility through manure, and promoting soil microbial activity. This study evaluates how sheep grazing influences soil health compared to no grazing at two locations with distinct management histories: SIPAC (no-tillage, perennial crops) and Meigs (annual tillage, high-intensity cropping).

Results presented are year one of a two-year project funded by the Organic Center. Soil health indicators measured include aggregate stability, organic matter, soil respiration, active carbon, phosphorus (P), nitrogen (NO_3-N), and potassium (K). Results revealed that location had a dominant effect on soil health, with SIPAC showing consistently higher values than Meigs. On average, soil health indicators were 173.7% higher in SIPAC, with nitrogen (+396.3%) and aggregate stability (+224.1%) exhibiting the largest differences, likely due to alfalfa's nitrogen fixation and reduced soil disturbance. Phosphorus (+148.0%) was also higher, possibly due to long-term grazing and manure deposition.

Grazing improved phosphorus, potassium, and

aggregate stability, particularly at SIPAC, while organic matter, active carbon, and nitrogen remained largely unaffected in the short term. At Meigs, full cover crop removal and low stocking rates likely limited grazing benefits. However, soil health was not negatively affected by grazing, suggesting that annual cover crops can serve as forage in tilled systems without degrading soil health. Long-term conservation strategies, such as reduced tillage, may enhance grazing's benefits, warranting further study.

Secondary and Postsecondary Agricultural Curriculum Development as part of the #DiverseCornBelt Project

Mariah Schaeper, Sarah LaRose
Purdue University

For decades, the main production crops in the Midwest were corn and soybean operations. The recent COVID-19 pandemic majorly affected the agriculture economy (Masters, 2020). According to John Newton (2020), family farm bankruptcies increased by nearly 20%. Along with this, there has been a decline in farm employment (Goetz, 2018) and environment degradation. To address these challenges and more, Purdue University is collaborating with nine other academic institutions on the Diverse Corn Belt (DCB) project, a $10 million grant funded by the USDA National Institute of Food and Agriculture. The goal of DCB is to diversify the farms and landscape of the Midwest states that are within the corn belt. Within the DCB grant, there is an education team that is developing learning modules for post-secondary and secondary education on a variety of topics which include principles of sustainability, ecological diversity, and economic diversity.

To develop this curriculum, post-secondary educators are developing curriculum for post-secondary institutions. A graduate student and a professor in agricultural education then take the post-secondary materials and use it as a guide to create sustainable agriculture lessons for secondary education. This includes creating unit plans, lesson plans, and the materials to teach those lessons. The goal is to freely share this curriculum with agriculture and science educators of the Midwest to use within their classrooms. Providing materials to secondary teachers to teach concepts of sustainability and diversification can give rise to new supporters and interest from young people that is needed for the future of agriculture.

Effects of Corn Stover Removal on Nutrient Loss and Soil Health Across Hybrids and Yield Levels

Bruno Paulus Scheffer, Daniel Quinn
Purdue University

The use of biomass as replacement feedstock for energy, bioplastics and platform chemicals is being driven by the negative effects of fossil carbon on the environment. As a possible alternative, corn stover, a major source of renewable biomass, had 30 million tons produced in Indiana in 2023. However, excessive removal may negatively impact soil fertility, nutrient availability, and long-term crop productivity. This study aims to assess the impact of corn stover removal percentages following grain harvest on nutrient removal rates and soil nutrient level changes across different hybrids and grain yield levels. Besides the researchers investigate whether a fall-seeded rye cover crop can offset nutrient depletion and maintain soil health. The study will be conducted at Purdue University's Agronomy Center for Research and Education (ACRE) and the Southeast Purdue Agricultural Center (SEPAC). Main treatments include two corn hybrids (Dekalb 62-70 and PR112) at different nitrogen levels (0 and 180 lbs N/acre). Sub-plots (5 ft x 5 ft) within each main plot will undergo six residue removal treatments (0%, 25%, 50%, 75%, 100%, and 100% + rye cover crop). Soil and biomass samples will be analyzed

to quantify nutrient depletion. Initial findings suggest that complete stover removal significantly reduces soil nutrients, necessitating replenishment strategies. Rye cover crops may help mitigate these losses by improving soil structure and nutrient retention. This study will provide evidence-based recommendations to balance biomass utilization with sustainable agronomic practices.

Assessing the Impact of Row Spacing on Growth and Yield of Six Edamame [Glycine max (L.) Merr.] Cultivars

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Edamame [Glycine max (L.) Merr.] is a great opportunity for Indiana farmers. Besides high nutritional value, edamame requires minimal inputs as the majority of N is supplied by the crop. As with grain soybean, it can greatly benefit crop rotations by providing residual N for the following crop. It also is well suited for implementing sustainable practices such as cover cropping following harvest. Limited research on edamame cultivation is available in the Midwest USA. This field study, established at the Meigs Purdue Horticulture Facility, aimed to explore cultivars suited for the fresh and direct consumer market and identify cultural practices that minimize weed-crop competition. Three different row spacings (7 inches, 15 inches, and 30 inches) in combination with six cultivars (Chiba Green, Sayamusume, Besweet 292, Midori Giant, Tohya, and Karikachi) were evaluated. This study was designed as an RCBD split-plot design with 4 replications, with different row spacings as main plots, and variety as the split-plot. Plant height; leaf area index; pod yield; seed protein content; dry biomass of plant, pod and weeds were measured. All data is being analyzed with R. We hypothesize a) narrow row spacing will reduce the weed growth/ number/ species compared to wider row spacing. Furthermore, narrow row spacing will reduce the density of common weed species compared to wider row spacing; b) 30" row spacing may increase branching and yield of edamame but will increase weed-crop competition; c) Wider row spacing will improve edamame seed yield and productivity compared to narrow row spacing.

Mapping a Farm Data Lifecycle: Lessons from the Purdue Student Farm 2024 CSA Program

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Farming is a perpetual decision-making process, not only for in-season tasks but including planning during the off-season. A rich variety of data are generated and used by farmers in decision-making. For example, when planning farming tasks, a crop's maturity date influences seeding and transplanting schedule. The data complexity for crop planning grows exponentially as farmers create intricate crop rotations to manage space, soil health, disease pressure, harvest timing, and more. Crop diversification, succession planting, and spatial planning are all critical decisions in horticulture. This is further complicated as there are uncontrollable yet influential factors, such as, weather or pest outbreaks that can dramatically impact a farm's productivity and success. To manage such complexity, farmers have invented data collection and data management systems that fit their needs, preferences, and budget. These include a diverse mix of digital and physical tools, from unstructured notebooks and template whiteboards, to interactive and programmable spreadsheets. Across this range of information practices, we have found recurring themes in the data that is collected, the way data is used, and the data management goals across similar types of farms. However, by reinventing new ways of managing data, farmers are also faced with interoperability and usability challenges that hinder collaboration among farmers or use of existing digital farm tools. To address this issue,

we sought to characterize the farm data lifecycle by analyzing the information practices at the Purdue Student Farm (PSF). In this case study, we present how we broke down the production timeline to identify key information rich activities that the farm manager and crews conduct as they manage a working Community Supported Agriculture farm that serves around 150 households. We analyzed record keeping tools used in the farm operation, mapping connections among tasks, data, and tools. This farm data lifecycle map reveals information flows and bottlenecks and opportunities for both low- and high-tech digital innovation. This preliminary work will inform our next research and development steps, in partnership with the PSF management team, as we co-design a more streamlined and standardized farm record keeping system.

Smallholder Farmers' Behavioral Intentions of Using Animated Video on Groundnut Aflatoxin Prevention Practices in Zambia

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Aflatoxin contamination poses a significant threat to food safety, public health, and economic development in developing countries. Chronic exposure to aflatoxin has been associated with various adverse effects in both humans and animals. Although numerous technologies have been developed and promoted to mitigate aflatoxin contamination, smallholder farmers struggle to adopt them due to limited access to information. Additionally, the shortage of extension workers in developing countries and the challenges they encounter further hinder the effective dissemination of agricultural information. The study aimed to describe and predict farmers, knowledge and awareness, and behavioral intentions toward the use of animated video in accessing agricultural information on aflatoxin prevention practices. The farmers consisted of 160 randomly selected groundnut farmers in the Petauke district of Zambia. A pre-test questionnaire was initially administered to assess the farmers' baseline knowledge.

Investigating Root-knot Nematode Suppressive Soils Among Organically Managed Vegetable Farms in Indiana and Kentucky

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Root-knot nematodes (RKN) are among the most destructive soilborne pathogens in vegetable production. It causes severe yield loss when nematode populations reach high levels. Organic vegetable growers have less choices in managing the pest because chemical nematicides are not an option. Soil microbiota are essential for maintaining soil and plant health, influenced by soil management practices. Certain soils have the natural ability to suppress pathogens and to promote plant growth due to specialized soil microbiota, and are known as suppressive soils. One promising strategy for nematode control is to harness the power of such suppressive soils.

In this study, we aimed to screen and identify RKN-suppressive soils by surveying certified organic or organically managed vegetable farms in Indiana and Kentucky. We collected 51 soil samples (25 from Indiana and 36 from Kentucky) from both high tunnel and field. We conduced soil test and plant parasitic nematode (PPN) tests. Based on the PPN test, we selected soils containing fewer than 20 RKN juvenile nematodes (J2) per 100 cc of soil for further evaluation for their ability to suppress RKN under growth chamber conditions. So far, we have identified two farm soils that significantly reduced the number of nematode eggs per unit of root weight by 64–67%, demonstrating strong RKN-suppressive properties.

This research aims to understand farming

practices, soil properties and soil microbiota that contribute to RKN-suppressive soils and develop methods to promote soil's natural nematode-fighting abilities. This holds immense potential for environmentally friendly vegetable production, benefiting both growers and consumers.

Portable Handwash Stations for Fruit and Vegetable Growers

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Proper handwashing practices are critical to minimizing the risk of contamination in produce farming. To address this, regular training sessions are essential to educate workers on the importance of hand hygiene, effective handwashing techniques, and key situations that require handwashing, such as after restroom use, before handling produce, and after contact with animals. To ensure compliance, monitoring systems, including periodic inspections and incentives, can reinforce adherence to established protocols. One barrier often cited by farmers is the perceived high cost and complexity of installing handwashing stations with plumbing connections. However, affordable and portable alternatives make hand hygiene more accessible, even for farms with limited resources.

Two types of low-cost portable handwashing stations have been introduced and evaluated by farmers: (1) a foot-operated station that transfers clean water from a bottom container to the top, reducing cross-contamination risks, and (2) a station designed by the University of Minnesota, constructed with lumber and equipped with a clean-water tank, handwashing container, wastewater bucket, and trash can. To assess their effectiveness and usability, data was collected from farmers to understand their preferences and needs. The results revealed that most farmers favored the foot-operated station due to its time-saving functionality, which allowed workers to wash their hands more efficiently during busy farming operations. However, for others, especially those with limited budgets, the lower-cost lumber station was the preferred option.

The data underscores the importance of providing flexible handwashing solutions tailored to the specific needs of farmers. Frequent and proper handwashing, in compliance with CDC and other regulatory guidelines, is vital to reducing cross-contamination risks from foodborne pathogens. By offering effective and practical handwashing options, farms can foster better hygiene practices, improve worker compliance, and support overall productivity and food safety. Investing in these solutions not only meets the hygiene needs of diverse farming operations but also promotes a healthier and safer agricultural environment.

Exploring the Potential of Black Soldier Fly Cmpost Tea for Weed Seed Suppression

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Weeds present a significant challenge in agriculture by reducing crop yields and demanding frequent control measures. Black soldier fly (Hermetia illucens) compost tea, produced from digested organic waste, has garnered recent interest as a soil amendment due to its unique chemical and microbial properties. While studies have examined its use in soil health, its potential phytotoxicity and effects on weed suppression remain underexplored. In 2024 laboratory studies were conducted to determine the effect of black soldier fly compost tea on the germination of barnyardgrass (Echinochloa crus-galli L.), velvetleaf (Abutilon theophrasti L.) and redroot pigweed (Amaranthus retroflexus L.). Dried black soldier fly compost (frass) was mixed with distilled water (0.25 g ml-1), shaken for 30

minutes, then left for 24 hours. The 1:4 compost tea was diluted to create a dose-response series of 0.03, 0.06, 0.09, 0.12, 0.15, 0.18, and 0.2 g ml-1. Twenty weed seeds of each species were placed onto separate petri dishes then treated with 3 ml of each tea concentration. Petri dishes were placed into a growth chamber set to 30°C during the day and 18°C at night, with a 14-hour light photoperiod for two weeks. At 7 and 14 days after treatment germinated seedling were counted and then removed. Both weed species were fit to 3-parameter logistic models. The dose required to reduce germination by half (ED50) was 0.039 g ml-1 for barnyard grass, 0.03 for velvetleaf and 0.025 g ml-1 for redroot pigweed. These findings suggest that black soldier fly compost tea could serve as an eco-friendly, low-dose weed management tool. However, additional studies are needed in situ to determine if the results from this trial are applicable to field conditions.

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Thank you to all of the poster presenters for their work with small farms & local food systems!