

2023 SFC Poster Descriptions

Digital Records for FSMA - A Toolkit for You

Dennis Buckmaster

Purdue University

The Food Safety Modernization Act (FSMA) necessitates some improved records of monitoring, cleaning, training, and inspections around your farm and firm. As a complement to information available from Safe Produce IN, a “toolkit” was assembled so you can obtain and keep these records digitally in a simple manner. This “toolkit” is based on Airtable which is a free cloud database platform. Simple templates are available for producers to customize for their operation to keep records regarding post-harvest water treatment monitoring, worker training, cleaning and sanitizing, water system inspections, and compost treatment.

Since many are new to AirTable and may be also new to the FSMA records, we have generated a series of six short videos that walk you step-by-step through the process of getting the templates, customizing them to your own needs, and getting your reports downloaded to your own computer. Reporting (record generation) can readily be done on a smart phone (or computer) literally in seconds and the result is streamlined, digital, and private yet sharable records.

Digital Horticultural Crop Activity Records Simple, Free, Adaptable

Dennis Buckmaster

Purdue University

Operations records (who, what, where, how) are those elements of records and data that are often missing when we try to analyze what happened during a growing season. They have value from several perspectives within and among seasons. Unfortunately, most farms use a notebook or assorted formats of records that are incomplete and rarely digital. A digital format allows sorting, aggregation and analysis (by zone/bench/block/field, crop, machine, person, product, etc.) in a much easier manner. A template (or example database for you to duplicate) was assembled so you can obtain and keep these records digitally in a simple manner. The template is based on Airtable, which is a cloud database platform that offers free services plus additional features for a fee. We believe it will be a rare instance for your Horticultural Crop Activity Records to require the paid level of service.

A series of five short (less than 45 minutes total!!) videos walk you step-by-step through the process of getting the templates, customizing them to your own needs, and getting your reports downloaded to your own computer. You will see that the reporting can readily be done on a smart phone (or computer) literally in seconds. The videos include a demonstration and audio-visual tutorial regarding how to duplicate the template, make it private and personalized to your operation, and export your data.

Legacy Innovation Farming Economics Project

Ed Sheldon¹, John Jamerson², Chuck Baldwin¹, and Tameka Peoples³

¹Purdue University/AgrAbility

²LIFE Project/Legacy Farming and Health Group

³The Peoples Foundation

The Legacy Innovation Farming Economics (LIFE) Project is sponsored by the United States Department of Agriculture's Outreach and Assistance for Socially Disadvantaged Farmers and Ranchers and Veteran Farmers and Ranchers Program (USDA 2501 Program).

In the fall of 2019, the Legacy Farming and Health Group, based in Lyles Station, Indiana, The Peoples Foundation of Lompoc, California, and the National AgrAbility Project joined forces to address challenges faced by socially disadvantaged farmers and ranchers, as well as veterans involved in production agriculture. The organizations bring a long and diverse history of serving these audiences. Their combined experiences served in developing a model, building on existing assets, to effectively promote and increase awareness and utilization of USDA programs and services by socially disadvantaged farmers, ranchers, and farmer veterans.

The LIFE Project partnership has resulted in national impacts through:

- Direct farmer consultations
- Virtual workshops and round table discussions
- Value-added and entrepreneurship training
- Farmer workshops
- 4-H/Youth programs
- Annual networking conferences in partnership with 1890 land grant institutions
- Collaboration with the National Black Farmers Association and the Association of American Indian Farmers

The success of the original LIFE Project grant cycle resulted in the project being renewed through at least 2025, allowing the partners to further expand and enhance services to socially disadvantaged farm families throughout the U.S.

Who are Indiana's Top Pollinators? Characterizing Bee Communities Across Specialty Crops

¹Ella Stroh, ²Ashley Leach, ¹Zeus Mateos Fierro, ¹Ian Kaplan

¹Purdue University

²Ohio State University

Pollination of specialty crops by bees increases fruit set and yield. While managed bees are commonly stocked in some systems to provide pollination, Indiana has over 400 species of wild bees that provide this pollination service for free. Despite this fact, there are few state-wide records of which wild bee species are the most important contributors to pollination. In this study, we characterized wild bee communities in Indiana specialty crops with varying degrees of pollinator dependence: high tunnel tomato (low), field tomato (low), apple (moderate), blueberry (moderate), and watermelon (high). Wild bee dominance over honey bees varied among crops, with apple and blueberry least reliant on wild bees (22% and 31% of observations, respectively) and watermelon and tomato most reliant (85% and 100% of observations, respectively). Community composition also differed among crops; *Andrena* and *Bombus*

predominated in apples and blueberries, Halictidae in high tunnel tomatoes and watermelons, and *Bombus griseocollis* in field tomatoes. While honey bee stocking may account for the majority of bee visitation in apples and blueberries, wild bees appear to be important pollinators of watermelon and tomatoes. Regional data on the composition of wild bee communities promotes a better understanding of their value to specialty crops in Indiana. This provides potential avenues for improving fruit set and yield by emphasizing the role that wild bees can play in providing free pollination services.

An Introduction to the AgInjuryNews Collection

¹*Nicole Becklinger*, ²*Bryan Weichelt*

¹University of Southern Indiana

²National Children’s Center for Rural and Agricultural Health and Safety/ National Farm Medicine Center/ Marshfield Clinic Research Institute

AgInjuryNews is an online, publicly accessible collection of articles and other reports related to agricultural injuries and Fatalities. AgInjuryNews.org is maintained by the National Farm Medicine Center and National Children’s Center for Rural and Agricultural Health and Safety. Articles and other reports are identified mainly through Google Alerts, a digital media subscription service, and submissions from collaborators. Articles are screened for relevance, and key pieces of information about each incident are entered in the system. Launched in 2015, AgInjuryNews has collected reports covering over 4,000 incidents and 5,500 victims from U.S. and Canadian reports. Much of this data has not yet been analyzed, and outside of some pockets of external organizations and government agencies, the system has been underutilized by unaffiliated external researchers and the greater agricultural community. Since summer of 2022, the lead author has completed three articles and is pursuing several additional individual and collaborative projects using the AgInjuryNews dataset with the support and encouragement of the program’s core team. This presentation introduces the AgInjuryNews system and its potential for research and outreach, increasing users’ understanding and awareness of safety hazards present in agricultural work environments.

Comparing Organic Sprays and Soil Amendments for Vegetables

Philip Grabowski, Rebekah Hynson, Natalie Staritz

Taylor University

We carried out experiments to help gardeners discern the pros and cons of using compost vs. chicken manure and how effective organic sprays (Neem oil, Spinosad, and Bt) are on the most common pests for cucurbits (such as cucumber, zucchini, squash and pumpkins).

The data collected from the spray experiment showed significant differences across treatments, but the differences in plant growth appeared weeks before pest problems started, suggesting that our results were driven primarily by the previous soil conditions (despite adding compost to all beds before planting) rather than from differences in pest control. Cucumber beetles were low compared to last year, likely due to weather or natural cycles. Squash bug and squash vine borers were still major problems, even with the sprays. Removing the vine borer larvae surgically was effective and hand-picking squash bugs was necessary weekly. None of the sprays effectively controlled the worst cucurbit pests but timely manual removal of insects can ensure substantial production.

After three years comparing chicken manure and compost, we can see the long-term benefits of increasing soil organic matter for spring production probably due to the wet spring conditions and the leaching of nutrients from the chicken manure over the winter. Also, heat-loving, drought-tolerant crops, such as peppers, performed better with the chicken manure, which probably contained more nutrients. A combination of compost (to improve soil structure) and chicken manure (to provide nutrients) may be the best soil amendments.

Demonstrating Irrigation Effects on Yield and Quality of Fruiting Vegetables

Emerson Luna, Wenjing Guan, Liz Maynard
Purdue University

Climate change results in extended dry periods and excessive precipitation that limits yield and reduces quality in fruiting vegetable production. Irrigation is necessary to replenish soil moisture when rainfall isn't sufficient. Proper irrigation management is critical to ensure profitable yields and quality in vegetable farming.

Fruiting vegetables are varied in their tolerance to water stress. The tolerance level is also varied by different growth stages. Understanding fruiting vegetables' water tolerance can assist with crop planting and allocating irrigation resources during drought periods.

Fertilizer Injectors for Small Farms

Dean Haseman, Emerson Luna, Wenjing Guan, Liz Maynard
Purdue University

This poster will demonstrate different types of fertilizer injectors for small farms.

Demonstrating Evapotranspiration-Based Irrigation Scheduling in Vegetable Production

Wenjing Guan, Emerson Luna, Liz Maynard
Purdue University

This poster illustrates how to use Evapotranspiration for irrigation scheduling. This is one of a series of topics in a project aims to improve irrigation management in vegetable production.

Do Ducks Require Open Water Sources?

Jenna Schober, Jill Merritt, Mallory Swanson, Victoria Tetel, Esther Oluwagbenga
Purdue University

Previous studies found that open water access leads to decreased production and increased mortality in commercial Pekin ducks. Other studies have found that open water access allows for natural preening behaviors and improved production. Preening cups have been suggested as an alternative to open water that would allow ducks to express preening behaviors. We set out to test whether preening cups would have detrimental effects on the ducks or their environment. We placed hatchlings randomly into 12 pens (65 ducks each). Ducks were housed to closely approximate industry standards for density. One preening cup was placed in 6 pens on day 18. The control pens only had nipple lines. Ammonia levels were recorded in 3 places per pen weekly. Body weights of 30 ducks per pen were recorded weekly.

Behaviors were monitored for 3 days per week. No significant differences were found for ammonia levels between treatments. No significant differences were observed in body weight at any age, nor in growth rates between groups. No significant differences were observed between the two groups for any behavior including preening. Previous studies have suggested that ducks raised without open water sources are not able to preen and thus show reduced preening gland size; however, with the preening cups used in this study, no differences were found. Our study shows that even at a very high density of preening cups to ducks, their presence does not adversely affect the ducks or their environment.

How Does Transportation Affect Poultry Stress and Welfare?

Victoria Tetel, Greg Fraley, Brooke Van Wyk
Purdue University

Transportation is an important part of life for poultry, but it is not clear if transportation causes stress in birds. Hormones, called glucocorticoids, play an important role in the stress response in ducks. They regulate body functions to keep them healthy and protected. When they are stressed, these hormones increase blood glucose levels to prepare the animal for fight-or-flight. The purpose of this study was to observe how these hormones function in response to an external stressor: transportation stress. We hypothesized that shipping ducks to farms would increase their glucocorticoid levels and ultimately, show that they are more stressed. To test the hypothesis, we collected serum from 10 drakes and 10 hens at 4 time points: 24 hours before transport, at transport as ducks were taken off the truck, 24 hours after transport, and 1 week after transport. We observed a sex difference in both glucocorticoid levels, where hens showed higher stress hormones compared to drakes. Overall, the hens were more sensitive to the stress of transportation. These results show that there is a sex difference in the pathways associated with the stress response in ducks. Thus, when considering management practices in poultry associated with time around transportation, it is important to consider multiple factors. Stressful situations will affect males and females differently, and there is likely an age-related factor to consider. It is important not to compound stressors on poultry, such as vaccines, following transportation that may likely have long term impacts on growth and fertility.

Does Rye Trigger Mite Outbreaks? Testing the Green Bridge Hypothesis on Commercial Watermelon Fields

Zeus Mateos
Purdue University

Mites are an important pest on a number of crops, especially watermelon. Cover crops, such as rye, are used in commercial watermelon fields to protect seedlings from sand-blasting damage but rye may also act as an alternative host for mites and thus act as a bridge onto the crop. However, there are little data substantiating these claims. We tested the hypothesis that watermelon growing interspersed with rye will have higher mite densities than rye-free fields. Over two years, commercial watermelon fields with three different levels of rye cover crop intensity (0%, 25%, and 50%) across Southwest Indiana were scouted once per week, 10 fields in 2021 and 15 in 2022. Infected leaves with mites were recorded along with other watermelon pests (aphids, striped cucumber beetles, spotted cucumber beetles, squash bugs, and lygus bugs) and beneficials (natural enemies, e.g. ladybugs, and pollinators, e.g. bees). On average, 0.22 mite-infected leaves were recorded per m² of watermelon, but these were significantly higher in the fields with rye, supporting the hypothesis that rye acts as a bridge to the crop. However, mite densities in all fields were well below levels considered economically damaging. Interestingly, aphid densities were lower in fields with rye, likely by interfering with colonization. None of the other pests or beneficials responded to rye presence. These data suggest that rye can have

variable effects, depending on pest biology and life cycle. Future work will consider alternative (i.e., flowering) cover crops boosting beneficials while minimizing the carryover of mites and other pests.

Do Lights in the Incubator Impact Poultry Growth, Feed Conversion Ratio, or Behavior?

Melanie Bergman, Muhammad Faisal, Jenna Schober, Victoria Tetel, Esther Oluwagbenga, Greg Fraley
Purdue University

Lighting is important throughout the lifetime of a bird from controlling reproduction to regulating behavior. In the poultry industry, eggs are incubated and hatched in the dark. Yet in the wild, eggs may be exposed to sunlight during development. Could changing the lighting environment of chicken eggs influence their development and production later in life? In this study, we used three different lighting treatments during incubation to observe the effects on embryonic growth, hatching, and post-hatch production. We incubated broiler chicken eggs in the dark, with green/red LED lights, or with full-spectrum white light. While in the incubator, we measured eggshell temperature, egg weight, embryo weight, and hatchability. Once hatched, we measured weekly body weight, average daily feed intake, weekly feed conversion ratio, and performed isolation fear tests. Egg shell temperatures, embryonic weight, and hatchability were not affected by the change in lighting treatments. Daily feed intake, feed conversion ratio, and body weights were consistent between different lightings, as well. The isolation fear tests measured the time an individual bird would vocalize, and the three lighting treatments showed no significant difference in vocalization timing. Our data supports the conclusion that the presence of light in the incubator has no effect on embryonic growth, hatchability, or post-hatch performance. Future directions could include understanding how light travels through the different layers of an egg or studying the effect of different amounts of light during incubation.

How Does Summer Heat Stress Affect Breeder Poultry and their Offspring?

Esther Oluwagbenga, Jenna Schober, Victoria Tetel, Greg Fraley
Purdue University

Hot and humid weather can affect the health and productivity of poultry due to release of stress hormones. These hormones can also get into the egg and influence the chicks that hatch from those eggs. We put breeder ducks in a room and caused heat stress for 3 weeks and compared them to controls. We collected eggs and measured the ducks' weight and body condition. We also looked at the effect on the offspring that hatched from the eggs laid during the experiment by testing them for stress hormones at 3 weeks of age. Our results showed that female ducks exposed to heat stress showed higher stress hormone levels than males, related to a decrease in production and welfare. The number of fertile eggs and hatched eggs were also lower in the heat stressed group. We found that the stress hormone, cortisol, produced by the mother was present in higher levels in the egg albumen in the heat stress group. Their offspring also had lower weight at hatching and grew at the same rate as the control group but showed more fearfulness and a greater stress response when tested. These results suggest that exposing ducks to high temperatures can have effects on not only the ducks themselves but also on their offspring. A better understanding of how heat stress affects breeder poultry and their offspring can help us to alter management practices to better prepare our poultry for the annual bouts of heat stress.

Developing Pollinator-Friendly Lures to Monitor Cucumber Beetle Pests in Cucurbit Production

Rachel Youngblood, Ian Kaplan

Purdue University

Of the diversity of pest insects that concern cucurbit growers throughout Indiana, the striped cucumber beetle (*Acalymma vittatum*) is a key damaging pest. These beetles aggregate in a range of cucurbit hosts and then transmit lethal diseases. Existing management practices rely heavily on insecticide use, which could have negative non-target effects on cucurbit pollinators that increase yield. This study aims to develop lures to attract cucumber beetles without distracting pollinators. At Purdue's Meigs horticultural farm during the summer of 2022, we used clear sticky cards baited with combinations of either: a) a natural pheromone of the striped cucumber beetle; or b) a synthetic blend of floral odors mimicking the smell of squash blossoms. Floral scent consisted of a commercial blend, known as TIC (1,2,4-trimethoxybenzene [500 mg], indole [500 mg], (E)-cinnamaldehyde [500 mg]). We also tested the effects of indole, a component of floral odor blends predicted to attract beetles without distracting pollinators who will likely orient to the smell of squash blossoms. Key cucurbit pests were recorded, including striped (*A. vittatum*) and spotted cucumber beetles (*Diabrotica undecimpunctata howardii*), as well as cucurbit pollinators. Overall, pheromones effectively captured striped cucumber beetle, while floral lures were strongly attractive to spotted cucumber beetle. Pest pheromones and indole lures were not attractive to bees; therefore, these treatments could be components to enhance the management of cucurbit pests without reducing pollination. We discuss the potential for "natural" pheromone and floral-based lures to contribute to pest monitoring and active management in midwestern cucurbit systems.

Conserving Rare Breeds: Why and How

Joanna Claudy

Since the dawn of the industrial revolution, the number of breeds used primarily for production have decrease to only a small handful. Meanwhile, hundreds of breeds that were developed for specific purposes, locations, and environments slowly fade away. The movement to conserve and save these rare breeds sees its future in small farms. However, not all farmers know that there are breeds approaching extinction or know why they should care. This poster will address the reasons to conserve rare breeds and how small farms can be an instrumental part in that effort.

Reducing Heavy Metal Uptake Risks in Carrot Through Soil Microbiome Management and Varietal Selection

¹*Kathleen Zapf, ¹Lori Hoagland, ²Philipp Simon, ¹Linda Lee*

¹Purdue University

²USDA - ARS

Carrots are hyperaccumulators of toxic heavy metals like cadmium. Although most people are aware of the risks of arsenic and lead in their diets, cadmium is toxic in very small concentrations in edible plant parts, translocated there from soils with higher than safe levels. Cadmium poisoning of people can cause damage and cancer to the kidneys, lungs, prostate, etc., and is also detrimental to carrot plant growth and nutrient content.

Small organic vegetable farms are at higher risk of cadmium-contaminated soil due to the need for

fertilizer applications and potential proximity to city activities that might contaminate the soil.
Experiment Methods: Summer of 2022 - 11 urban farms in Indiana, 6 carrot genotypes thought to vary in cadmium uptake, participatory research.
Results: Differences between genotypes, core vs. peel, and farm site (soil factors) on arsenic, cadmium, and lead content in carrot root.
Mitigation: Consumers should peel and wash carrots before consumption. Farmers should be aware of their soil's history and management practices. Farmers should test their soil to determine heavy metal content before planting. In the future, farmers may be able to select carrot genotypes for their resistance to accumulation of heavy metals like cadmium, as well as adding microbe amendments to change the metal content in the soil.

Entomopathogenic Nematodes for CPB Management

Allison Zablah

Purdue University

This study evaluates the effect of a spray rotation using organic products and how susceptible were the Colorado potato beetles to entomopathogenic nematodes. The research was conducted exploring alternative organic pesticides that can be used in a spray program with Spinosad to conserve the effectiveness of this product. It also includes the incorporation of EPNs to help suppress the pupal stage of this beetle, which occurs in the soil at the base of the plants. The EPN species that we will use in this study is *Steinernema carpocapsae*. The experimental design is a full factorial and evaluates two different treatments: 1. A soil application of EPNs and 2. five different spray programs. Bioassays were used to determine how susceptible CPBs were to EPN using a nematode product compared to water control. White traps were used to collect the EPN from the death insects. Our analysis shows there was little effect of any spray program on the number of adults on potato plants. Larvae were effectively managed using spray programs 1, 2, and 5 when Spinosad was applied early in the season. Both life stages were susceptible to EPN infection, although larvae were more so than adults. The next step of this research is to apply EPN to potatoes during Fall when larvae begin to pupate and adults overwinter. We conclude that the Colorado potato beetle would have no effect under any spray program and that larvae were more affected by entomopathogenic nematodes.

Converting Food Waste into Soil Amendments While Growing Protein with *Hermetia Illucens*

Milena Agila, Laura Ingwell

Purdue University

Farmers confront several problems of which low quality soil is part. With the aim of making improvements to the soil, several farmers choose to add amendments to it. Nowadays, one of the promising amendment sources are the ones that result from the digestion of black soldier fly larvae (*Hermetia illucens*). Because of this, the aim of this research was to quantify the conversion of organic waste from the dining court at Purdue University into soil amendments by black soldier fly larvae digestion.

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