In This Issue

From the Editor's Desk

(Petrus Langenhoven, plangenh@purdue.edu, (765) 496-7955)

Dear Valued VCH Readers,

Welcome to this week's edition of the Vegetable Crops Hotline!

As hot and humid conditions persist across Indiana with heat indices soaring above 100°F this week, relief is on the horizon with cooler temperatures expected during the first week of August. While we navigate these challenging conditions, several critical issues demand immediate attention from vegetable growers.

Disease alerts are particularly urgent this week as cucurbit downy mildew has been confirmed in surrounding states—southwest Kentucky, northern Ohio, and Michigan—making early detection and scouting essential for Indiana growers. High tunnel tomato producers should also be vigilant for tomato pinworm, a small but potentially devastating pest that has become widespread in Indiana tunnel production and can cause significant crop failure.

This issue provides practical guidance for water management during these stressful conditions, highlighting how simple rain gauges can be your best low-cost tool for irrigation decisions and offering strategies for applying water at the right time and in the right amount. We also share insights from our latest Soil to Market research, which examines succession planning, family involvement, and business success across various farm types and sizes.

With insect trapping updates showing continued activity and the ongoing challenge of managing crops under heat stress, this week's content focuses on the immediate, actionable information you need to protect your crops and optimize your resources during these demanding summer conditions.

New USDA Economic Research Service Report Examines Economics of Soil Health Practices

The USDA Economic Research Service recently released (6/25/2025) a comprehensive analysis of the economic outcomes of soil health and conservation practices on U.S. cropland. The June 2025 report reveals that while reducing tillage intensity can lower input costs, the profitability of practices like cover cropping often depends on financial assistance and varies significantly over time. Key findings indicate that the adoption of conservation tillage continues to grow, although cover crop persistence remains a challenge—less than half of the operations that used cover crops in one census period continued the practice in the next. Notably, farms combining no-till/strip-till with cover crops demonstrated greater technical efficiency than those using either practice alone. The report emphasizes that successful adoption depends on integrating multiple conservation practices within complete management systems rather than implementing individual practices in isolation. This report can provide valuable insights for vegetable growers considering soil health investments and highlights the importance of long-term planning and a comprehensive approach to adopting conservation practices.

The full report is available at https://www.ers.usda.gov/publications/pub-details?pubid=112840

Growers and Purdue Extension Educators

Your input and expertise make this newsletter a truly useful resource. If you have hot topics you'd like us to cover, success stories to share, or questions for our Extension specialists, please get in touch with us at plangenh@purdue.edu or contact the specialist directly. We also welcome high-quality photos of pest issues, unusual symptoms, or innovative production practices you've implemented on your farm.

Website Links in Newsletter Articles

We frequently include links to websites or online publications. If you are unable to access these resources, please don't hesitate to contact your local Purdue Extension office or us to request a hard copy of the information.

Midwest Vegetable Production Guide

The 2025 Midwest Vegetable Production guide is now available for growers to visit online at **mwveguide.org**, or you can download and print a guide from your computer at **mwveguide.org/guide**. The guide can also be purchased for $15 per copy. Contact your Extension Office or Stephen Meyers (slmeyeres@purdue.edu) directly to buy a copy.

Midwest Vegetable Trial Reports

Are you still considering purchasing vegetable seeds? The Midwest Vegetable Trial Reports feature many articles to help you make an informed decision. The resource also hosts research results related to production.

Best regards,

Petrus Langenhoven
Clinical Assistant Professor and Vegetable Extension Specialist
Department of Horticulture and Landscape Architecture
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Don't Miss This Week's Watermelon Variety Evaluation Open House

(Wenjing Guan, guan40@purdue.edu, (812) 886-0198)

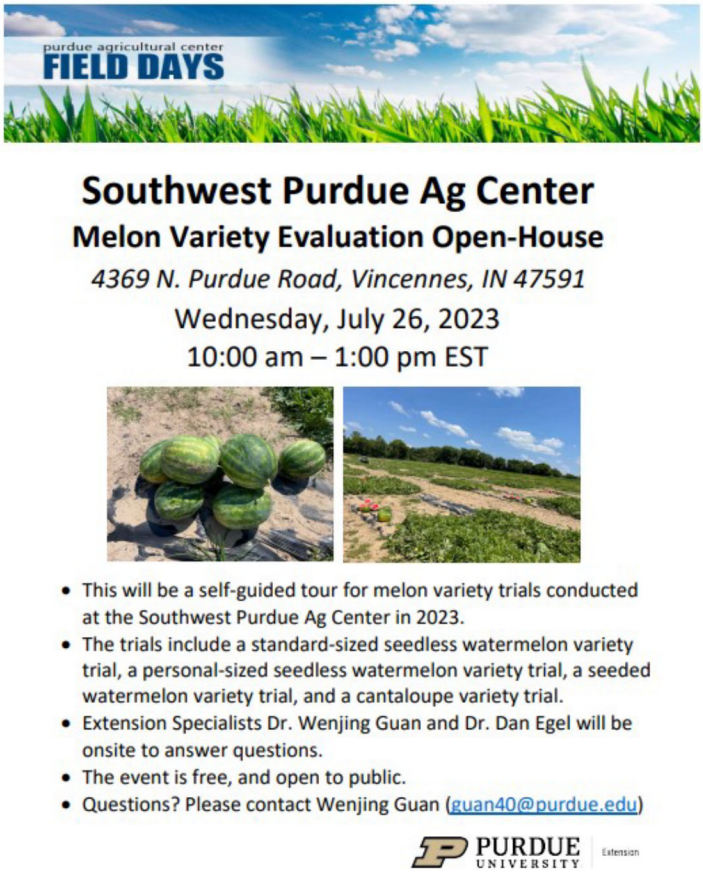
This Tuesday, July 29th – The Southwest Purdue Ag Center invites growers to attend their Watermelon Variety Evaluation Open House from **1:00 to 4:00 PM EDT**. With the event just days away, now is the perfect time to plan your visit and discover which watermelon varieties could enhance your operation.

This self-guided field tour allows you to evaluate the latest watermelon varieties at your own pace, giving you hands-on experience to assess performance, quality, and market potential. Whether you're considering new varieties for next season or looking to diversify your current plantings, this open house provides valuable insights directly from the field.

Extension Specialists **Dr. Wenjing Guan** and **Dr. César Escalante** will be available throughout the event to answer your questions and share their expertise on variety selection, growing techniques, and market considerations.

The open house format means you can drop in anytime during the four-hour window that works best for your schedule. This is an excellent opportunity to network with fellow growers while gaining firsthand knowledge about watermelon variety performance under Indiana growing conditions.

Mark your calendar for **Tuesday, July 29th, 1:00-4:00 PM EDT** at the Southwest Purdue Ag Center. Don't let this timely opportunity slip by – your next season's success could depend on the varieties you choose today.



What Caused the Cracking of Tomatoes and Melons?

(Wenjing Guan, guan40@purdue.edu, (812) 886-0198)

Fruit cracking is one of the most commonly observed disorders affecting many fruit crops. Cracking can occur in different forms, such as radial splits extending from the stem end, splits at the blossom end, or concentric rings around the fruit.

Research has shown that multiple factors influence fruit cracking. Some cultivars are more susceptible to cracking than others, pointing to a genetic component in the disorder. With the same variety, the severity of cracking can vary from season to season, highlighting the role of environmental conditions.

Environmental factors commonly associated with fruit cracking include irregular water availability, extreme temperatures, high solar radiation, large fluctuations between day and night temperatures, and elevated humidity levels. Additionally, certain nutrient deficiencies—particularly in boron, potassium, calcium, and zinc—have also been linked to increased fruit cracking.

In this article, I will share a few field observations of tomato and melon cracking and explore the potential contributing factors in each case.

Tomato Cracking

Stem-end cracking (Figure 1) was observed in a high tunnel

tomato experiment evaluating eight slicer varieties. The symptoms were minor during mid-season but became more pronounced toward the end of summer. Upon reviewing soil moisture data at the end of the season, we identified over-irrigation as the primary cause of fruit cracking. Soil moisture sensors installed at a 12-inch depth indicated that the soil remained nearly saturated in the latter part of the season.

Figure 1. Stem-end cracking of tomatoes (Photo by Wenjing Guan).

Irrigation in this high tunnel was managed using a preset automatic system programmed to run three times per day. Early in the season, we gradually increased irrigation to match plant growth and fruit development. However, we did not reduce irrigation as the plants matured and growth slowed. As a result, water continued to be applied at high rates even when the plants required less, likely contributing to excessive fruit cracking during the late season. Among the varieties tested, 'Celebrity Plus' exhibited the most severe fruit cracking, while 'STM2255' and yellow tomato 'Carolina Gold' showed the least.

More information about this high tunnel tomato experiment can be found in this experimental report: Evaluation of High Tunnel Tomato Cultivars for Yield and Quality.

Additional information on tomato cracking can be found in a previous newsletter article, Cracking Tomatoes.

Watermelon and Melon Cracking

In our watermelon evaluations, we have occasionally observed fruit splitting after heavy rainfall during the ripening stage in certain cultivars. These split fruits are unmarketable, leading to significant losses. While such issues still occur from time to time, most modern watermelon cultivars exhibit good tolerance to these environmental conditions. Field observations and photos of affected fruit are featured in a previous newsletter article Physiological Disorders after Heavy Rains.

Melon cracking and splitting are commonly observed under our climate conditions (Figure 2). While heavy rainfall and excessive irrigation increase the risk of cracking, we have found that certain cultivars are particularly susceptible to this issue, regardless of the weather conditions. This suggests they may not be well suited for open-field production in our region. Some of the melon types are mentioned in this experimental report: Cantaloupe and Specialty Melon Variety Evaluation in Indiana.

Figure 2. Different forms of melon cracking in the field (Wenjing Guan).

Most melon cracking we have observed typically occurs when the fruit is nearing ripeness. However, we recently encountered a case where a high percentage of fruit from a widely grown cantaloupe cultivar began cracking at an early developmental stage. Although heavy rainfall at the site may have contributed to the issue, plant tissue tests revealed deficiencies in potassium and boron—two nutrients essential for fruit development and known to be associated with cracking. Because most of the fruit had already set, correcting these deficiencies mid-season was unlikely to resolve the problem. This case highlights the importance of a well-balanced fertility plan in supporting the growth of high-quality melons.

Understanding Farm Decision-Making: Insights from the 2024-2025 Producer Survey

(Renee Wiatt, reneewiatt@purdue.edu) & *(Maria Marshall, mimarsha@purdue.edu)*

SOIL TO MARKET PROGRAM

The survey examined how farmers integrate decisions across three critical areas: farm business planning, production management, and food safety practices. Participants were asked detailed questions about their operational decisions, the timing of various planning activities, and the people involved in farm decision-making processes. The research team sought to understand what decisions farmers make and when and how these decisions occur throughout the production cycle.

This article series will present key findings from the survey, offering insights that can help both growers and Extension educators better understand the interconnected nature of farm planning. These findings aim to support more profitable and sustainable vegetable farming operations by examining the relationship between strategic planning and farm performance.

Succession, Family, and Success: Differences Across Farm Size and Farm Type

While the primary focus of the Soil to Market Producer Survey collected in 2024-2025 was to explore the decision-making of U.S. farm producers with respect to appropriate scale management strategies and practices to enhance economic efficiency and sustainability, it also gathered data on other topics. Some of these topics include farm demographics, business success, farm growth, and farm succession. In this article, we examine the data on succession, success, farm size, and generations of family involved in day-to-day management by farm type (fruits, vegetables, grains, livestock, and row crops) and by farm size (small farm or medium-sized farm).

Although all farmers in this survey were vegetable producers, they could also grow other crops such as fruits, grains, livestock, and row crops. Roughly 52.2% of producers indicated that they also produced fruits, 65.4% produced grains, 45.4% produced livestock, and 38.6% produced row crops (such as field corn or soybeans). USDA defines small family farms as those with an annual gross cash flow income (GCFI) of less than $350,000; mid-size farms have a GCFI of $350,000 to $999,999; and large-scale farms are those with a GCFI of $1 million or more (Dorn, 2021). Large-scale farms were excluded from this survey and analysis. Figure 1 reports the average number of acres farmed by farm type and size. Not surprisingly, medium-sized farms reported, on average, farming roughly 381 acres, compared to small farms averaging 85 acres. Row crop farmers have the highest average number of acres farmed, with 304 acres, followed by grain farmers with an average of 267 acres.

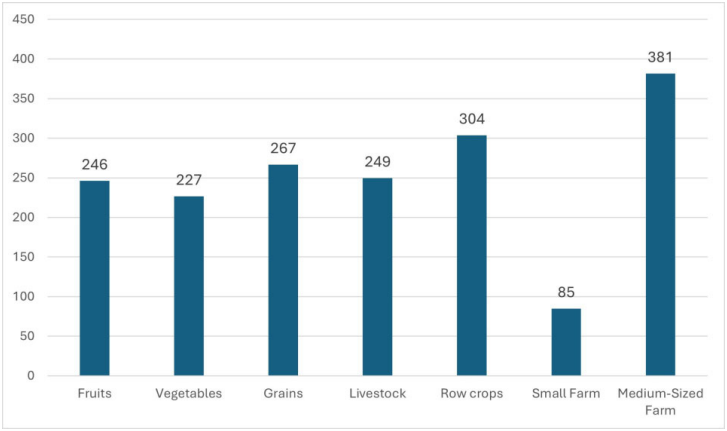


Figure 1. Average Number of Acres by Farm Type and Size.

According to the 2017 Census of Agriculture, roughly 96% of all farms in the United States are family farms (Nseir & White, 2021). In our producer survey, we asked the simple question as to whether the farm business was a family business. The Census of Agriculture defines a family farm as one "where the majority of the business is owned by the producer and individuals related to the producer" (Nseir & White, 2021). However, when farmers in our national survey were asked whether their operation was a family business, it was open to their own definition and interpretation. Farmers may decide that their farm is a family business because they work with their family, co-own with their family, or because they farm land that has been in their family for generations. In our sample, roughly 66.8% of the producers surveyed reported that their farms were family businesses.

Figure 2 shows the percentage of each category that respondents have a succession or exit plan, and Figure 3 shows the percentage of farms per category that inherited the farm business from a family member. Please note that while small farms and medium-sized farms are mutually exclusive, the same is not true for fruit, vegetable, grain, livestock, and row crop farms. Medium-sized farms had the highest rate of having a succession or exit plan, with 85% responding positively to that question. The lowest rates of both having a succession/exit plan and having inherited the farm business from a family member are small farms. Of the enterprise types, grain farms are most likely to have a succession/exit plan, with 81% of respondents indicating a positive response, and livestock farms are most likely to be inherited from family members.

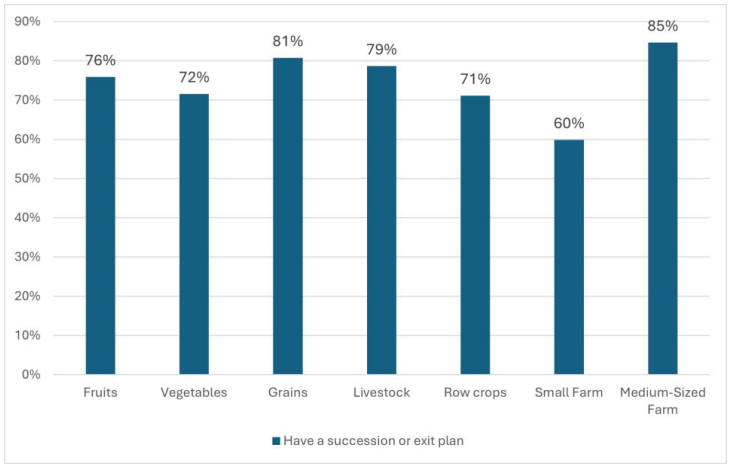


Figure 2. Succession Planning and Exit Planning by Farm Type and Size.

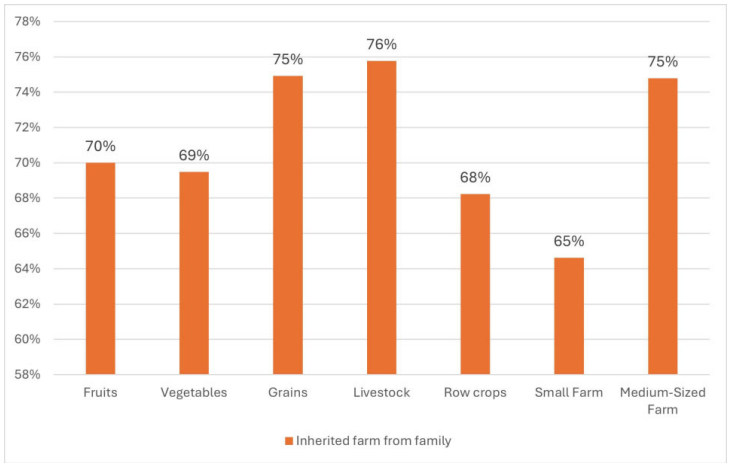


Figure 3. Farm Inheritance by Farm Type and Size.

Figure 4 shows the average level of success reported when the farm owner/operator was asked how successful they consider their business. The scores ranged from 1, which indicated *very unsuccessful,* to 5, which indicated very *successful*. On average, all enterprise types and sizes reported (on average) between *somewhat successful* (4) and *very successful* (5). However, medium-sized farms reported the highest level of success with an average of 4.44 compared to small farms' average of 4.05. Of the

farm types, the highest levels of success were reported among grains and livestock farms.

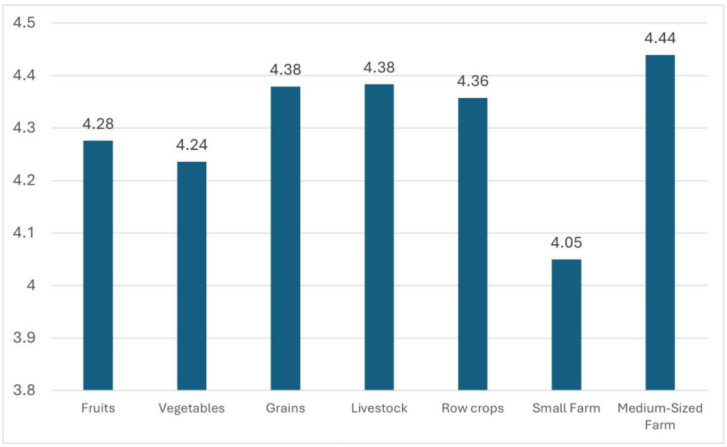


Figure 4. Average Level of Success by Farm Type and Size.

Figure 5 shows the average number of generations in the day-to-day management of the farm business. Of the whole sample of farmers, roughly 38% reported that one generation was in the daily management, roughly 46.6% of farms reported that two generations were in daily management, and 15.4% reported that three generations were involved. On average, livestock farmers have more generations involved in daily management than any other type of farm, followed by grain farms. Medium-sized farms reported (on average) roughly 1.9 generations involved in daily management of the farm and small farms reported roughly 1.66 generations.

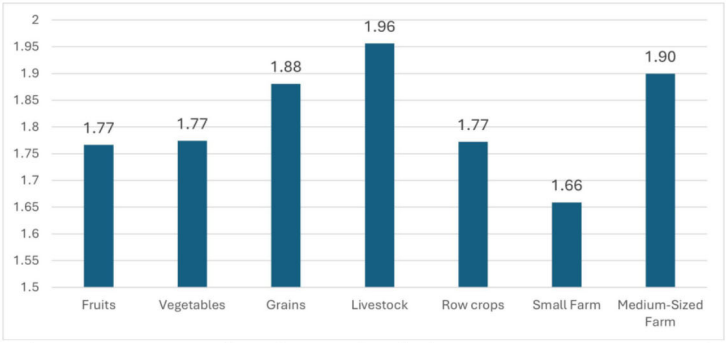


Figure 5. Average Number of Generations in the Day-to-Day Management of the Business.

There can be large differences found among farm size and farm type. Medium-sized farms in our national survey are more likely to have a succession/exit plan, but livestock farms are most likely to have inherited the farm from a family member. Not surprisingly, livestock farms have the most generations involved in daily management on average. Medium-sized farms had the most acres farmed on average and also rated themselves as more successful than small farms or other enterprises on average.

References

Dorn, T. (2021, January 27). Family farms continue to power U.S. agriculture. *U.S. Department of Agriculture.* https://www.usda.gov/about-usda/news/blog/family-farms-continue-power-us-agriculture

Nseir, A., & White, T. (2021, January 22). Family-owned farms account for 96% of U.S. farms, according to the Census of Agriculture Typology Report: Small family farms make up 88% of all U.S. farms. *USDA Census Counts Newsroom*. https://www.nass.usda.gov/Newsroom/archive/2021/01-22-2021.php

Wiatt, R., Marshall, M.I., Feng, Y., Langenhoven, P., and Shoaf, N. (2024-2025). Soil to Market Producer Survey on Integrated Decision-Making Survey [data file and codebook]. IRB-2024-1552. Funded by USDA-NIFA-AFRI: *Taking the Next Step as a Small and Medium Sized Farm: Understanding the Integration of Production, Food Safety, and Profitability.*

Funding Acknowledgement

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Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and should not be construed to represent any official USDA or U.S. Government determination or policy.

Insect Spotlight: Tomato Pinworm

(Sydney Territo, sterrito@purdue.edu) & *(Laura Ingwell, lingwell@purdue.edu, (765) 494-6167)*

If you are a high tunnel tomato grower, you may have encountered small, blotchy leaf mines (Figure 1) or tiny brown mottled moths (Figure 2) on your plants in the past few years. These tiny pests are the tomato pinworm, *Keiferia lycopersicella* (family Gelechiidae). They should not be confused with the leaf mining fly, *Liromyza sativae,* which creates narrow winding mines on the leaves of plants, including tomato. Their native range includes several warm states such as California, Hawaii, and Texas, as well as countries in Central America. They are occasionally found in temperate region greenhouses, often coming from infested stock plants. However, in recent years, they have made their way to Indiana and are widespread in high tunnel tomato production. Their presence and feeding cause anywhere from minor leaf damage to significant crop failure, depending on the severity of infestation. Although these moths prefer tomato plants, they are capable of feeding on any plants in the Solanaceae family. This can include potatoes, peppers, and eggplants, as well as several weeds in the nightshade family.

Figure 1. Leaf mine damage from tomato pinworm (Photo by Sydney Territo).

Figure 2. Adult tomato pinworms on a hanging wing trap (Photo by John Obermeyer).

Tomato pinworms, much like other moths, undergo complete metamorphosis and cause most of their damage during their larval (caterpillar) stages. The larvae hatch from small, singular eggs laid on the underside of the leaf and burrow inside, eating between the outer layers of the plant and creating a small, blotchy mine. They feed in this manner for a week or two in their early instars, inflicting increasingly larger mines on the plants, until they then emerge to curl the leaf over (Figure 3) and continue protected feeding until pupation. After pupation, the adults emerge to mate and reproduce, not causing any damage. Their full life cycle typically takes upwards of a month to complete, and they go through about eight generations per year. Oftentimes, the moths experience overlapping generations, making them a more difficult pest to manage. In most situations we have encountered, pinworms do not cause significant fruit damage. In most situations, we have encountered damage that is restricted to the leaves and sometimes the stems, late in the season. This can indirectly reduce plant yield by lowering the plant's photosynthesis capacity. In rare situations, we have seen severe populations spill over into the fruit and cause severe economic damage.

Figure 3. Leaf curling performed by tomato pinworm (Photo by Dan Egel).

In terms of management tactics, common techniques for managing this pest include cultural practices and biological control tactics. Pheromone-baited sticky traps are available and can be used to monitor adult activity. If you find any blotchy mines or larvae in any leaves, prune and remove them as soon as possible. In terms of biological control, several species of parasitoid wasps in the *Trichogramma* genus are effective egg parasitoids and can be bought and released. We have not tested this in high tunnels. Additionally, there are some parasitoid wasps, including those in the *Parahormius* genus, that also appear to parasitize larval pinworms; however, little is currently known about their abundance and distribution in our region. We have recovered parasitoids from infestations in West Lafayette and are awaiting positive ID. Insecticides used for other tomato-feeding caterpillars, including foliar applications of Bt, can manage the larvae, but only during the transition from egg to larva and when they exit the mine before they curl back into the leaf protection. One novel method of pest management may include the tactic of mating disruption, which has been successfully used in orchards to manage codling moths. This would involve saturating the HT with the synthetic pheromone, making it nearly impossible for the adult moths to successfully find a mate in all of the 'noise' of pheromone from the lures. Please refer to the Midwest Vegetable Production Guide, specifically the section on caterpillar pests in tomatoes, for more detailed management solutions. When applying insecticides, remember to follow the label; it's the law.

Downy Mildew Confirmed in States Surrounding Indiana

(Cesar Escalante, escalac@purdue.edu)

Last week, cucurbit downy mildew (*Pseudoperonospora cubensis*) was reported on cucumber in southwest Kentucky and northern Ohio. Last month, the disease was also reported in cucumber crops in Michigan. Being that close to Indiana, it is a good time to stay alert and scout fields for symptoms related to this disease. Remember, early detection of this pathogen is key to implementing appropriate management strategies. This disease

can be severe on cucurbit crops, to the point where leaves are lost, thereby reducing yield and product quality.

The causal agent of this disease does not overwinter in areas such as Indiana because it requires a living host to survive the winter. Therefore, the pathogen reaches Indiana primarily through wind dispersal from cucurbit crops in the South. Some cucurbit crops are also grown in greenhouses in the northern U.S. and Canada and serve as sources of inoculum. For this reason, downy mildew may or may not show up in Indiana; regardless, we should remain alert. An excellent resource for monitoring this disease is the Cucurbit Downy Mildew Forecasting page, accessible through the following link: https://cdm.ipmpipe.org/.

What should you be looking for in the field?

First, I should mention that downy mildew affects all cucurbit crops, and symptoms differ slightly from crop to crop. While angular, prominent yellow lesions can be observed on pumpkin and cucumber (Figure 1), the symptoms on watermelon and melon are more diffuse (light yellow) and irregular in shape (Figure 2). Under wet conditions, gray sporulation of the pathogen can be observed on the underside of the leaves (Figure 3); this is easier to see using a magnifying glass. Severe infections can lead to necrotic lesions and collapsed plants.

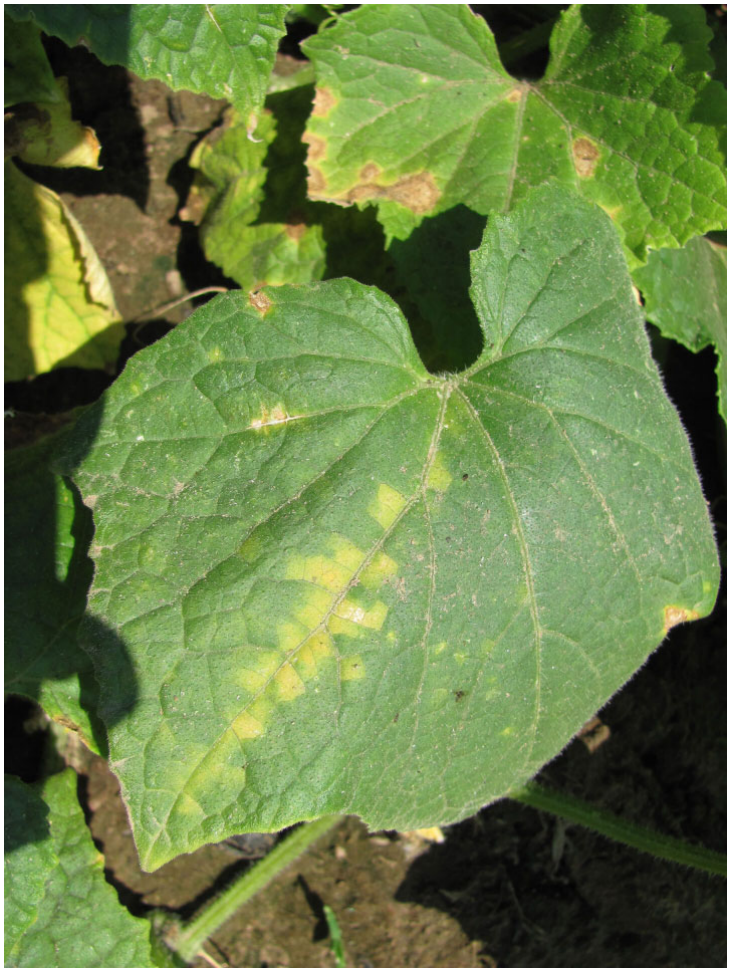

Figure 1. Downy mildew of cucumber. Note angular chlorotic/yellow lesions Photo by Dan Egel, https://ag.purdue.edu/department/arge/swpap/downy-mildew-cucumber.html).

Figure 2. Light yellow and necrotic lesions of downy mildew on a watermelon leaf (Photo by Dan Egel, https://ag.purdue.edu/department/arge/swpap/downy-mildew-watermelon.html).

Figure 3. Downy mildew of pumpkin. Sporulation is visible on the underside of the leaf near the vein where moisture has accumulated (Photo by Dan Egel, https://ag.purdue.edu/department/arge/swpap/downy-mildew-pumpkin.html).

Disease management practices

Crop rotation is not an effective practice for managing this disease, for the reason mentioned earlier; the pathogen arrives from other areas “to visit us.” However, keep in mind that crop rotation is still important for managing other cucurbit diseases. Apply contact fungicides as soon as the disease is detected. Some examples of contact fungicides include chlorothalonil products (Bravo®, Echo®, Equus®, Initiate®) and mancozeb (Dithane®, Manzate®, Penncozeb®). Systemic products are also effective in managing this disease. Some systemic fungicides you can use include Elumin®, Gavel 75DF®, Orondis Opti®, Orondis Ultra®, Ranman 400SC®, and Zampro®. A detailed list of fungicide products, including those mentioned here and copper-based products, is available in the Midwest Vegetable Production Guide.

Additional resources:

Egel, D. 2018. Vegetable diseases: downy mildew of cucurbits. Purdue Extension. BP-140-W. https://edustore.purdue.edu/bp-140-w.html

Midwest Vegetable Production Guide. 2025. https://mwveguide.org/guide

Gauthier, N. 2025. Cucurbit downy mildew confirmed in Kentucky. University of Kentucky.

Insect Trapping Updates

(Laura Ingwell, lingwell@purdue.edu, (765) 494-6167)

Figure 1. Squash vine borer adult (Photo by John Obermeyer).

Squash Vine Borer

https://extension.entm.purdue.edu/veg/squash-vine-borer/

The number of participants reporting trap catches has declined dramatically. Clinton, Allen, and Henry Counties are consistently reporting 1-4 moths per night. It seems that these populations didn’t get the memo that they are supposed to coordinate their mating during one concentrated time point in the summer. Regardless, at this point, most cucurbits should be large enough to withstand a small number of caterpillars, unless you have a small planting. Remain diligent.

Figure 2. Corn earworm larva in an ear of sweet corn (Photo by John Obermeyer).

Corn Earworm

https://extension.entm.purdue.edu/veg/cornearworm/

Much of the state should be near the peak pollination of our dent corn crops. This is a relief for sweetcorn growers, who now have a threshold of 10 moths per night to trigger an insecticide application. In the past 1.5 weeks, we have seen numbers below these thresholds. Trust the traps and take a break from spraying corn earworms. The ladybeetles will thank you and keep those pesky aphids at bay.

Hot and Humid Weather Persists, but a Cool Down is Expected During the First Week of August

(Austin Pearson, pearsona@purdue.edu, (765) 675-1177)

The heat and humidity have returned to the state, as heat indices soared above 100°F on Wednesday and Thursday (July 23-24) this week. The National Weather Service issued heat advisories that spanned from northeast Texas to northeast Ohio on July 24. Over the last 7-day period (July 16-22), average temperatures ranged from near normal in northern Indiana to 2-4°F above normal in southern Indiana (Figure 1). Maximum temperatures were near

normal in the south to 2-4°F below normal in the northern half of the state (Figure 2). Minimum temperature departures were more notable, as temperatures ranged from 1 to 6°F above normal statewide (Figure 3).

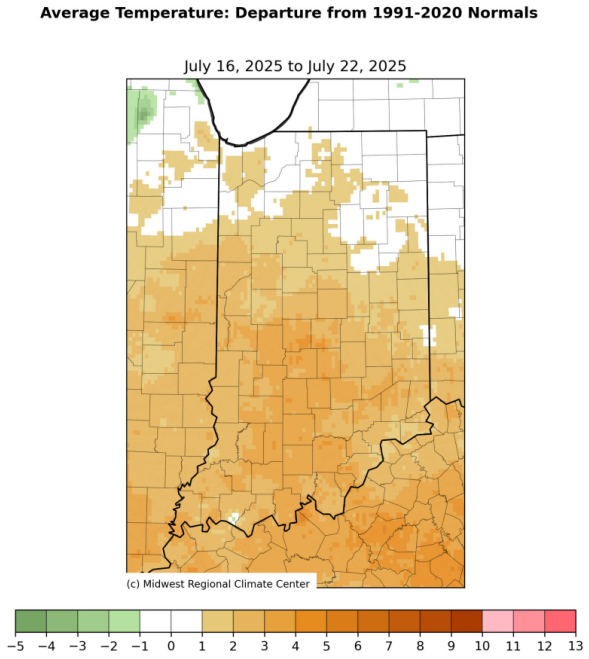

Figure 1. July 16-22 Mean Temperature departure from the 1991-2020 normal.

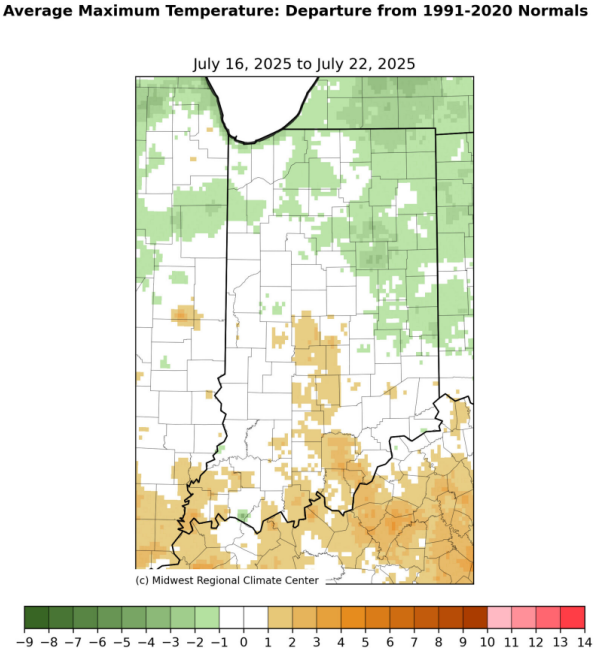

Figure 2. July 16-22 Max Temperature departure from the 1991-2020 normal.

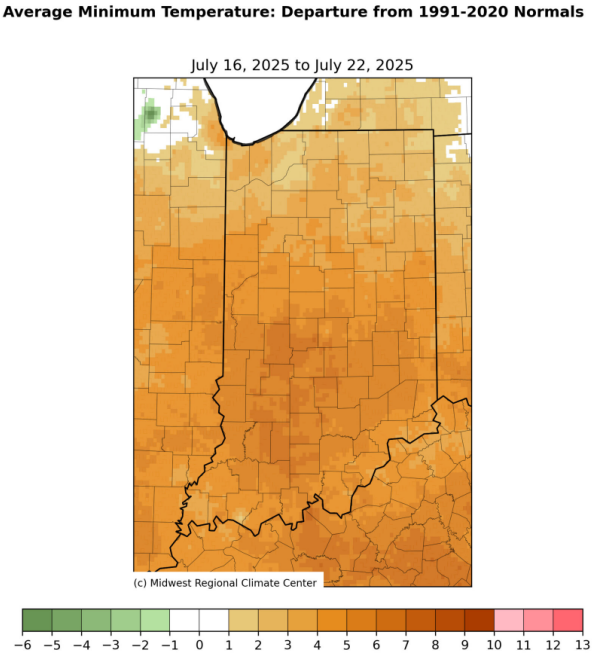

Figure 3. July 16-22 Min Temperature departure from the 1991-2020 normal.

Notice anything different with these maps? The Midwestern Regional Climate Center (MRCC) released new gridded maps this week, sourced from PRISM datasets and the NCEI 1991-2020 Normals dataset. Regional maps are now accessible on the MRCC's Midwest Climate Watch and Ag Climate Dashboard, while Indiana maps can be obtained from the Indiana State Climate Office. The high-resolution grids enable us to see more detailed map features, helping us identify hotspots for temperatures and precipitation. Speaking of precipitation...

Southern Indiana received the highest rainfall totals from July 16 to 22, with areas measuring between 6 and 9 inches (Figure 4). Mitchell 2.1 N, located in Lawrence County, recorded 9.12 inches during these 7 days. Francisco 0.1 SE, in Gibson County, reported 6.57 inches over the same span. During the previous 30-day period (June 23-July 22), northern Indiana experienced areas with less than 50 percent of normal rainfall, and in some cases, less than 25 percent of normal rainfall in parts of Allen County (Figure 5). Most of southern Indiana has received between 150% and 300% of normal rainfall over the past 30 days, with a significant portion falling between July 16 and 22.

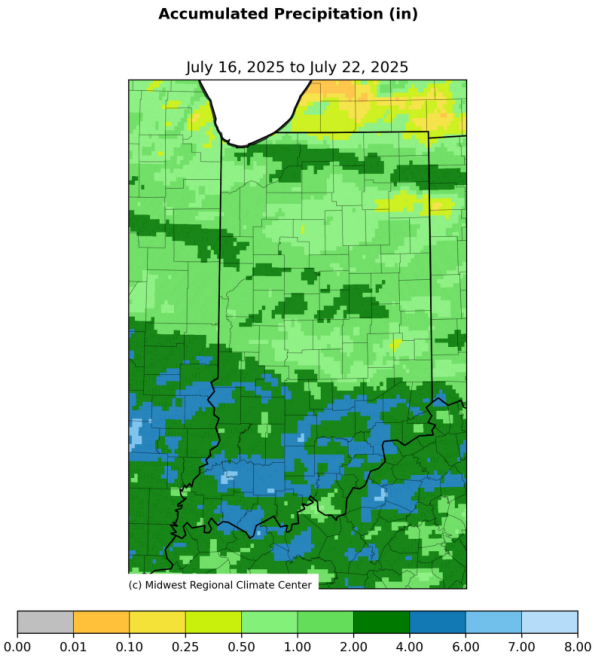

Figure 4. July 16-22 accumulated precipitation.

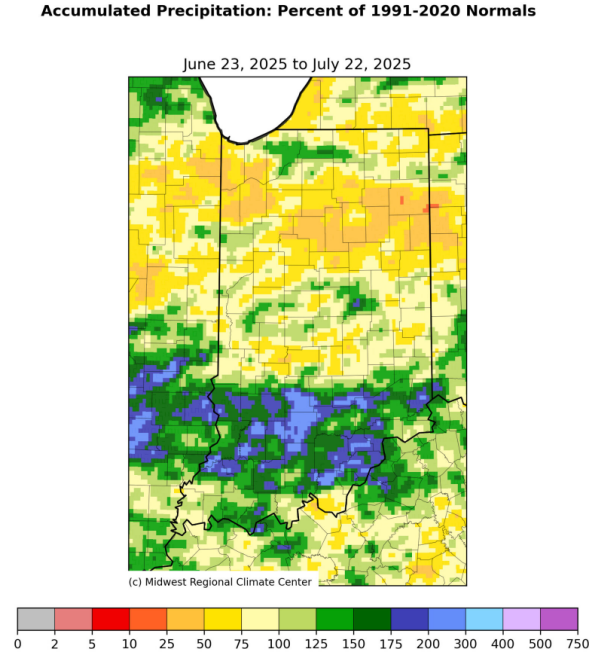

Figure 5. Accumulated precipitation from June 23 to July 22 shown as a percentage of the 1991-2020 normals.

How has the July 22 US Drought Monitor responded to recent rainfall totals? Southern Indiana is now free of Abnormally Dry (D0) conditions, but Moderate Drought (D1) has expanded into several counties in northern Indiana (Figure 6). Severe Drought (D2) has been added in far western Lake County this week. Not all areas in northern Indiana saw worsening conditions. Heavy rain improved conditions in St. Joseph, Elkhart, Noble, and DeKalb counties, which were previously under D0 conditions. Overall, about 15 percent of the state is experiencing drought conditions (D1 or D2), while nearly 16 percent is in D0 status.

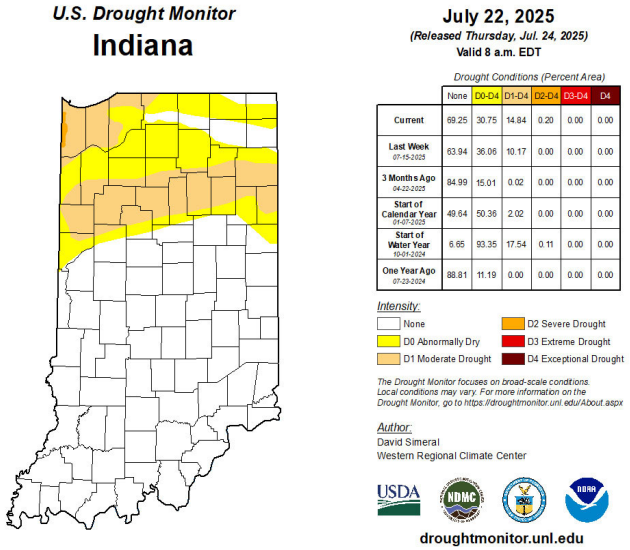

Figure 6. July 22, 2025, US Drought Monitor map

Regarding Modified Growing Degree Days (MGDD), these maps have also been updated to provide a clearer view of MGDD accumulations across the Midwest (Figure 7). Almost all of Indiana has experienced above-normal MGDD accumulations since May 1. Central Indiana, west and south of Indianapolis, is running 150-180 units above normal for the growing season as of July 22.

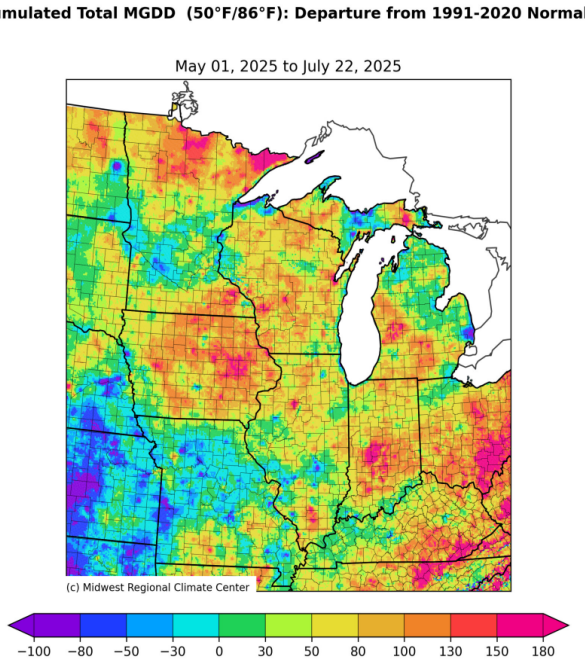

Figure 7. MGDD (base 50, ceiling 86F) accumulation for May 1 – July 22 represented as the departure from the 1991-2020 climatological normal.

So, what's ahead in the coming weeks? The Climate Prediction Center indicates that near-to-above-normal temperatures and typical precipitation are likely to persist through the end of the month (Figure 8). However, a cooldown is expected in the first week of August, with below-normal temperatures and near-normal to below-normal precipitation expected (Figure 9).

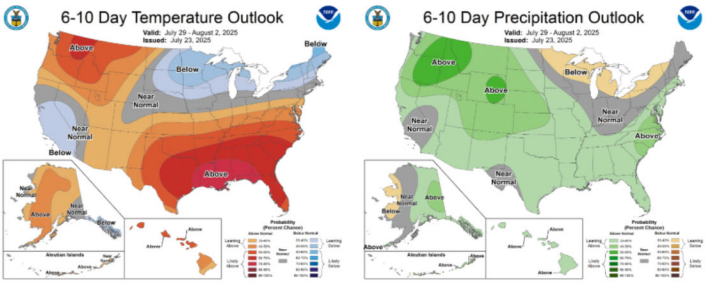

Figure 8. CPC 6-10 Day Temperature and Precipitation Outlooks, valid July 29-August 2, 2025.

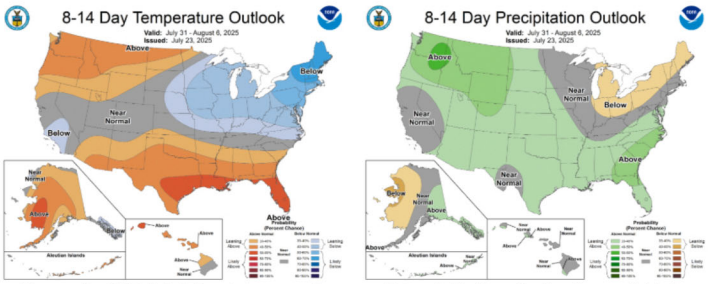

Figure 9. CPC 8-14 Day Temperature and Precipitation Outlooks, valid July 31-August 6, 2025.

Applying Water at the Right Time and in the Right Amount

(Angie Gradiz Menjivar, gradizme@msu.edu)

This article was originally published in the Michiana Irrigation Association Summer Newsletter. The Michiana Irrigation Association (MIA) Board, working in conjunction with Purdue and Michigan State University Extension, produces the summer newsletter for those who irrigate, irrigation industry professionals, and the state agencies that serve them.

Timing and application rate are critical when it comes to irrigation. Applying water too early, too late, too little, or in excess can lead to wasted water, reduced crop performance, and increased plant stress. As weather patterns become more unpredictable and water becomes an increasingly valuable resource, adopting strategies to apply water at the right time and in the right amount, known as **irrigation scheduling**, is essential for crop and water productivity.

There are several tools available to help with irrigation scheduling, but first, it's important to understand the basics. The primary role of irrigation scheduling is to apply water in a way that meets the crop's water demand, also known as evapotranspiration (ET). The goal is to maintain adequate soil moisture within the root zone, ensuring water is readily available to the plants when they need it most.

Soil serves as a reservoir for water, and its capacity to store water varies depending on **soil texture**. Sandy soils drain faster and hold less water, while clay soils retain more. After rainfall or irrigation, water drains through the soil, and what remains is called **field capacity**, the maximum water available to plants. If the soil dries out too much, it reaches the **permanent wilting point**, when plants can no longer access water and may begin to die. When soil pores are completely filled with water, **saturation** occurs, often resulting in runoff or deep percolation; water draining below the root zone and becoming unavailable to plants.

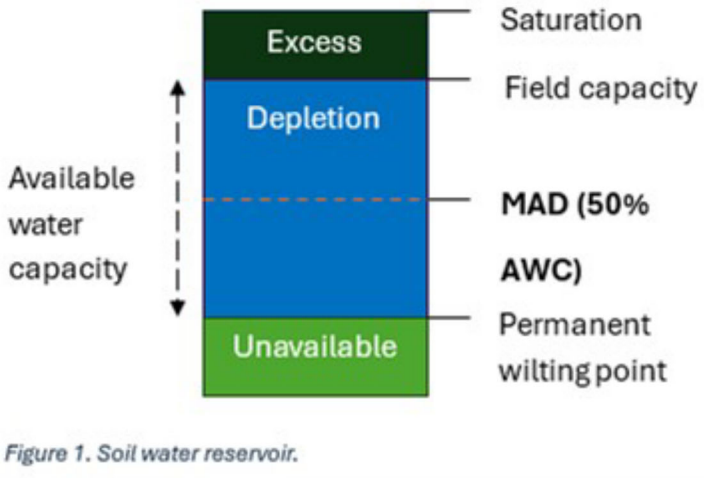

Figure 1. Soil water reservoir.

The difference between field capacity and the permanent wilting point is known as **available water (AW)**; the moisture that is accessible to plants. The **maximum allowable depletion (MAD)** represents the percentage of available water that can be depleted before plants begin to experience water stress. This threshold varies depending on the crop type and growth stage. A common guideline is to irrigate before 40% – 50% of available water is depleted, as going beyond this point can negatively impact crop yield due to stress.

A common and practical way to schedule irrigation is by using the checkbook method. Think of it like managing a bank account: rainfall and irrigation are deposits, and crop water use is a withdrawal. By tracking these inputs and outputs, you create a running balance of how much water is available in the soil's root zone. When the soil water depletion reaches or exceeds the maximum allowable depletion, it's time to irrigate. The goal is to refill the soil back to field capacity, while still leaving room for potential rainfall to avoid overwatering.

Michigan State University Extension offers helpful tools to support the checkbook method, including a soil water balance sheet an Excel-based irrigation scheduler. More recently, MSU developed a mobile irrigation scheduling app that is user-friendly and accessible for growers on the go. It's important to create a separate scheduling sheet or profile for each field, as crop type, soil texture, irrigation system capacity, and rainfall can vary significantly from one location to another.

All of these tools rely on daily potential evapotranspiration (ET_r) data and forecasted crop water demand for the upcoming week, available from 94 Enviroweather stations across Michigan. By selecting the weather station closest to your field, you can access accurate estimates to help schedule your irrigation.

Another simple approach using Enviroweather is to calculate crop water use by multiplying the reference evapotranspiration by a crop coefficient (K_c). The crop coefficient adjusts for differences in crop type and growth stage, allowing you to estimate how much water your specific crop needs.

Another simple approach using Enviroweather is to calculate crop water use by multiplying the reference evapotranspiration by a crop coefficient (K_c). The crop coefficient adjusts for differences in crop type and growth stage, allowing you to estimate how much water your specific crop needs. To use,

1. Visit the Enviroweather website (https://enviroweather.msu.edu/).
2. Select "Crops" from the main menu.
3. Click on your crop of interest (e.g., Corn).
4. Choose "Corn Potential Evapotranspiration."
5. Select your nearest weather station and enter your crop's emergence date.
6. Click "Submit" to generate crop water use estimates.
7. To view additional data such as temperature, rainfall, or ET_r, click "Show more data."

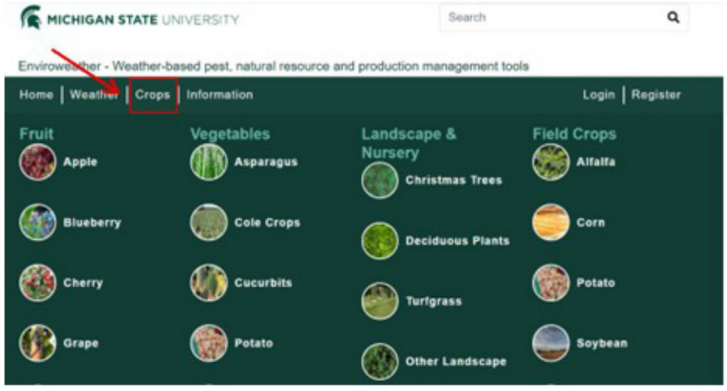

Figure 2. Enviroweather website to calculate crop water use.

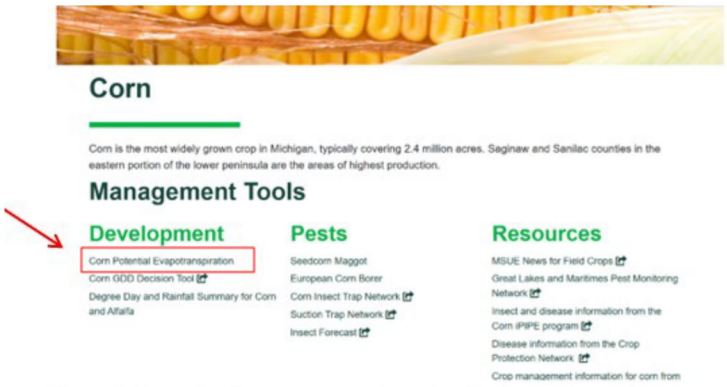

Figure 3. Example of corn as crop selected on Enviroweather website.

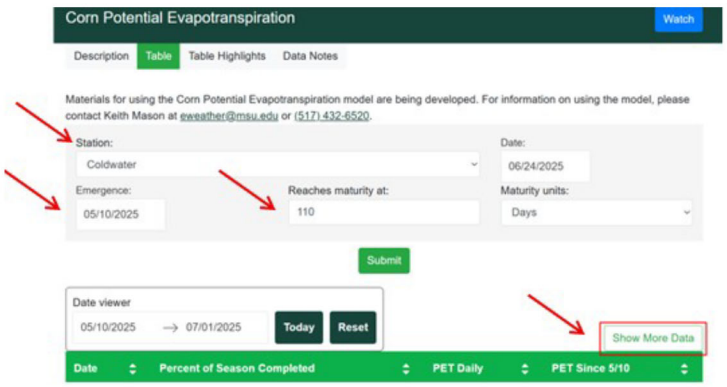

Figure 4. Corn potential evapotranspiration tool.

Additionally, MSU Extension provides weekly crop water use estimates for three key regions in Michigan. To access these updates, visit Crop Water Use.

There are other methods available to schedule irrigation, for example, soil moisture sensors can provide real-time insights into field conditions. You can refer to the "Utilizing Soil Moisture Sensors for Efficient Irrigation Management" factsheet to learn more about how these sensors work and how to use them effectively.

For additional information and resources on irrigation management, please visit the MSU Irrigation website.

Rain Gauges Are One of the Best Low-Cost Tools for Saving

(Brenden Kelley, kelle162@msu.edu)

This article was originally published in the Michiana Irrigation Association Summer Newsletter. The Michiana Irrigation Association (MIA) Board, working in conjunction with Purdue and Michigan State University Extension, produces the summer newsletter for those who irrigate, irrigation industry professionals, and the state agencies that serve them.

One of the best tools for managing irrigation and saving water is a simple rain gauge. Even with the aid of modern weather forecasts, it is hard to beat data collected from your field. While manual collection of rainfall data does require some effort, it can be easily incorporated into your scouting regime. Good irrigation records, a weather forecast, and frequent evaluation of the crop's stage, stressors, and received rainfall will provide you with all the ingredients to manage your irrigation.


Figure 1. Types of rain gauges (Photo by Younsuk Dong).

There are several issues with depending on your preferred meteorological source alone for irrigation management. Firstly, even with today's state-of-the-art meteorological equipment, it is rare that the forecast is always right. Even if your meteorologist can tell you when and where it will rain, projections of received volume are typically associated with a high degree of uncertainty. To further complicate the issue, most forecasts are generated for

population dense areas. If you're lucky, your weather source may interpolate between the geographical locations they calculated the weather for. While this may be better than assuming your weather will be the same as the closest data collection site, precipitation is often a spatially sensitive variable. Have you ever seen a nice storm front rain on the neighbor's field while you're still kicking up dust? These events may be uncommon, however, it's not uncommon to see a quarter-inch difference in received rainfall within a half mile. Checking a manual rain gauge shortly after a precipitation event avoids all the guesswork!

Not all rain gauges are created equally. There are dozens of different rain gauge designs available, ranging from something that resembles a small test tube to large, complex apparatuses. While small devices might be enticing due to low costs and convenience, it's often worth spending a few extra dollars for a higher quality rain gauge. A 32-oz fast food cup can even be made to work as a fairly accurate rain gauge when paired with a graduated cylinder. Learn more about this in the Irrigation Fact Sheet #16 on the MSU Irrigation website. Based on preliminary results of a rain gauge comparison done by the Michigan State University Irrigation Team, rain gauges with small collection openings had larger degrees of error due to reduced sampling size. Some of the cheaper models also have printed units of measurement as opposed to etched or molded markings. The paint or ink used to measure can be harder to read, especially after they have faded. Additionally, some systems measure in quarters and eighths as opposed to tenths of an inch. This works, however, tenths are easier to work with and more precise, mathematically speaking. If you're making an effort to collect manual data and managing irrigation that will apply many gallons of water, it's wise to invest in a rain gauge you have confidence in!

Electronic rain gauges can also be purchased and set up to automatically send you data. This saves some effort, but this equipment is not flawless. Debris can easily plug the funnel that most electronic rain gauges are composed of. Without maintenance, it's easy to be misinformed by these units. If used properly, they can be convenient, provide real-time data, and save you a lot of driving. Both manual and electronic rain gauges should be tested to ensure proper calibration. This can be done by pouring a known volume of water into the gauge and dividing that volume by the surface area of the gauge's opening. The reading indicated on the rain gauge should match the result of your calculation. An example is shown below. Alternatively, you can compare readings to a rain gauge that is known to work well.

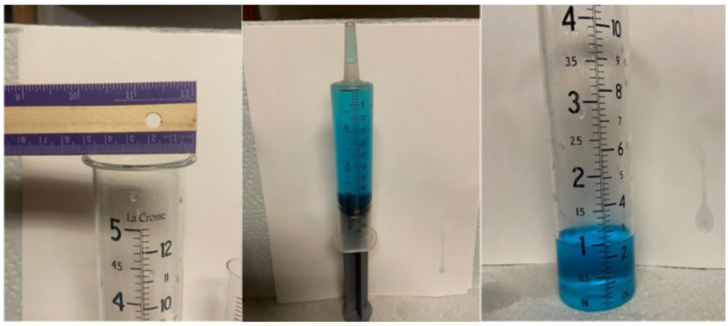

Figure 2. Follow these simple steps to check the accuracy of a rain gauge with a round opening (Photos by Brenden Kelley).

Carefully measure the diameter of the opening of your rain gauge in cm or inches. Measure from the crown of the lip from one side to the crown of the lip on the other (left). The chart below provides the volume a ½", 1" and 1.5" rainfall should measure in your rain gauge. Use a graduated cylinder or a large syringe from the local farm store to accurately measure out the volume listed for your gauge's opening and pour it into the rain gauge (center). If the gauge is accurate, it will read precisely ½", 1"and 1.5"(right). Replace the gauge if it has a noticeable difference.

Rain Gauge Diameter		cc or milliliters		
cm	Inches	1/2"	1"	1.5"
2.0	0.79	4	8	16
2.5	0.98	6	12	25
3.0	1.18	9	18	36
3.5	1.38	12	24	49
4.0	1.57	16	32	64
4.5	1.77	20	40	81
5.0	1.97	25	50	100
5.5	2.17	30	60	121
6.0	2.36	36	72	144
6.5	2.56	42	84	169
7.0	2.76	49	98	196
7.5	2.95	56	112	224
8.0	3.15	64	128	255
8.5	3.35	72	144	288
9.0	3.54	81	162	323
9.5	3.74	90	180	360
10.0	3.94	100	199	399

Figure 3. Rain gauge diameter and volume.

Southwest Purdue Ag Center Hosts Pumpkin Field Day

(Wenjing Guan, guan40@purdue.edu, (812) 886-0198)

Mark your calendars for an exciting educational opportunity! The Southwest Purdue Ag Center invites you to join their Pumpkin Field Day on **September 17, 2025, from 1:30-5:30 pm EDT** at 4369 N. Purdue Road, Vincennes, IN 47591.

This hands-on event provides participants with the opportunity to explore a diverse range of pumpkin and winter squash varieties while gaining valuable insights into cutting-edge agricultural practices. Attendees will learn about the latest research developments in no-till farming techniques, effective weed control strategies, and integrated pest management approaches that can

enhance crop production and sustainability.

The field day welcomes growers, gardeners, educators, and anyone with an interest in pumpkin cultivation. Admission is free, but registration is required as space is limited to 50 participants.

To secure your spot, register online at https://tinyurl.com/SWPACpumpkin or call 812-886-0198. For questions or cancellations, contact Barb Joyner at joynerb@purdue.edu or 812-886-0198. Early registration is encouraged to ensure availability and help organizers accommodate all interested participants.

Purdue Small Farm Education Field Day Draws 63 Attendees Despite Summer Heat

(Petrus Langenhoven, plangenh@purdue.edu, (765) 496-7955)

The Purdue Small Farm Education Field Day proved that dedicated growers won't let summer temperatures dampen their enthusiasm for learning. Despite the hot weather, 63 attendees gathered at the Purdue Student Farm yesterday to participate in comprehensive demonstrations and presentations focused on small-scale farming solutions.

The event, co-hosted by the Department of Horticulture and Landscape Architecture and the Purdue Student Farm, ran from 9 a.m. to 1 p.m. and featured expert-led demonstrations covering critical aspects of small-scale vegetable production.

Comprehensive Educational Programming

Crop Production and Variety Selection sessions provided growers with research-backed insights into optimizing their operations. Petrus Langenhoven presented findings from the 2024 sweet pepper variety trial, sharing performance data from 10 varieties tested for high tunnel production in Midwestern conditions. The raised bed demonstration, led by Nathan Shoaf, explored various materials, configurations, and heights, helping attendees understand the trade-offs between benefits, such as improved drainage, and challenges, including increased costs and labor demands.

Figure 1. Nathan Shoaf talking about the use of different materials to construct raised garden beds (Photo by Petrus Langenhoven).

Equipment and Tool Management demonstrations provided participants with hands-on experience using essential farming implements. Ashley Adair demonstrated to attendees how to calibrate an Earthway seeder for precise sidedressing of poultry-based fertilizers. The popular "Hoes 101" session, presented by Stephen Meyers and Celia Corado, taught proper maintenance and use of various hand-weeding tools, with many participants bringing their own implements for sharpening practice.

Figure 2. Stephen Meyers discusses different options for weed management (Photo by Petrus Langenhoven).

Integrated Pest Management and Food Safety sessions addressed critical operational concerns. Laura Ingwell demonstrated the use of pheromone-baited traps for monitoring tomato pinworm populations, a relatively new pest challenge in Indiana's high tunnel tomato production. Amanda Deering led discussions on packinghouse design strategies to prevent cross-contamination and implement effective food safety protocols for operations of all sizes.

Figure 3. Laura Ingwell discusses insect monitoring (Photo by Petrus Langenhoven).

Innovative Growing Systems highlighted cutting-edge approaches to sustainable production. Miranda Purcell showcased the performance of Mars and Canadice grape varieties under high tunnel conditions, demonstrating how protected cultivation can decrease time to production while increasing yields. Barrett Wilson's hydroponic shipping container farm demonstration introduced attendees to controlled-environment agriculture using Freight Farms technology.

Sustainable Agriculture Research sessions featured ongoing projects exploring innovative farming approaches. Moriah Bilenky and Keirstyn Amponsah presented preliminary results from research evaluating sunn hemp as a cover crop for no-till garlic production, highlighting the crop's potential for weed suppression and nitrogen provisioning. A companion presentation by Moriah Bilenky, Jose Cabezas, and Hannah Robalino explored Integrated Crop Livestock Systems, specifically examining how goats can be used to prepare vegetable beds compared to traditional tarping or tilling methods.

Practical Solutions and Farm Hacks rounded out the programming with Jane Pickey and Student Farm interns sharing innovative solutions designed to enhance productivity, efficiency, and sustainability on small-scale operations.

Research-Based Impact

"This field day creates a vibrant hub where small farm operators and urban growers from across Indiana converge," said Petrus Langenhoven, Purdue Student Farm director. "We've consistently seen participants implement specific techniques learned here to enhance their own farms and urban gardens. Often, it's the nuanced practices that dramatically transform the productivity and sustainability of small-scale agricultural operations."

The event's success demonstrates the strong demand for research-based, practical education among Indiana's small-scale farming community. Attendees included market gardeners, commercial growers, agricultural educators, and beginning farmers, all seeking evidence-based solutions to common production challenges.

Looking Forward

The enthusiasm shown by attendees, despite challenging weather conditions, underscores the value of hands-on agricultural education and the importance of connecting research with practical application. The Purdue Student Farm remains a vital resource for Indiana's small-scale farming community, bridging the gap between university research and real-world agricultural challenges. We hope to see you in 2026!

For more information about Purdue Extension's small farm programming and upcoming educational opportunities, visit the Purdue Extension website or contact your local Extension office.

Shape the Conversation: Submit Your Topics for Indiana's 2026 Horticulture and Small Farm Conferences

(Laura Ingwell, lingwell@purdue.edu, (765) 494-6167)

Submit your content ideas for the 2026 Indiana Horticulture and Small Farm Conference.

Do you want to hear from someone in particular or about a specific topic at this year's newly combined conference? If so, please scan the QR code or follow the link below to submit your suggestions. The survey will be open until July 15, 2025.

https://purdue.ca1.qualtrics.com/jfe/form/SV_23Mes7vXu2xqtcG

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