

# VEGETABLE CROPS HOTLINE

*A newsletter for commercial vegetable growers prepared by the Purdue University Cooperative Extension Service.*

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## From the Editor's Desk

(Petrus Langenhoven, [plangenh@purdue.edu](mailto:plangenh@purdue.edu), (765) 496-7955)

Welcome to the [Vegetable Crops Hotline](#) (VCH), Purdue Extension's exclusive newsletter for people in the business of growing vegetables.

## What's new in 2024?

1. The VCH will publish seventeen newsletter issues in 2024.
2. The publication day has been moved to Friday (it was on Thursday in the past). The decision was made to accommodate articles from the Midwest Regional Climate Center. Updates on national weather trends occur on Thursdays.
3. We are introducing a '**Featured Article**' this year. Most issues have a featured article.
4. We are also introducing a '**Spotlight**' article. The Meyers (Horticulture and Landscape Architecture) and Ingwell (Entomology) labs have agreed to write articles highlighting specific weeds and insects. 'Spotlight' articles will be published between 3/15 and 8/23.
5. We are introducing a '**Timeless Articles**' section where articles of importance from past publications will be listed.
6. We do have a '**Special Issue**' on 3/15. In this issue, I would like to highlight all spring and summer events. Authors may still submit other articles for this issue.
7. The VCH publication schedule is available online at <https://vegcropshotline.org/schedule/>

## What remains the same in 2024?

1. Each issue will have the following standard articles
  - From the Editors Desk
  - Midwestern Regional Climate Center weather prediction
  - Vegetable Extension Group Corner
  - USDA and SARE News (if any)
2. New subscribers can do it online at <https://vegcropshotline.org/subscribe/>. Educators can download the hard-copy subscription form at [https://vegcropshotline.org/wp-content/uploads/2024/02/VCH-SubForm\\_2024.pdf](https://vegcropshotline.org/wp-content/uploads/2024/02/VCH-SubForm_2024.pdf).

## Subscription Information

### Hard Copy Subscribers

A hard copy of the first 2024 issue is sent to all who subscribed to VCH via US-mail in 2023 and all new subscribers for 2024. To continue receiving future copies through US-mail, 2023 subscribers must renew their Hotline subscriptions using the form attached to this issue. Don't know which year you subscribed for? Check the envelope you receive this newsletter in. The year that your subscription is paid through is at the bottom right-hand corner of your envelope.

### Digital Subscribers

There is no need for any action if you receive the newsletter through email. You will continue to receive the newsletter on the issue date. In addition, you will receive emails with information about articles or announcements that need your immediate attention. These articles will be posted under Hot Topics on the VCH webpage and will be included in the next issue. All previous articles published in the VCH newsletter are available on the VCH website (<https://vegcropshotline.org/>).

## Website Links

Frequently, we include links to websites or publications available online. If you can't access these resources, don't hesitate to contact your local Extension office or us to request a hard copy of the information.

## Midwest Vegetable Production Guide

The Midwest Vegetable Production guide is now available for growers to visit online at [mwveguide.org](http://mwveguide.org), or you can download

and print a guide from your computer at [mwveguide.org/guide](http://mwveguide.org/guide).

## Timeless Articles

Farmer Retirement: An Elusive Concept?

<https://vegcropshotline.org/article/farmer-retirement-an-elusive-concept/>

Death, Divorce, and Disability: How Can Your Farm Plan for Human Resource Risk?

<https://vegcropshotline.org/article/death-divorce-and-disability-how-can-your-farm-plan-for-human-resource-risk/>

Adapting and Planning for Farm Businesses in Uncertain Times

<https://vegcropshotline.org/article/adapting-and-planning-for-farm-businesses-in-uncertain-times/>

Community Supported Agriculture (CSA): Top six recommendations for your farm market

<https://vegcropshotline.org/article/community-supported-agriculture-csa-top-six-recommendations-for-your-farm-market/>

Start Your Season off Right with Pest-free Transplants

<https://vegcropshotline.org/article/start-your-season-off-right-with-pest-free-transplants/>

The Purdue Plant and Pest Diagnostic Lab – Ready to Serve You

<https://vegcropshotline.org/article/the-purdue-plant-and-pest-diagnostic-lab-ready-to-serve-you/>

Do not hesitate to contact me at [plangenh@purdue.edu](mailto:plangenh@purdue.edu) if you have any questions or suggestions to improve the newsletter. Let me know if there are specific topics you would like to see more of in the newsletter. Also, let us know if things are not working for you. We want to improve the newsletter, and your input is valuable.

We hope you enjoy the newsletter and have a happy and productive season in 2024.

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## Planning for Successful Vegetable Transplant Production

*(Liz Maynard, [emaynard@purdue.edu](mailto:emaynard@purdue.edu), (219) 548-3674)*

### Featured Article

Many Indiana vegetable crops begin life as transplants. If lack of nutrients, lack of light, disease, or other problems slow growth during this stage, it may reduce establishment success and/or growth and yield in the field or high tunnel. Good management of the following factors should lead to healthy transplants (Figure 1).



Figure 1. Cabbage seedlings.

### Time

Don't seed transplants too early. Overgrown transplants are difficult to manage. If they get so root-bound and shaded by other plants in the same flat that growth stops, it will take them longer to resume growth in the field. They may become weakened and more susceptible to disease in the transplant tray and field. The ideal time depends on the crop and cell size, as well as the growing temperature. For ease of transplanting, the finished transplant should have a well-developed root system that holds the root ball together, a sturdy stem, and be of a size that minimizes injury during the transplant process.

Typical growing times are:

- Cucumbers, 2-3 weeks
- Squash and watermelon, 3-4 weeks
- Cantaloupe, 4-5 weeks
- Lettuce, 4 weeks
- Cole crops, tomato, and pepper, 5-7 weeks
- Onions, 10-12 weeks.

### Cell size

Vegetables are commonly grown in trays with cell diameters of 1/2 inch to 2 inches and sometimes in pots up to 4 inches. Larger cells or pots usually lead to greater early yield in fruiting crops like tomatoes, peppers, and muskmelons. Larger cells are also easier to manage because the greater soil volume holds more water and nutrients. The ideal cell size for a particular operation will depend on space available for transplant production, transplant tools or equipment used, crop harvest schedule, and management available for transplant production.

### Growing media

Growing media should be free of plant diseases, have pH in the desired range, and have enough pore space to allow good drainage and aeration. A laboratory test of the media for pH, electrical conductivity, and major nutrients is useful to avoid any unexpected problems, whether the media is purchased or made on the farm. Many commercial labs have a test package



specifically for greenhouse media. Take care when flats are filled to avoid packing media into cells because that will reduce the pore space.

## Temperature

Maintaining temperature in the growing medium at the optimum for germination means seeds will germinate and emerge quickly, reducing the chance that pathogens will kill the germinating plant. A heat source under plug trays (Figure 2) or a germination chamber that provides both humidity and optimal temperature can promote rapid and uniform germination. During production, air and growing medium temperature can be used to control the speed of crop development, with faster development at higher temperatures up to the optimum for the crop. Avoid chilling temperatures (below 45-50°F) for warm-season crops. Be aware that cold irrigation water reduces the temperature of the growing media and may chill sensitive crops.



Figure 2. Heat underneath plug trays.

## Light

Once seeds have emerged, the brightness and duration of light directly influence how quickly the plants develop. Light provides energy to the plant to create the building blocks needed for the plant structure and biochemical machinery. With low light levels, seedlings will develop new leaves slowly, root development will be poor, stems will be thin, and plants will get tall and spindly, or 'stretch.' In a greenhouse, natural light can be maximized by eliminating shade-producing objects in and outside the greenhouse, painting surfaces white to reflect light, minimizing condensation on the glazing, and orienting the roof or sidewall of the house perpendicular to the sun's rays. In a growth room, artificial light sources that provide photosynthetically active light (wavelengths between 400 and 700 nanometers) may be used. A solid bank of cool white fluorescent lights provides an inexpensive light source for transplant production (Figure 3). Lights should be placed as close to the seedlings as possible without injuring them to maximize the light they receive. Artificial light may also be used in a greenhouse but may not be a worthwhile investment for vegetable transplant production.

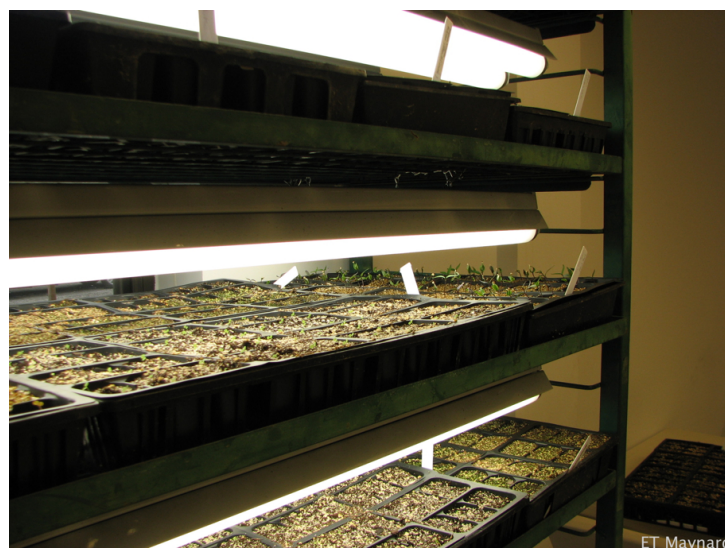


Figure 3. Fluorescent lights for transplants.

## Water

An annual laboratory test of irrigation water is recommended to document alkalinity, electrical conductivity, pH, and mineral content. Well water characteristics can change yearly, and this information is useful when troubleshooting a production problem or planning a fertilization program. A separate test for microbial quality is also needed for food safety purposes. Watering seedlings is a critical aspect of production. Watering too frequently reduces air available to plant roots and promotes a weak root system. Infrequent watering that leads to crop wilting will over-stress plants, leading to long-term growth reduction. Also, when growing media gets too dry, fertilizer salts can become concentrated enough so that roots are injured and become more susceptible to diseases like pythium root rot. Transplant growth can be managed by judicious watering: keeping plants on the dry side will keep growth in check. Uneven distribution of water translates quickly into uneven growth of transplants. The person in charge of watering should understand the importance of the job, know how to determine when irrigation is needed, and use the proper technique when hand watering to evenly supply water. If an automated system is used, check it for even distribution and plan for touch-up watering in areas that dry out more quickly.

## Mineral nutrition

The need for fertilization during transplant production depends largely on the nutrient content in the growing media and how long it takes to produce the transplant. In addition, judicious restriction of nutrients, particularly nitrogen and phosphorus, can be used to manage transplant growth. The media soil test recommended above (item 3) will provide information about what nutrients are in the media. Most commercial peat-based or other soilless growing media designed for transplants contain a small amount of 'starter fertilizer' to supply nitrogen (N), phosphorus (P), and potassium (K). Seedlings grown for more than two or three weeks in this media will usually benefit from additional nutrients. Growing media that contains a significant amount of compost may have enough nutrients that no more fertilization is needed

during production. A transplant production system should include a plan to supply mineral nutrients that consider nutrients supplied by the growing media and water.

**A version of this article was previously published in the Vegetable Crops Hotline Newsletter.**

Planning for Successful Vegetable Transplant Production  
<https://vegcropshotline.org/article/planning-for-successful-vegetable-transplant-production/>

## Consider Reading These Articles

The following articles include updated information about growing media selection and the management of fertility.

How Do Growing Media for Organic Production Compare?  
<https://vegcropshotline.org/article/how-do-growing-media-for-organic-production-compare/>

Vegetable Transplant Care Translates into Early Yield Differences  
<https://vegcropshotline.org/article/vegetable-transplant-care-translates-into-early-yield-differences/>

Abnormal Transplant Symptoms Might be Caused by Poor Media  
<https://vegcropshotline.org/article/abnormal-transplant-symptoms-might-be-caused-by-poor-medium/>

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## Vegetable Pathologist Candidate Seminars

(Petrus Langenhoven, [plangenh@purdue.edu](mailto:plangenh@purdue.edu), (765) 496-7955)

A search committee appointed by the Department of Botany and Plant Pathology has identified three candidates who will be interviewed for the Clinical Vegetable Pathologist position at SWPAC, Vincennes.

### Interview Schedule

**Jane Marian Luis**, Department of Horticulture and Landscape Architecture, Purdue University

- Research seminar: Monday, March 11, 9:30 am  
– <https://purdue-edu.zoom.us/j/92753733795>
- Extension seminar: Monday, March 11, 1:30 pm  
– <https://purdue-edu.zoom.us/j/97394202587>

**MD Ziaur Rahman Bhuiyan**, North Carolina State University

- Research seminar: Wednesday, March 13, 9:30 am  
– <https://purdue-edu.zoom.us/j/93983117893>
- Extension seminar: Wednesday, March 13, 1:30 pm  
– <https://purdue-edu.zoom.us/j/92155185070>

**Cesar Escalante Guardado**, Auburn University

- Research seminar: Monday, March 25, 9:00 am  
– <https://purdue-edu.zoom.us/j/91308000590>
- Extension seminar: Monday, March 25, 1:00 pm –  
<https://purdue-edu.zoom.us/j/96018157320>

## Meet Candidates In Person at SWPAC

There will also be the opportunity to meet the candidates in

person at the Southwest Purdue Ag Center. **Lunch will be provided, and RSVPs are appreciated.**

Contact Barb Joyner at (812) 886-0198 or email her at [joynerb@purdue.edu](mailto:joynerb@purdue.edu)

## Schedule

**Jane Marian Luis**, Department of Horticulture and Landscape Architecture, Purdue University

- Tuesday, March 12, at 11:30 am in the SWPAC meeting room

**MD Ziaur Rahman Bhuiyan**, North Carolina State University

- Thursday, March 14 at 11:30 am in the SWPAC meeting room

**Cesar Escalante Guardado**, Auburn University

- Tuesday, March 26 at 11:30 am in the SWPAC meeting room

We hope you can make either a Zoom meeting or attend the meetings here at SWPAC. Your input is essential.

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## Insect Traps as a Monitoring Tool

(Laura Ingwell, [lingwell@purdue.edu](mailto:lingwell@purdue.edu), (765) 494-6167)

There are many traps available to help with monitoring insect populations. As you prepare for the 2024 growing season, I wanted to review some of them in case you want to implement trapping on your farm to help improve your pest management programs.

## Trap Design

Traps come in a variety of shapes, sizes, and colors. Much research has gone into the design, taking advantage of the behaviors of each insect that the trap is created to capture. Some insects are attracted to specific colors, others various shapes, and some move in a predictable manner in response to certain stimuli. For example, pests like aphids, thrips, and whiteflies are attracted to the color yellow, hence the reason why many sticky cards are yellow. Pollinators are also attracted to yellow because of the occurrence of this color in plant flowers. Therefore, you can unintentionally catch pollinators in yellow traps. Broadly, moths fly in an upward direction when they encounter stimuli or navigate based on the moonlight. Therefore, cone-shaped traps are often used to collect moths. In orchards, red balls coated in pheromones and a sticky substance are used to monitor pests that attack developing fruits; the trap mimics the shape and color of the fruit. The three main trap types used to monitor vegetable insects include bucket traps (Figure 1), delta traps (Figure 2), and cone traps (Figure 3).





Figure 1. Bucket-style trap (Photo by Laura Ingwell).

The bucket-style trap comes in various colors and holds a pheromone lure in the basket below the lid. Insects fall inside the bucket and can not get out. A kill strip is often placed inside the bucket, but this can be omitted or replaced with soapy water if you are an organic grower.



Figure 2. Delta trap (Photo from Gemplers.com).

This trap is coated on the inside with a sticky substance that traps the insect to the surface. A pheromone lure is often placed on the sticky surface inside the trap, and the trap is suspended in the crop canopy. The trap is often white but can come in other colors depending on the target insect.



Figure 3. Cone trap (Photo by John Obermeyer).

The trap pictured above is called a Hartstack trap. Another version of a cone trap can be seen below. The pheromone lure is attached at the wide base of the cone. A collection chamber at the top of the trap can be removed and emptied.

The benefits of trapping are numerous. Depending on the pest-crop complex, traps can be used to monitor the emergence of a pest population so that you may alter your planting, usually after the emergence, to avoid damage to young seedlings/transplants. Traps can also be used to time the application of pesticides or the release of natural enemies. By using traps as a monitoring tool, you can detect when a pest population is active on the landscape and present in your crop. It is the best practice to monitor a trap first, then when the pest is detected, scout the crop to confirm its presence. You can then make applications of pesticides or release natural enemies at a time to get the most bang for your buck. Below, I will provide a few examples of pest insects and traps that are available to integrate into your IPM program.

## Corn earworm

The corn earworm, *Helicoverpa zea*, is a common pest of sweet corn. To monitor this pest, we pair a cone-shaped trap with a pheromone lure that smells like the female moth. When male moths are present on the landscape and looking for a mate, they fly around 'sniffing' the air for a female. The trap is designed to capture males, which we can use to indicate that the population is present in the crop and looking to mate and lay eggs. It is the egg laying on the silk of the developing corn that causes the damage. Therefore, we can monitor the stage of the crop (i.e., is silk present) and the population of the moths (how many we catch in our traps) to time insecticide applications more effectively. There is a statewide trapping network established for this pest, which can be found here:

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

You can use the trapping location nearest your farm to monitor the population or erect a trap on your farm. Spray applications should consider three factors:

1. Trap catches.
2. Presence of silk in the crop.
3. Stage of surrounding field corn.

More information can be found on the website above.



Figure 4. Corn earworm adult (left) that will be captured in the trap and larvae (right) which cause damage to the crop (Photos by John Obermeyer).



Figure 5. Scentry Heliopsis trap for squash vine borer trap (Photo by Alan Eaton, University of New Hampshire).

## Squash vine borer

The clearwing moth, *Melittia cucurbitae*, can be devastating in cucurbit production, especially in urban production systems. This moth typically has two generations per year in our region. The damage they inflict on the crop occurs when the females deposit their eggs at the base of the crop. The eggs hatch and the caterpillars bore into the stem. The most effective way to manage this pest is to target insecticide applications at the time of egg hatch so that the larvae consume a lethal dose as they take their first few bites before boring into the stem. The best way to monitor this is to use a pheromone-baited trap, much like the abovementioned CEW. Again, we have a lure that smells like the female moths. When the adult males are present on the landscape and looking for a mate, they can be lured into a trap using the scent of the female. You can time your pesticide application to a few days after you begin catching adult male moths, ensuring good coverage at the base of the plant. For this pest there is also a statewide trapping network established, which can be found here:

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

This year, we will be using a delta trap and, through a collaboration with the Great Lakes Urban Ag IPM Working group, expand our trapping network across the Midwest. We will use sticky traps to ease reporting. However, a better design is a cone trap that can also be used for corn earworms (Figure 5). There are other species of clear-winged moths that you may catch in the traps, including peach tree borer and grape root borer. Specific pheromones for these species are available, but sometimes they can be attracted to the smell of their relatives (i.e., other clearwing moths).



Figure 6. Squash vine borer adult that will be captured in the trap (Photo by John Obermeyer).

## Tomato pinworm

This is a 'new' pest (Figure 7) in Indiana and is becoming a problem, specifically in tomatoes cultivated in high tunnels. This microlepidopteran pest is problematic because the adults are very small and difficult to detect, and the larvae are leaf miners or fruit borers, meaning they are protected within the plant tissue for much of their lifecycle. You can purchase tomato pinworm lures that are placed inside a delta trap to monitor this pest in your crop. Place them around the perimeter and check weekly. If you detect adult moths, then scout the crop, beginning with the leaves and stems, to look for damage. If you are interested in joining a state-wide monitoring network for this pest in 2024, please contact me directly.



Figure 7. Tomato pinworm adult that will be captured in the traps (left; photo by GNORLY) and larvae damaging the plant (right; photo by Dan Egel).

There are a variety of other traps available for monitoring specific pests, many of which are common for orchard crops. If you have a particular pest on your farm that you struggle to detect or manage, I recommend you look into options that are available for pheromone trapping/monitoring.



## FAQs

Will pheromone-baited traps lure a pest into my crop, making it more of a problem?

No, in most instances, these traps only work within a few feet of the monitoring station and, therefore, will only pull in local populations. That is, those that are already on your farm and foraging for a suitable crop. The only exception is Japanese beetles. I DO NOT recommend using these traps. This pest is so widespread and mobile we do see that placing a trap on your farm/in your yard can increase the pest pressure, pulling in your neighbor's beetles. They are great for research when we need to catch hundreds, but they are not recommended as a management/monitoring tool.

How often should I check my trap?

I recommend checking twice a week, if possible, especially when your crop is in a vulnerable stage (seedling emergence or after transplant, or silking for corn production). Empty/replace the traps as you begin to catch the pest. This will make it easier for you to distinguish new catches from old.

How often do I have to change the lure?

This depends on the lure and the manufacturer, but it is an important detail to pay attention to. If the lure is in the field beyond the recommended time, the scent declines, and it is no longer effectively pulling in the target pest.

Where do I get trapping supplies?

There are a variety of suppliers, so check with whom you have already purchased your pest management tools from. If you are looking for others, check out Great Lakes IPM, Gemplers, or other agricultural supply retailers.

If you are interested in participating in any of the state-wide trapping networks or would like to see a new pest added, please email me at [lingwell@purdue.edu](mailto:lingwell@purdue.edu) or call (765)494-6167.

**A version of this article was previously published in the Vegetable Crops Hotline Newsletter.**

Insect Traps as a Monitoring Tool

<https://vegcropshotline.org/article/insects-traps-as-a-monitoring-tool/>

## Consider Reading These Related Articles

Looking for Squash Vine Borer (SVB) Trapping Collaborators

<https://vegcropshotline.org/article/looking-for-squash-vine-borer-svb-trapping-collaborators/>

Presence of Tomato Pinworm on High Tunnel Tomato in Indiana

<https://vegcropshotline.org/article/presence-of-tomato-pinworm-on-high-tunnel-tomato-in-indiana/>

Pheromones and Pheromone Traps

<https://vegcropshotline.org/article/pheromones-and-pheromone-traps-4/>

DIY Traps for Cucumber Beetle Management

<https://vegcropshotline.org/article/diy-traps-for-striped-cucumber-beetle-management/>

## Farmer Retirement: An Elusive Concept?

(Renee Wiatt, [reneewiatt@purdue.edu](mailto:reneewiatt@purdue.edu))

It is something that those who work with farmers hear frequently: "I'll never retire!" or "I do have a retirement plan; to die in the tractor!". While those statements may seem humorous on the surface, they give insight to a deep-seated issue among farmers. Many farmers are simply disinclined to retire. In a recent survey (1) of farmers in the North Central Region (NCR) of the United States, only 37% of farmers were mentally ready to retire. That leaves 63% of farmers who are not mentally prepared to retire from the farm.

Even though Baby Boomer business owners are retiring in record numbers, farmers and farm households are not prepared for succession. The average age of the American farmer as of 2017 was 57.5 years of age (2). According to research, farmers and other entrepreneurs are working past pension age (3). It does not seem to be the strategic and financial tasks that are difficult to pass to the next generation; it is the social capital related to farming in one's community that comes as the largest loss (3).

Ideally, farmers will spend time planning early and often to pass the farm to the next generation (both management and ownership). It is imperative that all generations reach consensus in regard to expectations, business goals, everyone's role in the farm, and a timeline for the succession process. Without reaching a consensus (or close to one), the succession process will undoubtedly be more costly and timely than expected.



The 2023 Farm Succession Survey did find an inverted relationship between farmer age and the number of years until they expect to retire, which is encouraging. However, of those farmers who answered they would "never" retire, their average age was 35 years. Furthermore, those farmers who predicted 1-5 years until retirement were, on average, already of retirement age (63.74 years).

Farmers must grapple with both mental and financial readiness to let go of the family farm to the next generation. The data (1) showed that of farmers surveyed in the NCR, there were 37.3%

who were mentally ready to exit the business, and 54.2% were financially ready to exit the business. Measuring overlap, 36.8% of farmers were both financially and mentally ready to exit the business (presumably retire). One fact that stands out among this data is that financial readiness is leading mental readiness. There is an emotional component of the family farm that makes exiting the business more difficult than other businesses. The legacy of the farm, along with the community and family ties, make this exit difficult and thus delayed.

So, what can farmers do to better prepare for retirement?

- Plan early.
- Plan often.
- Communicate with all generations in the farm.
- Strive for consensus and “getting everyone on the same page.”
- Make firm plans but revisit and adjust as needed.

If you are looking for a resource to help start talking about succession in your farm business, check out “The Farm’s Legacy: A Guidebook for Intra-Family Succession”, available for free downloading and printing here:

[https://edustore.purdue.edu/item.asp?Item\\_Number=EC-817-W](https://edustore.purdue.edu/item.asp?Item_Number=EC-817-W). If you are interested in receiving the Purdue Institute for Family Business Newsletter, you can subscribe [here](#)!

If you want to read more articles about succession, the following are available from the PIFB 2024 Newsletter 1:

- [Tax Acts of 2012 and 2017 Were Game Changers, and Portability Is Crucial! By Polly Dobbs](#)
- [Starting an Estate Plan by Jenna Nees](#)
- [Linking Business Income to Family Support, Time Spent Together, and Flexibility in the Family Business by William Walls](#)

## References:

1. Wiatt, R., Marshall, M.I., and Langemeier, M.I. (2023). 2023 Farm Succession Survey.
2. National Agricultural Statistics Service, 2017.
3. Contzen, S., Zbinden, K., Neuenschwander, C., and Métrailler, M. (2016). Retirement as a Discrete Life-State of Farming Men and Women Biography? *Sociologia Ruralis*, 57 (S1).  
<https://onlinelibrary.wiley.com/doi/10.1111/soru.12154>

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## About

The Purdue Institute for Family Business (PIFB) is an integrated research, outreach, and teaching program. It offers educational programs that address the major competencies needed for effective family business ownership and management. The goal of the initiative is to prepare family business stakeholders—strategically, financially, and emotionally—for the significant and sometimes unpredictable transitions and decisions that must be made, which determine the success and continuity of the family business.

PIFB provides multi-generational family businesses with research-based business management resources aimed at improving personal leadership performance and driving operational growth. Our ambition is to prepare family business owners, managers, and stakeholders (including non-owner spouses and future owners) to be effective stewards of their family enterprises.

Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the authors and do not necessarily reflect the views of Purdue University or other funders.

## Contacts

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## What Does the 2022 Ag Census Show About Indiana Vegetable Production?

(Liz Maynard, [emaynard@purdue.edu](mailto:emaynard@purdue.edu), (219) 548-3674)

The USDA 2022 Ag Census was released on February 13, 2024. What does it say about vegetable production in Indiana?

The number of farms growing vegetables for sale is 1,456, just 1.9% more than reported in the 2017 census. The acreage of vegetables harvested for sale is 38,483, a decrease of 4.1% from the 2017 census. Farms growing vegetables represent 2.7% of the total number of farms in Indiana, and vegetables are produced on about 1/4 of 1% of Indiana farm acreage.

Vegetable crops with more than 500 harvested acres reported in the census include processing tomatoes, with 7,086 acres, followed by pumpkins, watermelon, processing potatoes, sweet corn, snap beans, fresh market tomatoes, cantaloupe, fresh market potatoes, and squash (summer and winter) (Figure 1).



Institute for Family Business



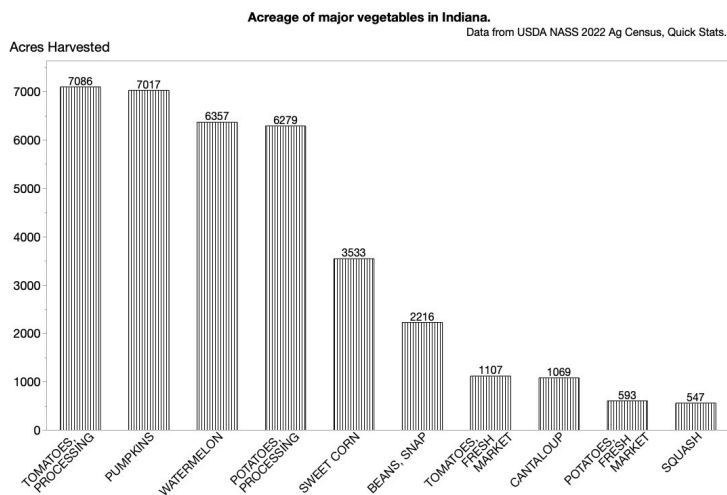


Figure. 1. Acreage of major vegetables in Indiana.

Forty-one other vegetable crops had at least 1 acre harvested in Indiana, according to the census (Figure 2). Gourds, asparagus, bell peppers, chile peppers, pickling, and fresh market cucumbers, cabbage, and onions, all were harvested from more than 100 acres. Garlic and lettuce were each harvested from about 70 acres. Eggplant was harvested from 34 acres, followed by cauliflower, kale, turnips, carrots, spinach, radishes, green onions, sweet potatoes, fresh herbs, collards, okra, mustard greens, rhubarb, beets, and Chinese cabbage, which were each harvested from at least 10 acres. Crops harvested from fewer than 10 acres included turnip greens, parsley, sugar and snow peas, Brussels sprouts, daikon radish, mustard cabbage, celery, escarole and endive, ginger root, horseradish, chicory, honeydew melons, and parsnips.

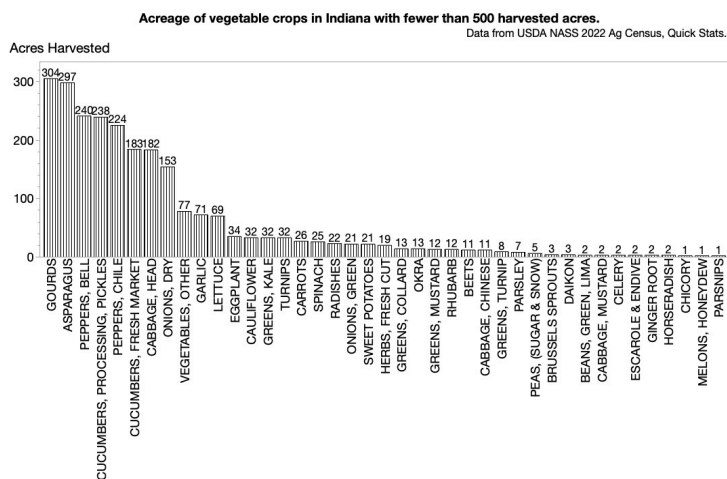


Figure. 2. Acreage of vegetable crops in Indiana with fewer than 500 harvested acres.

The census also reports the number of farms harvesting various vegetable crops. Tomatoes are grown in the open on 572 farms and pumpkins on 544 farms; more than a third of Indiana vegetable farms grow at least one of these crops (Figure 3). Sweet corn is harvested on 449 farms. Other crops harvested on at least 250 farms include snap beans, bell peppers, squash, cucumbers (either fresh market or processing), watermelon, and potatoes. Chile peppers are harvested on 241 farms, and other crops grown on at least 100 farms include lettuce, cantaloupe,

cabbage, dry onions, garlic, fresh herbs, kale, green onions, carrots, broccoli, eggplant, and asparagus. Spinach and radishes are each grown on just under 100 farms; other crops grown on between 50 and 100 farms include okra, gourds, beets, turnips, parsley, collard greens, sweet potatoes, and mustard greens. Crops grown on fewer than 50 farms include cauliflower, Chinese cabbage, turnip greens, sugar and snow peas, green peas, rhubarb, Brussels sprouts, horseradish, celery, daikon, lima beans, escarole and endive, mustard cabbage, parsnips, ginger root, honeydew melons, southern peas, and chicory.

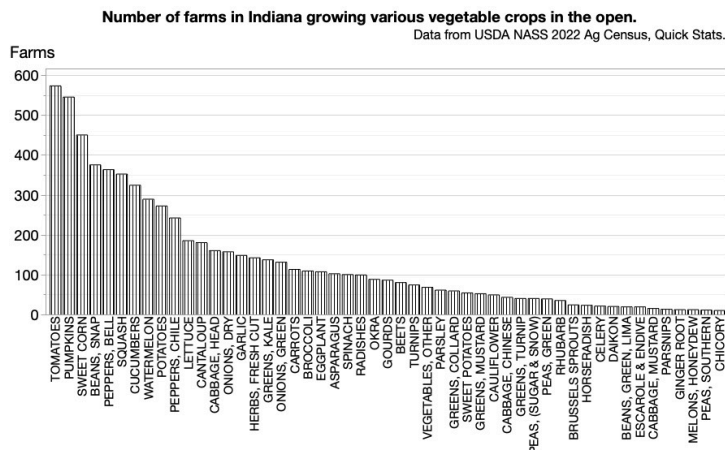


Figure. 3. Number of farms in Indiana growing various vegetable crops in the open.

In the census, crops grown in high tunnels or greenhouses are tabulated separately from crops grown in the open. For Indiana, the census reports 260 operations growing tomatoes under cover, with 1,083,199 square feet (24.9 acres) in production. The total area of vegetables under cover was 1,597,001 square feet (36.7 acres), managed by 298 operations.

In summary, the 2022 Ag Census shows Indiana's vegetable farm number (just under 1,500) and acreage (about 38,500) to be fairly stable over the last five years. Eight crops are produced on at least 500 acres each, and more than 40 more are produced on at least 1 acre total. More than 250 operations produce tomatoes under cover.

This just skims the surface of information available. The complete census for Indiana can be found at:

[https://www.nass.usda.gov/Publications/AgCensus/2022/Full\\_Report/Census\\_by\\_State/Indiana/index.php](https://www.nass.usda.gov/Publications/AgCensus/2022/Full_Report/Census_by_State/Indiana/index.php)

## Strawberry Agricultural Mulches Survey

(Wenjing Guan, [guan40@purdue.edu](mailto:guan40@purdue.edu), (812) 886-0198)

Attention Strawberry Growers.

A group of scientists are surveying growers' current practices and opinions about agricultural mulches in their strawberry fields. They hope that growers can share information about current practices and opinions about different types of agricultural mulches with the research team by completing a short online survey.

The survey is located here:

<https://opinion.wsu.edu/strawberries24>

Responses to this survey are voluntary, and your answers will be kept completely confidential. The survey is being conducted by Washington State University's Social and Economic Sciences Research Center and is certified exempt by the WSU IRB 20193-001. No individual or business will ever be identified in the results.

If you have any questions about why this survey is being done, about accessing the survey, or anything else related to the survey, please contact the SESRC at [strawberry.survey@wsu.edu](mailto:strawberry.survey@wsu.edu) or call them toll-free at 1-800-833-0867.

Thank you for considering our request, and we hope to hear from you soon.

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## North Central SARE Graduate Student Grant Program

(Lais McCartney, [lmccartn@purdue.edu](mailto:lmccartn@purdue.edu))

### Call for Proposals

Learn more about the North Central Sustainable Agriculture Research and Education Graduate Student Grant Program [here](#); awards can be up to \$20,000 for projects lasting up to 36 months. Applications are due by 4 pm Central on April 18, 2024. Indiana SARE State Coordinator Lais McCartney can read your grants and suggest edits if you give her enough turn-around time. You can contact Lais at [lmccartn@purdue.edu](mailto:lmccartn@purdue.edu) or text at 317-919-2691. The [SARE project database](#) shows the scope of grants awarded in the past 36 years for ideas and to build upon the research.



Figure 1. Students at the Purdue Student Farm (Photo by Tom Campbell).

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## Where to Find “Special” Indiana Pesticide Registrations

(Stephen Meyers, [slmeyers@purdue.edu](mailto:slmeyers@purdue.edu), (765) 496-6540)

Many of the pesticide products Indiana farmers use do not include specialty crops on the container's label. These uses are often

added through 24C Special Local Need (SLN) or supplemental labels, which can be challenging to locate. In response, the Office of the Indiana State Chemist created a “Pesticide Products-Special State Registrations” webpage with PDF files for each product. To access the webpage, click this address: [https://oisc.purdue.edu/pesticide/special\\_state\\_registrations.html](https://oisc.purdue.edu/pesticide/special_state_registrations.html) or scan this QR code:



This webpage includes all special registrations, from biological insecticides for hemp to insecticides for emerald ash borers to herbicides for use in various fruits, vegetables, and ornamentals. For example, the 24C label for Dual Magnum® herbicide expands its use in approximately 70 vegetable, fruit, herb, and ornamental crops. According to the Office of the Indiana State Chemist, the webpage will grow to include Section 18 (emergency exemption labels) and Experimental Use Permits (EUPs).

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## Enforcement of the Endangered Species Act

(Laura Ingwell, [lingwell@purdue.edu](mailto:lingwell@purdue.edu), (765) 494-6167)

As the EPA works to update pesticide labels to comply with the Endangered Species Act, we will work to keep you informed of the recent changes. However, it is in your best interest to visit databases often to be sure that you are in compliance with current pesticide laws. One such website to visit includes the [EPA Bulletins Live!](#) site.

One recent label change may impact some of our specialty crop growers in Indiana, particularly those of you residing in the northern portion of the state, with a few select geographies identified in southern regions. The active ingredient that has a new restriction is cyantraniliprole. This insecticide compound is from the group of diamides and is very efficacious at controlling various pests in fruit, vegetable, and nut crops. The trade names of products impacted by the label change include Benevia®, Exirel®, Mainspring®, and Minecto Pro®. Code CYN23 asserts that if you apply any of these products through aerial application, you need to refer to the bulletin to see changes related to droplet size, wind speed, wind direction, and appropriate buffer zones. We recognize that this may not impact many of our growers, but we wanted to bring your attention to the resources and will



continue to provide updates as we receive them.

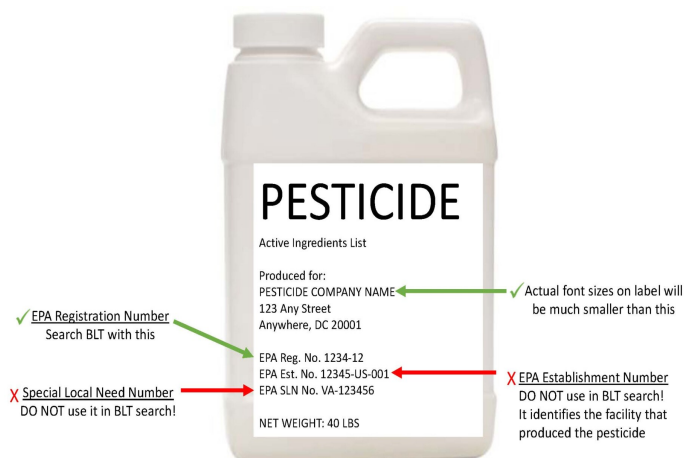


Figure 1. Reading a pesticide label (Photo by Christian Krupke).

## Winter: Where art thou?

(Jacob Dolinger, [jdolinge@purdue.edu](mailto:jdolinge@purdue.edu))

Hoosiers are hardy, but that wasn't a quality that was important this winter. Meteorological winter—December 1 to February 29—is drawing to a close, and it doesn't quite feel like it ever really happened. There was one notable cold weather outbreak in mid-January, but besides that, temperatures were generally at or above normal. Even when accounting for the January freeze, the month ended 0.1°F above normal. This comes on the heels of an incredibly warm December across the state, which was 7.4°F above normal and the 3rd warmest December on record. Overall, this has been a top 5 warmest winter for various locations across Indiana, including Fort Wayne, South Bend, Lafayette, Terre Haute, and Richmond.

We also saw that the warm temperatures meant that precipitation didn't always fall as snow. We've had some snow, but nothing jaw-dropping. As of writing, Lafayette 8 S has received 9.1 inches of snow since December 1 but should receive 20.3 inches in a normal season. In Indianapolis, where we've seen 8.1 inches of snow, the normal annual total is 25.5 inches. Down near Evansville, snowfall is below 50 percent of normal, and up through northeast Indiana as well (Figure 1).

Accumulated Snowfall: Percent of Mean  
December 1, 2023 to February 21, 2024

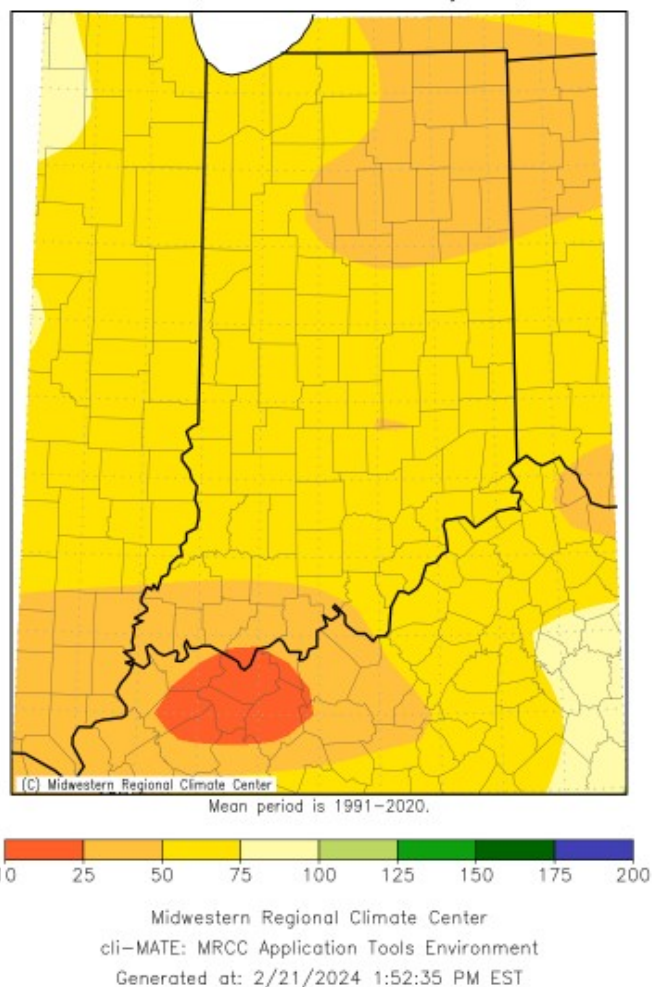


Figure 1. Accumulated snowfall: Percent of mean, December 2, 2023 to February 21, 2024.

If you're hoping for more snow, you may be disappointed. The National Weather Service's Climate Prediction Center (CPC) predicts a 60-70 percent chance of above-normal temperatures for much of northern Indiana and 50-60 percent moving south through the state. The monthly outlook for March has the eastern half of the state in only a slight chance for above-normal temperatures, but the longer-term three-month outlook has an even higher chance of above-normal temperatures through May (Figure 2).

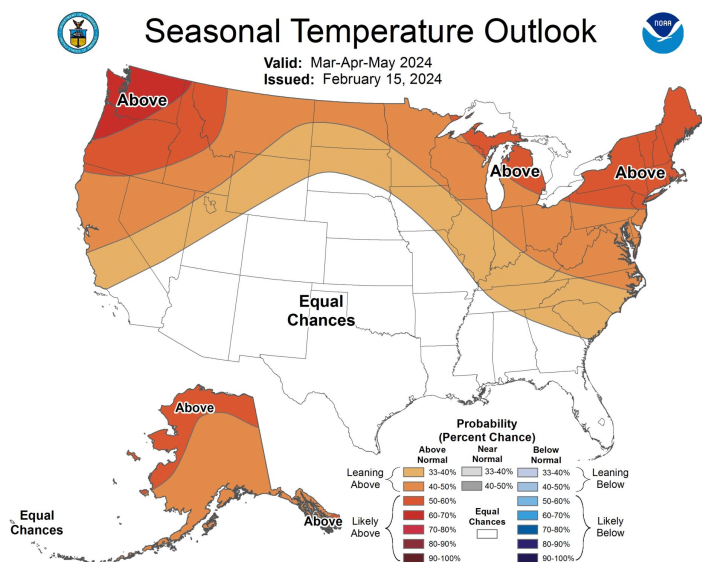


Figure 2. Seasonal temperature outlook, March, April and May 2024.

Don't put the snow boots away just yet, though. Historically, snow is not uncommon in March, and a good winter whiplash in April isn't unheard of either. South Bend saw 1 inch of snow on April 1, 2022, and in Fort Wayne, there was over 4 inches of snow on April 20, 2021.

## Selecting Vegetable Varieties for Your Farm

(Petrus Langenhoven, [plangenh@purdue.edu](mailto:plangenh@purdue.edu), (765) 496-7955)

Are you still thinking about varieties for the upcoming season? Purdue has been keeping a record of vegetable variety trials in the Midwest since 1999. *The Midwest Vegetable Trial Report* series includes reports of applied research relevant to vegetable and melon production in the Midwest. Here are some abstracts of the most recent reports. Visit the [Midwest Vegetable Trial Report](https://docs.lib.purdue.edu/mwvtr/) webpage (<https://docs.lib.purdue.edu/mwvtr/>) for more information.

[Colored Sweet Bell and Tapered Pepper Cultivar Evaluation for High Tunnel Production in West-Central Indiana, 2023](#), Petrus Langenhoven and Dennis Gustavo Toc Mo

Colored sweet bell-shaped and tapered pepper is a summer crop that is 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, we have evaluated thirty pepper varieties, and each variety is assessed in two production cycles. This paper reports on five sweet bell and five tapered pepper entries evaluated at the Purdue Student Farm, West Lafayette, Indiana.

[2023 Cantaloupe Cultivar Evaluation in Indiana](#), Wenjing Guan and Dennis Nowaskie

Traditionally, eastern-type cantaloupe is produced in Indiana. Longer shelf-life cultivars were developed and have been grown in Indiana. This report includes 11 cantaloupe cultivars, including some newly developed ones.

[2023 Personal-sized Seedless Watermelon Cultivar Evaluation in Indiana](#), Wenjing Guan and Dennis Nowaskie

Indiana ranks sixth in watermelon production in the U.S., following Florida, Georgia, Texas, California, and North Carolina in 2022. A total of 7,000 acres of watermelons were planted, with a production value of \$71 million (USDA, 2023). Watermelons grown in Indiana are primarily red flesh seedless, and around 10% are personal-sized seedless watermelons (6-8 lbs).

[2023 Seeded Watermelon Cultivar Evaluation in Indiana](#), Wenjing Guan and Dennis Nowaskie

Watermelons grown in Indiana are primarily red flesh seedless, and a small portion of personal-sized red flesh seedless. Seeded watermelons are typically not grown in large acreages, but they may be used as pollinizer plants for growing seedless watermelons. The 2023 seeded watermelon cultivar trial included 15 seeded watermelon cultivars.

[2023 Standard-sized Seedless Watermelon Cultivar Evaluation in Indiana](#), Wenjing Guan and Dennis Nowaskie

The annual watermelon cultivar evaluation trial is conducted at Southwest Purdue Agricultural Center (SWPAC), in Vincennes, Indiana. The trial evaluates yield, fruit quality, and overall plant performance of commercial watermelon cultivars and advanced breeding lines. The trial is financially supported by Purdue Extension and seed companies. The 2023 standard-sized triploid watermelon cultivar trial had 35 cultivars, including six with solid dark-green rind patterns and one with a solid light-green rind pattern.

[Chile pepper variety evaluation and profitability analysis at three farms in Minnesota and Wisconsin, 2022](#), Natalie Hoidal, Charlie Rohwer, Ryan Pesch, Rodrigo Cala, Javier García, Griselda Bernabe Suarez, and Fernando Alejandro García Loyo

Latino fresh market vegetable farmers in Minnesota and Wisconsin are interested in growing hot peppers for local markets, both for fresh and dried pepper sales. This variety trial is the third and final trial of a 3-year project. We trialed 14 varieties of peppers representing jalapeño, serrano, habanero, poblano, and "other" types. The varieties included the top varieties from 2020 and 2021, alongside new varieties. We measured yield, fruit size, and Scoville heat units. In addition to the variety trial, we conducted an enterprise analysis to determine the profitability of hot pepper production in the Upper Midwest.

[Evaluation of 11 Broccoli Cultivars for Summer Harvest in Southwest Michigan in 2023](#), Ben Phillips and Leah Freeman

A broccoli cultivar trial was planted at the Southwest Michigan Research and Extension Center (42.081985, -86.354087, Benton Harbor, Michigan). Bejo (BJ), Clifton (CL), Sakata (SK), and Tozer (TZ) seed companies donated 11 broccoli cultivars for plastic-mulch bedded hand harvest. The trial quality was good for collecting data on stressed plants. A dry start and cabbage



maggot attack reduced stand with replacement plants lagging behind, and heat around head formation created a high proportion of non-marketable heads.

#### [Evaluation of Five Cauliflower Cultivars for Summer Harvest in Southwest Michigan in 2023](#), Ben Phillips and Leah Freeman

A cauliflower cultivar trial was planted at the Southwest Michigan Research and Extension Center (42.081985, -86.354087, Benton Harbor, Michigan). Bejo (BJ), Clifton (CL), Sakata (SK), and Tozer (TZ) seed companies donated five cauliflower cultivars for plastic-mulch bedded hand harvest. The trial quality was good for collecting data on stressed plants. A dry start and cabbage maggot attack reduced stand with replacement plants lagging behind, and heat around head formation created a high proportion of non-marketable heads.

#### [Evaluation of 13 Round Tomato Cultivars in Southwest Michigan in 2023](#), Ben Phillips and Jenny Schoonmaker

A round tomato cultivar trial was planted at the Southwest Michigan Research and Extension Center (42.081985, -86.354087, Benton Harbor, Michigan). Bejo (BJ), Enza Zaden (EZ), Seminis (SM), Sakata (SK), and Seedway (SW) seed companies donated round tomato cultivars for plastic-mulch bedded and trellised hand harvest. Overall, trial quality was excellent despite a dry start that brought in insects and hard rains that flared bacterial diseases.

#### [Evaluation of 23 Pickling Cucumber Cultivars for Machine Harvest in Southwest Michigan in 2023](#), Ben Phillips and Jenny Schoonmaker

A pickling cucumber cultivar trial was planted at the Southwest Michigan Research and Extension Center (42.088261, -86.351980, Benton Harbor, Michigan). Bejo (BJ), Nunhems (NU), Rijk Zwaan

(RZ), and US AgriSeed (UA) seed companies donated parthenocarpic (seedless) cultivars for mechanical once-over harvest. Overall, trial quality was good despite a droughty start, though picking could have started sooner.

#### [Evaluation of Five Roma Tomato Cultivars in Southwest Michigan in 2023](#), Ben Phillips and Jenny Schoonmaker

A Roma tomato cultivar trial was planted at the Southwest Michigan Research and Extension Center (42.081985, -86.354087, Benton Harbor, Michigan). HM Claus (HM), PanAmerican (PA), and Sakata (SK) seed companies donated five Roma tomato cultivars for plastic-mulch bedded and trellised hand harvest. Overall, trial quality was excellent despite a dry start that brought in insects and hard rains that flared bacterial diseases.

#### [Evaluation of Six Slicing Cucumber Cultivars in Southwest Michigan in 2023](#), Ben Phillips and Jenny Schoonmaker

A slicing cucumber cultivar trial was planted at the Southwest Michigan Research and Extension Center (42.081985, -86.354087, Benton Harbor, Michigan). Clifton (CL), Seedway (SW), Seminis (SM), and Syngenta (SY) seed companies donated five slicing cucumber cultivars for plastic-mulch bedded hand harvest. The trial quality was OK, with a dry start that created an uneven stand and some deer browsing.

#### [Strawberry Production in an Elevated Bench Growing System inside a High Tunnel in Southern Indiana](#), Wenjing Guan, Dean Haseman, Laura Ingwell, Samantha Willden, and Dan Egel

The objective of this study is to evaluate the performance of eight strawberry cultivars grown in an elevated bench system. Yield and quality parameters were measured. This report also includes a discussion on production challenges and economic considerations of this production system.

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The Vegetable Crops Hotline newsletter provides the commercial vegetable grower with timely information about farm management, business planning, disease, insect and weed pests, fertility practices, post-harvest problems, pesticide label changes, meetings, and much more. Each year, the Hotline is published 12 times during the growing season (April - September), with an additional four issues in February, March, and October.

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