UConn Extension and Department of Plant Science and Landscape Architecture

CT IPM CROP TALK

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Use of tunnels or greenhouses allow for season extension, and when artificial heat and lights are added, they can be used for year-round production. Photo: Shuresh Ghimire

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EXTENSION & PLANT SCIENCE AND LANDSCAPE ARCHITECTURE

Building Resiliency: Climate Smart Adaptation for Fruit Growers

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Introduction

The 2023 growing season gave fruit growers a preview of what producing food in a rapidly changing climate could look like in the future. This year, the general trend of increasing temperatures was solidified and reflected in the USDA's recent adjustment to the state's Plant Hardiness Zones – gaining a new warmer 7b zone along our coastline and losing our coldest 5b zone in the northwestern region (USDA ARS, 2023) [Figure 1]. Coupled with extreme weather events such as the devastating May 18th frost and the unprecedented July rainfall, it's clear that thoughtful climate adaptation strategies will be essential as we move forward. Since mitigation efforts are as varied as the potential climate challenges, understanding the entire breadth of your options is the best place to start. Below are some climate-smart considerations aimed at increasing the resiliency of your fruit operation. It is by no means a complete presentation of climate-smart adaptations. Rather, they are the practices that will best assist any operation to endure the contemporary challenges of fruit production.

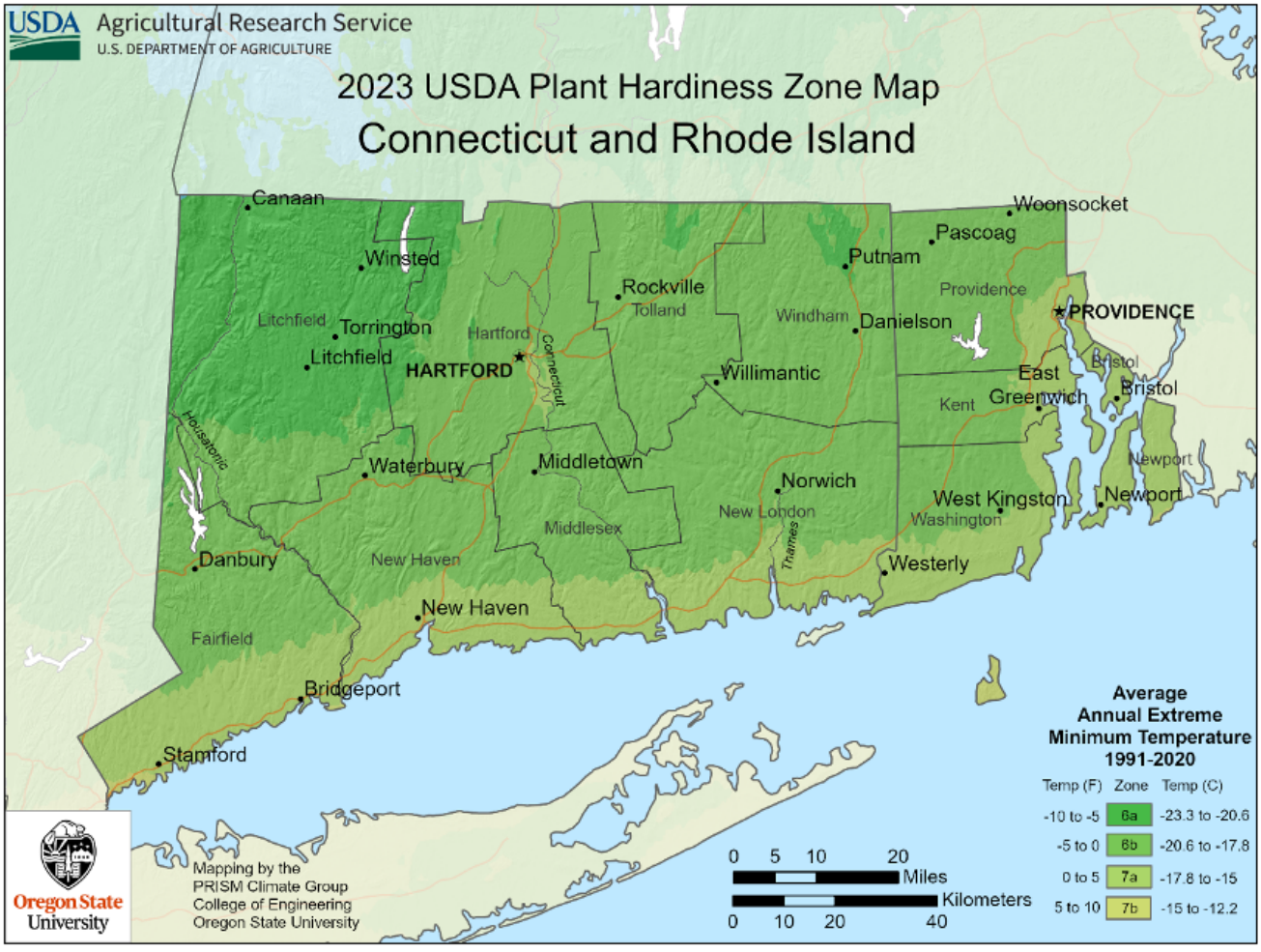

Figure 1 – 2023 USDA plant hardiness zones for Connecticut and Rhode Island (USDA ARS, 2023)

Site Selection

Site selection is the first, and arguably most important, preventative climate adaptation tactic as it relates to both profitability and sustainability (Bradshaw, N.D.). A land evaluation, prior to purchase or planting, offers the opportunity to explore a range of site variables and conditions. This can also be done when expanding a current operation to a site or even before putting a new field into production. Some major considerations are:

- Soil Drainage – This refers to the ability of a site to adequately drain excess water. Standing water causes a range of issues for fruit producers. Sites that are low-lying, very flat, or contain heavy, clay soils may prove to have poor soil drainage.
- Air Drainage – Similarly, a site's topography can affect the drainage of cold air, which tends to accumulate and linger in low or flat areas – termed frost pockets (Figure 2). A site with a gentle slope (4-8%) is ideal for fruit production, allowing cold air to drain away from plants and reducing the risk of injury.
- Soil Depth – Soil depth refers to the distance between the surface and any dense layer that might restrict the root growth of plants. This could include soil parent material, a hardpan, or the seasonal high-water table.
- Soil pH – Most fruit crops have different soil pH requirements. Blueberries prefer a very acidic pH of 4.8 while apples prefer 6.0-6.5. A simple soil test can help you make informed decisions about a site's pH.
- Annual Minimum Temperatures – Production can often be limited by the minimum temperature a site experiences in a year. Even cold hardy apples may be injured when temperatures go below -20°F. For *V. vinifera* grapes, winter temperatures below 0°F can cause winter injury (Fennell, 2004).
- Annual Growing Degree Days – Different fruit crops and varieties require different periods of time above a certain temperature to complete their life cycle and produce fully ripened fruit. This is measured using degree days (DD), which begin to accumulate at temperatures often above 50°F. Shorter-season varieties may be required at sites with insufficient DD accumulation.
- Slope & Orientation – In addition to air and water drainage, the slope and orientation of land can further influence fruit production by affecting the plant's access to sunlight. Special consideration should be given to sites on slopes, specifically the direction of their exposure to sunlight. A south facing slope will allow plants to intercept more light than one on a north facing slope.

Site Selection Resources:

- USDA NRCS Web Soil Survey: https://websoilsurvey.nrcs.usda.gov/app/
- NEWA – DD Calculation: https://newa.cornell.edu/
- SNAL: https://soiltesting.cahnr.uconn.edu/
- Land Evaluation Video: https://ctfarmrisk.extension.uconn.edu/farmeval/

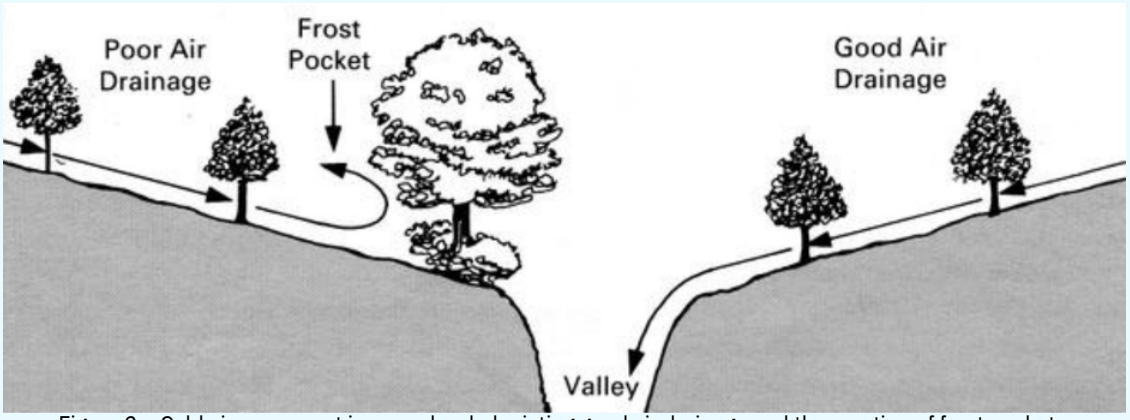

Figure 2 – Cold air movement in an orchard, depicting good air drainage and the creation of frost pockets (NCSU, 2016)

Varietal Selection

Just behind site selection in importance, the proper selection of plant material offers the next best defense against our rapidly changing climate. Plant breeders have been working for decades to develop fruit varieties well-adapted to a variety of abiotic and biotic stresses. Cold hardiness, pest resistance, and precocity are all parameters that affect a plant's ability to endure the challenges of unpredictable weather. This includes proper scion and rootstock selections.

- Precocity – A precocious variety is one that flowers and fruits early. Precocity is desirable for multiple reasons, mainly due to the fact that some sites might not have adequate growing degree days (DD) for fruit to fully develop and ripen. However, many growers may choose to grow early (or late) varieties to extend the window in which their consumers can access fresh local fruit. Additionally, late-season varieties face the challenge of accumulating late-season disease pressure and multiple generations of insect pests, requiring additional management and inputs late in the season.
- Cold Hardiness – If your site is revealed to have questionably low minimum annual temperatures, cold hardiness might be a trait you select for in your varieties. Frostbite™ apples developed by the University of Minnesota boast a cold hardiness of -30 to -35°F (Minnesota Hard, 2023). For wine grapes, cultivars have been extensively evaluated for varying degrees of cold injury (Zilia, 2023) [Figure 3]. This information should be used to inform varietal selections.
- Pest Resistance – Pest resistance is perhaps the most important group of improvements in our modern fruit varieties. Essential to practicing integrated pest management (IPM), resistant varieties offer growers the opportunity to avoid certain pest problems all together. The BlueJay variety of blueberries offers great disease resistance to Mummy Berry, one of our biggest blueberry diseases – providing resistance to both its primary and secondary disease cycles. Likewise, apple varieties Enterprise, Fuji, and Tsugaru have been revealed to be highly resistant to Fireblight (Kostick et al., 2019).

Date Sampled	Variety	Bud10 °F	Bud50 °F	Bud90 °F	PHL10 °F	XYL10 °F
11/20/2023	Cabernet Sauvignon	2.5	0.0	-2.0	11.5	-9.0
11/20/2023	Chardonnay	-6.0	-7.0	-9.0	8.5	-8.0
11/20/2023	Merlot	2.5	0.0	-2.5	10.0	-7.0
11/20/2023	Riesling	-1.5	-4.0	-7.0	9.0	-9.5
11/14/2023	Concord	-4.0	-7.5	-9.5	9.0	-15.0
11/14/2023	Syrah	2.5	-0.5	-2.5	11.5	-6.0
11/14/2023	Semillon	2.5	0.5	-1.5	11.5	-6.5
11/14/2023	Malbec	2.0	-1.5	-3.5	11.0	-5.0
11/2/2023	Pinot Gris	1.0	-0.5	-3.5	12.0	-3.5
11/2/2023	Pinot Noir	3.0	-1.0	-3.5	12.0	-5.0
11/2/2023	Sangiovese	7.0	4.0	2.5	16.0	-2.0
11/8/2023	Gewurztraminer	2.0	0.0	-1.5	12.5	-6.0
11/8/2023	Gruner Veltliner	2.0	0.5	-2.5	13.5	-5.5
11/8/2023	Chenin Blanc	2.5	-0.5	-2.0	14.0	-5.0
11/8/2023	Alvarinho	5.0	3.0	1.0	14.5	-2.0
11/9/2023	Zinfandel	6.0	3.0	0.5	11.5	-4.5
11/9/2023	Petit Verdot	4.5	2.0	0.0	13.0	-5.0
11/9/2023	Tempranillo	6.5	1.0	-3.5	10.5	-13.0
11/9/2023	Grenache	4.0	2.0	-2.0	13.0	-4.5
11/1/2023	Sauvignon Blanc	4.0	2.5	0.5	13.5	-3.5
11/1/2023	Aligote	-0.5	-2.0	-3.5	12.5	-3.5
11/1/2023	Mourvedre	7.0	6.0	4.0	16.5	0.5
11/1/2023	Nebbiolo	5.0	3.0	2.5	17.5	0.0
11/2/2023	Muscat Blanc	3.0	1.0	-1.5	16.0	-5.5
11/7/2023	Viognier	1.0	-0.5	-3.0	14.5	-4.0
11/7/2023	Cabernet Franc	3.5	0.0	-1.5	12.5	-5.0

Figure 3 – Critical temperatures for common wine grape cultivars causing various levels of damage [Bud10 – 10% bud kill, Bud50 – 50% bud kill, Bud90 – 90% bud kill, PHL10 – 10% phloem damage, XYL10 – 10% xylem damage] (Zilia, 2023)

There are multiple avenues for growers to ensure that they are making the proper plant materials selection. Nurseries often do a great job marketing the varieties that they offer, highlighting each's beneficial traits. The New England Management Guides (Small Fruit and Tree Fruit) also provide some great regional recommendations. Lastly, always consult with your local Extension educator if you have any questions not answered by the nurseries or existing literature.

Cultural Management

Good cultural management is an incredibly broad topic. It includes pest management, plant nutrition, and water management. Here, a snapshot of some of the most important cultural practices as they relate to climate change adaptation is presented. This is by no means a complete list but provides a sufficient place to begin for most fruit growers.

Integrated Pest Management (IPM)

Integrated pest management (IPM) is a holistic approach to managing pest – a systems approach that considers the entire growing season, the life cycles of both the crop and the pest, and one that is aimed at reducing the detriments of pest management, mainly environmental and economic impacts (Figure 4). IPM includes the above-mentioned site and plant material selection which offers a preventative approach to pest management. It is also heavily reliant on the use of scouting and trapping, allowing more-informed corrective action decisions to be made. Many IPM practices are simple cultural measures like dormant pruning to remove diseased wood, canopy thinning to increase airflow in the summer months, or mulching blueberries in the early spring to cover overwintering mummies. When it comes time to apply pesticides, it's important to consider each material's efficacy, recommended rates, and FRAC group. Materials should always be applied in rotation or with multiple FRAC groups in a single mix to avoid developing resistant pest populations. For more information on IPM, please visit the UConn Extension IPM Website: https://ipm.cahnr.uconn.edu/

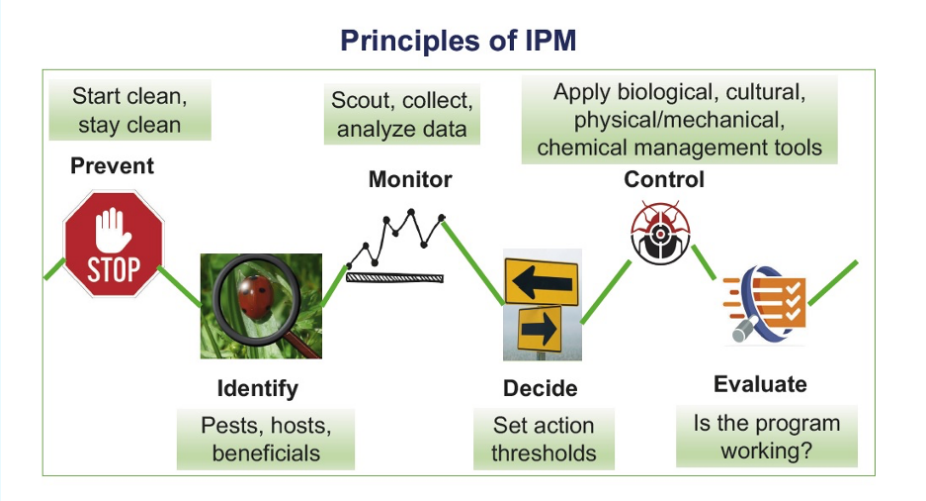

Figure 4 – Principles of IPM (UConn Extension, 2023)

Abiotic Stress Management

Anything that can be done to keep your plants happy is essential. There is a lot to be said about a plant's resilience when it has the proper environmental conditions to thrive. Maintaining this innate resilience is key when facing the unpredictability of climate change. Since there are plenty of environmental factors that cannot be controlled in an orchard or vineyard, it is important to focus on those that you can.

- Water Management – Managing water in a fruit operation can be challenging and is largely dependent on natural precipitation, opening the door to stress associated with both drought and/or flooding. Supplemental irrigation in the dry months and ensuring that excess water has a place to go in the wetter months will help to mitigate the variability in precipitation over time.
    - Drainage – Ideally, drainage would be a pre-plant consideration and would be in place prior to an issue arising. However, some growers may have noticed that over time, their site is much wetter than it used to be – the nature of a changing climate. In these cases, drainage can be readily installed in existing operations. Tile drains and curtain drains are the most common types of drainage installed in orchards, each with their own costs and benefits.

- Irrigation – Again, installing irrigation would ideally be a pre-plant consideration but can be installed after the fact. Even if you use the irrigation once every 5 years, it will still be worth the investment. There are multiple options for irrigation, including drip, trickle, and overhead irrigation. A water source should also be considered when selecting a site, whether you have access to a well for regular irritation or just a pond for emergencies.

- Soil Management – In addition to water, the soil environment is largely manageable and under your control. Parameters such as soil pH, nutrition, organic matter and cover all factor into climate change adaptation.
  - Soil Organic Matter (SOM) – Soil organic matter consists of plant residues and living microbial biomass, found in both active and stable forms termed detritus and humus respectively (Fenton et al., 2008). The benefits of maintain sufficient SOM levels are numerous and include:
    - Enhanced aggregate stability = leading to improved water infiltration, aeration, and reduced runoff/erosion
    - Improved water holding capacity = reduced water-logging, drought stress
    - Increased CEC = sustained access to nutrients
    - Increased buffering capacity = resists swings in soil pH
    - Accelerated decomposition = increasing availability of plant nutrients
    - Enhanced soil biodiversity = suppression of pests and diseases
    - Enhanced pore space = aeration, increased root growth
  - Cover – Maintaining an adequate cover in your orchard will ensure that efforts to improve soil health are sustained. A vegetative cover, such as grass, works to hold the soil in place, reducing the risk of erosion, compaction, and helps to increase water infiltration.
  - Nutrition – Proper nutrition is not only essential for producing a good crop, but it also helps to reduce plant stress, allowing for greater resilience in the face of climactic challenges, whether they be biotic or abiotic in nature. Soil tests should be conducted once every two years. Foliar tests can be done every year and are the best tool we currently have for evaluating the nutritive status of a plant. Fertilizer applications should be informed by at least one of these tests. Nutrition standards for just about every crop type have been developed and testing labs like the Soil Nutrient Analysis Laboratory at UConn will provide specific, tailored soil amendment recommendations based on your test results.
  - pH – Already discussed above, soil pH influences a range of processes in the soil environment, including the availability and uptake of nutrients. Any soil test will provide a site's soil pH reading. Corrective action recommendations are included.

- Funding Opportunities – To help support farmers mitigate the impacts of climate change, there are several programs out there that offer funding to make improvements related to water and soil management.
  - CT Department of Agriculture Climate Smart Agriculture and Forestry Grant: https://portal.ct.gov/DOAG/ADaRC/ADaRC/Grants/Climate-Smart-Agriculture-and-Forestry-Grant
  - USDA NRCS Programs, Initiatives, and Grants: https://www.nrcs.usda.gov/programs-initiatives

Diversification

Diversification is an excellent tool for building farm resiliency. Diversification relies on the fact that each crop and/or cropping system has its own unique requirements and parameters, meaning each will respond differently to our changing climate. Some crops might be more tolerant of late spring frosts while another may provide an early season cash infusion. Likewise, alternative production systems can help to extend the growing seasons or provide additional protection from the environment. Diversification is really a process of hedging your bets. If something doesn't work out this year due to a pest issue or flooding, diversifying your operations will ensure an alternative source of revenue (Kime, 2023). Below you'll find some recommendations for diversifying your operation, but the possibilities are endless.

Introducing new crop types into your operations is one of the easiest ways to diversify. A grower's familiarity with apples is easily translated to peaches or even bush fruit like blueberries. Much of the equipment and culture is shared between these crops. For those already fairly diversified, there is a host of less well-known fruit crops that could offer your operation a marketing edge in addition to resiliency.

- Currants, Gooseberries – *Ribes* spp.
  - A group of bush healthy fruit with varying levels of disease, drought, and cold tolerance. Some tolerate partial sun and are utilized for both fresh consumption and processing.
- Aroniaberry, Chokeberry – *Aronia mitschurinii*
  - An incredibly healthy small pome fruit crop with high levels of antioxidants and a unique astringent flavor. This crop accepts a variety of growing conditions, including a wide pH range. It is native and very cold hardy. It is primarily used for processing jams, jellies, and baked goods – like cranberries (Figure 5).
- Honeyberry, Haskaps – *Lonicera caerulea*
  - Haskaps are another bush fruit, with elongated blue fruits. It is cold hardy, matures early and is high in vitamin C.
- Seaberry, Common Sea Buckthorn – *Hippophae* spp.
  - This is another cold hardy bush fruit intended for processing. It has bright orange berries that are used around the world to produce jams, jellies, juices, and skin care products (Figure 6).
- Kiwiberry, Hardy Kiwi – *Actinidia arguta*
  - This is a cold tolerant vining crop with small green fruit with a flavor and texture reminiscent of their tropical counterparts (Figure 7).

Figure 5 – 'Viking' aroniaberries (Lentz, 2022)

Figure 6 – Seaberries (Green Barn Farm, 2023)

Figure 7 – Hardy kiwi variety 'Ananasnaya' (Strik, 2021)

In addition to diversifying your crops, it might be worth exploring alternative production systems for your existing crops. Systems such as tabletop strawberries or brambles grown in high tunnels offer a range of benefits from season extension to pest avoidance to early development. For more information on alternative production systems, including protected culture or controlled environment agriculture, please contact your Extension specialist.

Pollination Support

Most all our fruit crops require pollinators to set fruit. Pollinator activity is largely influenced by weather during the critical pollination period. If it is too cold or rainy, pollinators will not be as active – effectively shortening the period for pollination to occur and potentially affecting your fruit set. Many fruit growers already purchase or rent pollinators during bloom. However, ensuring that we have a healthy population of native pollinators is essential. Pollinator gardens and habitats can provide our native pollinators with support year-round, ensuring access to food and shelter. Many companies have been selling pollinator seed mixes for years. Even minimally managed-pollinator gardens, such as spreading seed along the woods edge can provide benefits. For more information, please check out the UConn Pollinator Program: https://ipm.cahnr.uconn.edu/pollinators/

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Garlic Cultivation in Connecticut

Maggie Ng, UConn Extension Outreach Assistant

Photo 1: Harvested garlic bulbs. Photo: Jennie Cramer

Garlic is a staple crop in the Northeast, but it can be difficult to know exactly when to plant and harvest garlic in this region. There are quite a few important guidelines during all stages of garlic cultivation. In Connecticut, planting should take place in early- to late-November. The goal is to time planting for the development of roots, but not enough time for the shoots to emerge from soil before winter. Aim for a garlic harvest of mid- to late-July the following year. There are two types of garlic, hardneck and softneck, but the hardneck type is more commonly grown in New England due to their flavor and appearance, so we will only be referring to that type in this article. Curing and storage are also crucial to a productive garlic harvest. This article will detail the necessary steps to ensuring a lovely and bountiful garlic harvest!

Planting and seed garlic

First things first, we will discuss when and how to plant garlic. Starting with clean seed is critical—you want to use the best seed to set yourself up for success from the beginning. When selecting seed cloves to store for the next planting, look for the cream of the crop. Cloves selected for seed should be of the highest quality, larger in size, and disease-free. Disease can easily spread throughout a field if using infected seed cloves. Carefully separate cloves after removing the papery outer skin. Make sure to store seed garlic at 50°F, with a relative humidity of 65-70%.

In this region and climate, garlic planting is done in the fall, as garlic requires a period of winter chilling to initiate formation of the bulb. However, planting too early may cause the seed to produce shoots before winter and expose the plant to cold damage. Aiming for a planting 4 to 6 weeks before first hard frost is recommended for CT growers to allow garlic the 9-month growing window it needs before harvest. This typically shakes out to early- to late-November, but can shift slightly year to year, so keeping an eye on the forecast remains important.

Planting seed into well-drained soil and at proper spacing is vital for bulb development. A simple way to establish a well-drained planting area is to create raised beds. Seed cloves should then be planted 3 to 6 inches apart in-row 2 to 3 inches deep, with their points facing upwards. Spacing between rows should allow for preferred methods of weed control, irrigation, and/or mulching. The planted area should then be covered with at least 3 inches of mulch—many growers prefer to use a straw mulch—to keep the ground insulated throughout the winter. This mulch then acts as weed control into the spring, and can help to regulate soil moisture as well.

Photo 2: Garlic planting. Photo: Illinois Extension

Harvest

Once spring rolls around, your garlic will be growing tall and green up through its cozy winter bed. As the season progresses, the scape, or a false flower stalk, will emerge. This typically happens during June. Many growers prefer to harvest the garlic scapes, while others choose to leave them intact. Harvesting the scapes has been thought to allow the plants to focus energy on bulb formation and development. Scapes can also be marketed and sold as a specialty agricultural product. They should be cut after they curl. Only hardneck garlic produces a scape.

Photo 3: Tall, green garlic shoots. Photo: Shuresh Ghimire

Photo 3.a: Garlic scape. Photo: David Fuller

Another garlic product is green garlic. This is premature garlic that is harvested before the cloves start to become defined within the head. It is used in a similar way to scallions or green onion, and is ready when the plant has begun to fall over, but 50% of the leaves are still green. This indicates that the bulbs are still intact.

Hardneck garlic should be harvested when the bulbs are fully mature. But how do you know when exactly that is? There are a few tips and tricks to help answer this question. First is to check the leaves of your garlic plants. If the bottom 3 leaves are brown and senesced, you have about a 2-week window within which to complete your harvest. After these 2 weeks are up, the bulbs will not cure or store properly, as the outer skin will disintegrate. Refer to photo 4 for a visual on the appropriate harvest stage.

Photo 4: The appropriate harvest stage. Note the bottom three senesced leaves. Photo: David Fuller

Another trick is to dig up 1 or 2 plants to check the development of the bulb. Under-dig the entire plant, making sure not to damage or cut the bulb with your tool, and cut the head lengthwise. Refer to photo 5 for a comparison of an underdeveloped versus fully developed head of garlic. If the cloves within the bulb are not differentiated, the crop is not ready for harvest and needs more time in the ground. The cloves being separated within the wrapper is an indicator that the rest of the crop is ready.

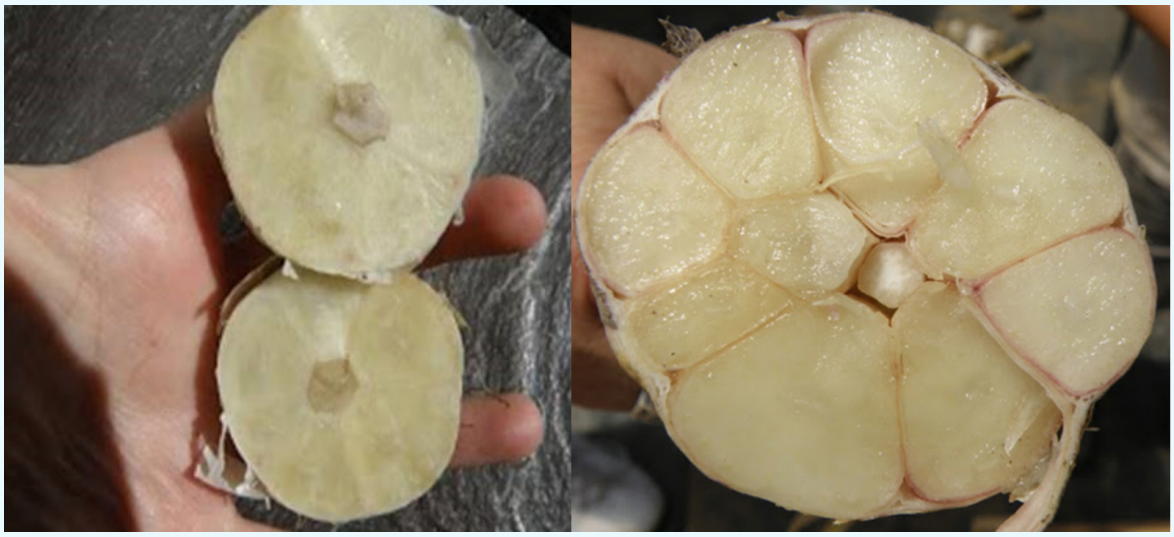

Photo 5: Left: an underdeveloped bulb of garlic with no clove definition. Right: a fully developed bulb with cloves separated within the wrapper. Photo: Crystal Stewarts-Courtens

One last indicator of readiness is the shape of the clove in the bulb. Each individual clove should be tightly wrapped within the head, and have developed from a round to wedge shape. In hardneck varieties, the cloves may actually begin to pull away from the stalk when they're fully developed.

When you're confident the garlic is ready for harvest, begin by undercutting or under-digging your plants carefully. Gently pull each plant and shake or wipe off the dirt—do not kick or hit the heads against anything, as wounding the bulbs can result in poor storage quality. Harvest ideally takes place on a sunny, dry day earlier in the morning (before 11 am) to avoid sun scalding.

Curing and storage

The post-harvest curing and storage of garlic is critical in making marketable, long-lasting bulbs. Curing areas should be kept dry (do not wash), with minimal moisture brought in from harvested plants—this means removing as much soil as possible before bringing the crop indoors. Maintain low relative humidity (about 50%) wherever you're planning to cure the bulbs. Hang garlic in a well-ventilated area where sunscald will not be an issue. Avoid temperatures at or above 90°F. The curing process takes anywhere from 10 days to 4 weeks. Bulbs are properly cured once the outer skin is dry and crispy and the center of the stem is hard. Garlic stems can be cut to ~1 inch length at any point after curing has completed.

Photo 6: Hanging garlic in a well-ventilated area, such as this greenhouse, is crucial to prepare it for storage. Photo: Shuresh Ghimire

Store garlic for consumption in a location where a temperature of 32-35°F can be maintained, with a relative humidity of 65-70%. Garlic that has been selected for seed can be stored at 50°F, with a relative humidity of 65-70%.

Pests and diseases

There are a handful of pests that affect garlic, including onion thrips, onion maggots, mites, and nematodes. Diseases that affect garlic include botrytis, basal rot, white rot, and downy mildew. For more detailed information on symptoms and pest management, please refer to this factsheet from Cornell Extension. Remember to follow the label when using any pesticide!

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Farm to School Opportunities

Jiff Martin and Shannon Raider

October is National Farm to School Month and the first week of the month is for celebrating CT Grown for CT Kids Week! More schools and farms than ever engaged in celebrating the week with taste tests, special events and activities all month long. In the **East Hartford Public School District**, students at Goodwin Elementary School tried local yogurt from Hastings Farm and apples and winter squash from Handel Farm. In **Lebanon Public School District**, students enjoyed locally grown products sourced from Sweet Acre Farm and Bluebird Hill Farm in the cafeteria, including roasted butternut squash and apple casserole, strawberry apple smoothies. In **Middletown Public School District**, all 4th graders took a spring field trip to Cold Spring Farm to plant carrot seeds and sow potatoes. During CT Grown for CT Kids Week, those same students returned to Cold Spring Farm to harvest those plantings.

Although the fall is a great time to celebrate local food in schools, the opportunity to sell to schools is a year-round opportunity for interested farmers. Here are two important updates for Connecticut's fruit and vegetable producers:

- Opportunity #1 - The **Local Food for Schools Incentive Program** has officially launched. The $1.8 million program offers funds to most of Connecticut's K-12 school districts for purchasing CT Grown products. The program is designed to help schools build partnerships with local and regional producers, including socially disadvantaged farmers/producers. Initial funding is provided by USDA-FNS and administered by the State of CT Department of Education. Each district can spend anywhere from $2k to $20k for starters, depending on the size of the district, and there is more funding coming from both the feds and the state in 2024 and 2025.

- Opportunity #2 - The **CT Grown for CT Kids Grants Program**, administered by the CT Department of Agriculture, is calling for applications (due Dec 14th). Funds available have increased to $1m this cycle. Producers are eligible to apply directly for up to $5,000 for items that will help improve their position to sell to schools, such as harvesting equipment, wash/pack stations, winter storage, and season-extending high tunnels. There is also a one-time category this cycle for operating shipping container-farms (up to $250,000). Lastly, producers may also be invited to join a school district that applies for a larger grant (up to $50,000) for experiential learning such as farm field trips, pop-up farmers market, and community dinners.

UConn Extension's Put Local On Your Tray Program is partnering with 25 school districts in a 'deep dive' to plan and implement their local purchasing strategies. Many of these districts participated in two 'Chop, Peel Dice' events where over a dozen farmers and twice as many food service directors met in person to enjoy local food, build business relationships, share opportunities and challenges to bring CT Grown products to the cafeteria. Events were held at River Ridge Farm in Portland and at the Northwest Connecticut Regional Food Hub in Torrington. Similar meet & greet events are planned for 2024. Is your farm business ready to be added to our Farm Directory so more schools can find you? Reach out and stay engaged with us at www.putlocalonyourtray.uconn.edu.

Choosing Resistant Cultivars

Maggie Ng, UConn Extension Outreach Assistant

Amidst cleaning greenhouses, clearing field debris, and finally getting to that pesky tractor repair, it's about that time to start making next year's crop plan! If you're looking to incorporate some new cultivars into your plan, what follows is a brief guide on how and why to choose resistant vegetable varieties.

Why choose resistant cultivars?

Drought, extreme heat, pathogens that cause disease… we are all too familiar with the plethora stresses that can cause our precious crops grief. Unfortunately, these stresses can cause significant or even total crop loss. While there are many aspects of our environment we cannot control or predict, there are certain elements that we have tools to aid in the fight against. Incorporating resistant vegetable varieties into your crop plan is a critical aspect of cultural management of disease and abiotic stresses. There are plenty of cultivars that have been bred to resist pathogens that cause disease, as well as tolerance to drought, heat, and cold. These resistant varieties are also bred with production in mind, as yield and fruit quality are of course important factors when choosing what to grow.

How do I choose resistant cultivars?

First, decide what types of crops you'd like to grow in the coming season. This might include brassicas such as broccoli or cabbage, solanaceous crops such as tomatoes or eggplant, or cucurbits such as cucumber or squash. Identify what you've had success with in the past, and what you might be curious about in the future. Be sure to consider cultivars that have appropriate time to maturity, plant hardiness zone, and desired growing characteristics such as fruit size and appearance.

Next, identify what types of diseases or abiotic stresses you've been facing. Have you dealt with a flush of *Alternaria* or black rot in your broccoli? Downy mildew that wiped out your last cucumber crop? How about the lettuce crop that wilted due to unseasonably high temperatures? These are all issues that can be addressed by careful cultivar selection. Figure out what types of resistance you are looking for in what crop, and if heat or cold tolerance is a factor you'd like to consider.

Where do I find resistant cultivars?

Seed company websites may have a filter that narrows down the list of varieties of your interest, including disease resistance varieties. Simply select the appropriate filter for disease resistance and/or additional tolerance (heat, cold, drought, etc.).

Below is a list of resources for those curious about resistant and tolerant cultivars. First is Cornell Extension's comprehensive list of disease resistant vegetable varieties. It is organized by crop type. Next is a brief guide on how resistant varieties are a crucial aspect of cultural practices for disease and stress management. Lastly is an article from University of Delaware's Extension detailing heat-tolerant lettuce varieties suited for growing in warmer temperatures, and how to prepare for a fall lettuce planting.

Resources

- Cornell Extension's Disease Resistant Vegetable Varieties
- Cornell Extension's Tips on Using Resistant Varieties for Managing Plant Diseases
- University of Delaware Cooperative Extension's Heat Tolerant Lettuce Varieties and Preparing for Fall Lettuce Planting

Connecticut Vegetable Crop Calendar



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Disclaimer: This guide is for educational purposes only to assist growers in making planting decisions. We cannot guarantee exact planting or harvesting dates, as there are a multitude of variables that shift year-to-year. Recommendations are generalized and made with the best available knowledge at the time of publishing.

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Spring

	Early	Mid	Late

March	• Prepare seeding trays and potting media
	• Seed these cool-season crops indoors/under protection:
	  ◦ Basil
	  ◦ Onions
	  ◦ Asian greens 
		• Seed these cool-season crops indoors/under protection:
		  ◦ Broccoli, kale, cabbage
		  ◦ Cauliflower
		  ◦ Beets, spinach
		  ◦ Herbs
		  ◦ Lettuce 
			• Begin to seed these crops indoors/under protection:
			  ◦ Lettuce
			  ◦ Peas
			  ◦ Peppers
			  ◦ Tomatoes
			  ◦ Eggplant 

April	• Continue to seed these crops indoors/under protection:
	  ◦ Tomatoes
	  ◦ Peppers
	  ◦ Eggplant 
	• Plant potatoes
	• Begin to sow spring cover crops
	  ◦ Mustard, oats, annual rye grass, clover, Alfalfa
		• Direct seed after last frost date:
		  ◦ Peas
		  ◦ Beets
		  ◦ Sweet corn
		  ◦ Swiss chard
		  ◦ Spinach
		  ◦ Carrots 
			• Hill potatoes
			• Plant hardened-off cool-season transplants in the field
			• Seed these crops indoors/under protection:
			  ◦ Melons
			  ◦ Summer squash
			• Plant onions 

May	• Seed these crops indoors/under protection:
	  ◦ Beans
	  ◦ Cucumber, squash
	• Seed these crops outdoors:
	  ◦ Radish, turnip
	  ◦ Lettuce mix
	  ◦ Corn
		• Set out transplants to harden off
		  ◦ Tomatoes, eggplant
		  ◦ Peppers
		  ◦ Sweet corn 
		• Test your soils
		  ◦ Nutrients
		  ◦ pH & organic matter
			• Continue to direct seed:
			  ◦ Beets
			  ◦ Carrots
			  ◦ Radishes
			  ◦ Turnips 

Summer

	Early	Mid	Late

June	• Plant sweet potato slips
	• Harvest lettuce, radish, turnip
	• Direct seed sweet corn
	• Transplant:
	  ○ Tomatoes
	  ○ Peppers
	  ○ Eggplants
		• Seed summer cover crops
		  ○ Sorghum sudan grass, sun hemp, buckwheat
		• Transplant:
		  ○ Beans
		  ○ Sweet corn
		• Seed indoors: winter squash
			• Harvest:
			  ○ Beets
			  ○ Chard
			  ○ Broccoli, kale
			  ○ Cauliflower
			  ○ Spinach
			  ○ Chard
			  ○ Cucurbits

July	• Seed these crops indoors for fall:
	  ○ Broccoli
	  ○ Cauliflower
	  ○ Cabbage
	  ○ Beets
	  ○ Kale
	  ○ Lettuce
	  ○ Brussels sprouts
		• Harvest garlic, onions, & corn
		• Direct seed:
		  ○ Carrots
		  ○ Beets
			• Seed these crops for fall:
			  ○ Carrots
			  ○ Beets
			  ○ Chard
			  ○ Rutabaga
			  ○ Turnips
			  ○ Cabbage
			• Sow fall cover crops

August	• Seed heading brassicas
	  ○
	• Begin harvest:
	  ○ Melon
	  ○ Tomatoes
	  ○ Peppers
		• For a late harvest, seed:
		  ○ Head & leaf lettuce
		  ○ Chard
		  ○ Spinach
		  ○ Radishes
		  ○ Turnips
		• Kill potato vines
			• Harvest potatoes
			• Continue harvesting tomatoes, peppers, eggplant, summer squash

Fall

	Early	Mid	Late

September	• Cucumber, squash, corn harvests will slow down	• Continue to harvest:
		  ○ Lettuce
		  ○ Spinach
		  ○ Radishes
		  ○ Carrots
		  ○ Turnips
		  ○ Asian greens
			• Harvest gourds, squash, and pumpkins
			• Continue to sow cover crops
			• Tomato and pepper harvests will slow down

October	• Plant perennial onions, shallots, and leeks
	• Harvest:
	  ○ Beets
	  ○ Kale
	  ○ Lettuces
	  ○ Brassicas
		• Harvest:
		  ○ Broccoli
		  ○ Brussels sprouts
		  ○ Cabbage
		  ○ Carrots
		  ○ Scallions
		  ○ Spinach
			• Test your soils
			  ○ Nutrient analysis
			  ○ pH & acidity
			  ○ Organic matter
			  ○ Salts

November	• Plant seed garlic
	• Plant winter spinach, carrots
	• Continue harvest until done:
	  ○ Carrots
	  ○ Brassicas
		• Plant seed garlic
		• Order potting media
		• Clean field and crop debris
		  ○ Till in crops
		  ○ Remove plastic mulch
			• Plant winter spinach, mixed greens, and arugula in indoor growing spaces

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Winter

	Early	Mid	Late

December	• Clean and sanitize:
	  ◦ Tools
	  ◦ Tomato stakes
	  ◦ Greenhouses
	  ◦ Indoor growing spaces
	  ◦ Seeding trays
		• Create next year's crop plan
		• Consider:
		  ◦ New cultivars
		  ◦ Disease resistance
		  ◦ Heat/cold tolerance
		  ◦ Marketability
			• Order seeds 

January	• Check fencing and farm infrastructure 	• Toss expired fertilizers and pesticides • Order fertilizers and pesticides • Restock PPE	• Repair farm machinery 
February	 **Take a break!** **Rest and relax before the spring season begins.** 		

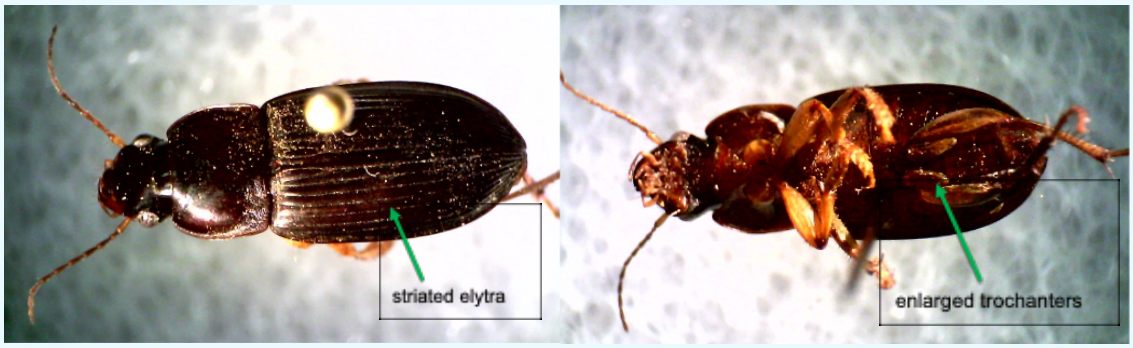
Ground Beetles

Emma Fox, Vegetable Entomology Extension Intern

Ground beetles, or members of the family Carabidae, are a group of beneficial insects commonly found in both natural and agricultural settings. They play a prominent role in our ecosystem, with at least 2,635 species found in North America north of Mexico and 362 species collected in Connecticut. As omnivores and generalist predators, they provide ecosystem services through their consumption of invertebrate pests and weed seeds. This makes them agriculturally useful for control of both insect and weed pests.

Description

Ground beetles can range in size from 1 to 60 mm as adults. They are shiny and variable in color, with many common species exhibiting dark brown to black coloring, though some are colorful and iridescent. They are almost always observed within the soil or on the soil surface and are rarely seen in flight due to their reduced or absent hind wings. Most species are nocturnal, but there are also day-active species. Some key identification features of adult ground beetles include enlarged trochanters and striated elytra. The heads of ground beetles are narrower than the thorax, with prominent eyes and threadlike antennae. Larvae are elongate with a large, rounded head and hooked chewing mouthparts.



Photos: Emma Fox, UConn

Life Cycle

Ground beetles undergo complete metamorphosis, characterized by four stages of development: egg, larva, pupa, and adult. Most of the life cycle occurs underground, with eggs typically laid beneath the surface of the soil and larvae foraging within the soil, feeding primarily on soft-bodied insects. After pupation, the adult emerges to forage for prey and seeds on the surface of the soil. Ground beetles overwinter as adults or larvae and can live for several years.

Agricultural Relevance and Conservation

Depending on the ground beetle species, they can be considered omnivores, granivores (weed seed predators) or carnivores. Their feeding preferences vary by species and prey availability. Some are opportunistic feeders and prey on caterpillars, mites, aphids, snails, and beetle larvae, among other insect pests. Other species like *Lebia grandis* are more specialized and are considered important predators of the Colorado potato beetle. Ground beetles that feed on seeds can play a significant role in regulating the weed seedbank. For example, the omnivorous ground beetle *Harpalus pensylvanicus* has been observed to consume giant foxtail, common lambsquarters and velvetleaf seeds among others. Due to the ecosystem services provided by ground beetles, it is advantageous to support and encourage their populations within agricultural fields. Provision of shelter and overwintering habitat is the most significant action that can be taken to conserve ground beetles. The installation of permanent plantings such as native plant hedgerows and beetle banks (elevated rows of perennial bunch grasses) can provide this crucial habitat for ground beetles. Mulching and avoiding excessive tillage can also support ground beetle populations on farms.

References

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- Krinsky, W.L., and M.K. Oliver. 2001. Ground Beetles of Connecticut: An Annotated Checklist. Connecticut Department of Environmental Protection, Hartford, CT.

- Ward, M., M. Ryan, W. Curran and J. Law. 2014. Giant Foxtail Seed Predation by Harpalus pensylvanicus (Coleoptera: Carabidae). Weed Science 62: 555-562.

UConn Extension's 2024 Vegetable and Small Fruit Growers' Conference Agenda

Register for the conference here: s.uconn.edu/ctvfc registration

Save the date! January 9, 2024
UConn Student Union
2110 Hillside Rd, Storrs, CT 06268

Find the full program here: s.uconn.edu/ctvfc program

Trade show: 8:00-8:55, 10:00-10:45, 12:00-1:00

8:00 AM **Registration, breakfast, socialize, visit trade show**
Morning Moderator - Shuresh Ghimire, Vegetable Extension Specialist, UConn

8:55 AM **Welcome**: Amy Harder, Associate Dean of Extension, UConn

9:00 AM **Bramble: summer vs fall** Mary Concklin, UConn Extension Educator Emerita

9:30 AM **Agricultural Labor Update** Heather Callahan, US Department of Labor, Hartford District Office

10:45 AM **High tunnel tomato nutrient management: findings from on-farm research**
Josef Gorres, Assistant Professor, Univ. of Vermont

11:15 AM **Niche crop Aronia** Evan Lentz, Fruit Extension Specialist, UConn

11:45 AM **Research update: Alternaria on brassicas in CT** Sydney Everhart, Associate Professor, UConn

11:55 AM **Research update: Understanding nematode parasitism to design better management strategies**. Raquel Rocha, Agricultural Scientist, CAES

12:05 PM **Lunch break/trade show**
Afternoon Moderator - Evan Lentz, Fruit Extension Specialist, UConn

1:00 PM **Innovation in fertigation for small fruit crops** Trevor Hardy, Brookdale Fruit Farm, NH

1:30 PM **Biodegradable Plastic mulch for specialty crop production**
Shuresh Ghimire, Vegetable Extension Specialist, UConn.
Charlie (Yingxue) Yu, Agricultural Scientist, CAES

2:00 PM **Mesotunnels for cucurbit production** Sarah Pethybridge, Associate Professor, Cornell University

2:30 PM **Research update: Vegetable K/P fertility trials and use of biochar** Haiying Tao, Assistant Professor, UConn

2:40 PM **Research update: Trap crops and insectary plants** Ana Legrand, IPM Associate Extension Professor

2:50 PM **Research update: Plant virus diagnostics and control- grapevine virus and potato virus**
Washington daSilva, Agricultural Scientist, CAES

3:00 PM **Research updates: Spotted lantern fly** Claire Rutledge, Agricultural Scientist, CAES

3:10 PM **Crop insurance options for CT farmers and FAQ** Colleen Kisselburgh, Arthur Carroll Insurance Agency

3:40 PM **Pesticide recertification credits and socialize. 4 CEU.**

The University of Connecticut and CT Agricultural Experiment Station are equal opportunity program providers and employers. Please call three weeks prior to this event if special accommodations are needed.

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CAES The Connecticut Agricultural Experiment Station
Putting Science to Work for Society since 1875

UConn Extension's Farm Risk Management Program
2023-2024 FREE Programs

Climate Smart Mitigation & Adaptation Strategies Workshop

When: Wednesday, December 6, 2023
Where: Middlesex County Extension Center, 1066 Saybrook Road, Haddam, CT
Time: 9:00 a.m. – 3:00 p.m.
Lunch provided

Options to Mitigate Farm Financial Losses

When: Tuesday, January 16, 2024
Where: CLiCK, 41 Club Rd, Windham, CT
Time: 9:00 a.m. – 12:00 p.m.

Crop Insurance Programs

When: Tuesday, January 23, 2024
Where: Tolland County Extension Center, 24 Hyde Ave, Vernon, CT
Time: 9:00 a.m. – 2:00 p.m.
Lunch provided

Business Planning and Financial Benchmarking

Program will include information on farm insurance, health insurance and retirement programs
When: Tuesday, February 6, 2024
Where: Tolland County Extension Center, 24 Hyde Ave, Vernon, CT
Time: 9:00 a.m. – 12:00 p.m.

Options to Mitigate Farm Financial Losses

When: Monday, February 26, 2024
Where: Mashantucket Pequot Tribal Nation Museum, 110 Pequot Trail, Mashantucket, CT
Time: 1:00 p.m. – 4:00 p.m.

Our popular One-on-One Sessions with Professionals

In-person:

When/where: Wednesday, February 7, 5:00 -8:00 p.m., Tolland County Extension Center, 24 Hyde Ave, Vernon
Wednesday, February 21, 5:00 -8:00 p.m., Tolland County Extension Center, 24 Hyde Ave, Vernon
Monday, March 4, 9:00 – 3:00 p.m., Middlesex County Extension Center 1066 Saybrook Road, Haddam

Virtual:

When: Tuesday, February 13, 9:00 – 3:00 p.m.
Tuesday, March 5, 9-3 pm
Tuesday, March 12, 9-3 pm

USDA United States Department of Agriculture
Risk Management Agency

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This material/event is funded in partnership by USDA, Risk Management Agency, under award number RMA23CPT0013448.

UConn Extension is working closely with experts throughout the state, including educators from the College of Agriculture, Health and Natural Resources, to launch a new, 12 module, online course on **Climate Smart Adaptation Strategies for Beginning Farmers.** This course addresses the constant challenges, that were prevalent in this past year's growing season, of intense rainfall events, drought, temperature and to address pest, disease, and land management problems they bring. Through using climate smart practices, this course that is focused on new farmers, will make them more resilient so that they can create a thriving farm business in our state.

Our first cohort beginning November 29th, with a second cohort start date of January 31st. The course includes expert instructors in various fields implementing climate smart agriculture practices, tools to help you implement these practices for under $2000, virtual field trips and more. The Course is completely online and asynchronous so that learners can follow at their own pace in whatever way fits into their busy farm life.

Course Modules include:

1. Intro to Climate Smart Farming*
2. Climate Smart Soil Health part 1
3. Climate Smart Soil Health part 2
4. On-Farm Composting
5. Agricultural Fabrics and Plastic Mulch
6. Managing Water on the Farm
7. Climate Smart Energy Efficiency
8. Biological Pest Control and Native Pollinators
9. Managing Native Species, Invasive Plants, and Noxious Weeds
10. Silvopasture
11. Matching Your Landscape, Climate, and Production
12. Financial Resources to Implement Climate Smart Farming

Class cost is $60, but on completion you will receive a $30 rebate for the cost of the class. Farmers that complete the class will be eligible to apply for our Climate Smart Microgrants which will open later in December. These micro-grants are meant for the purchase of equipment/inputs that cost up to $2400 for implementing climate smart farming practices.

To find out more information, see our website here: https://newfarms.uconn.edu/climatesmart/
If you're ready to sign up for the class, use the link here: https://s.uconn.edu/climatesmart

American Farmland Trust
SAVING THE LAND THAT SUSTAINS US

FARMER-LED INNOVATIONS IN TILLAGE REDUCTION

The New England Climate and Agriculture team at American Farmland Trust has an opportunity for Connecticut vegetable farmers to receive financial awards and facilitated peer-to-peer support for advancing tillage reduction strategies on their farms.

The Farmer-Led Innovations in Tillage Reduction program will offer six CT farmers:

A $5000 INNOVATION AWARD

and participation in a 2-year peer working group program.

AWARDEES COMMIT TO:

- **Participating in this peer working group to share ideas and support**
- **Offering one field walk to showcase their trials, and**
- **Attending at least two peer field walks**

APPLICATIONS ARE DUE BY DECEMBER 23, 2023

https://www.surveymonkey.com/r/CTFLI

Questions? Contact Julie Fine
jfine@farmland.org / 413 206 4023

Reducing tillage is key to managing for soil health and climate resilience. By supporting innovative farmers working at a medium- to large scale, we hope to share successes and failures that can help advance tillage reduction in the Northeast and beyond.

Funding for this program provided by CT NRCS and anonymous donors.

UConn Extension's Solid Ground program is excited to launch into the conference season this year, and we couldn't be more happy to partner with New Connecticut Farmers Alliance to bring you the Farmer 2 Farmer Conference on Saturday January 27.

By farmers, and for farmers, this event is created for the new farmers in our state to take stock of what worked and what didn't, assess weaknesses and strengths, and tweak the plan for next year. Each workshop topic is chosen based on listening to the challenges farmers have been facing in CT, and are led by farmers that have experience in topics such as integrating chickens into your vegetable operation, techniques for high tunnel operation, and strategies for successful scaling of your farm business.

At the end of all the workshops, time will also be included for discussion so that farmers can share the experiences they have had on their property and with their operations. This peer knowledge sharing helps inform each learner on what the options are when considering making changes to their growing practices.

At a central location in the state- the Meriden Public Library, the conference will take place from 10:30-5:30 and will include breakfast and lunch which are free of charge. Attendees will take home some locally saved seeds and lots of information about service providers that can help support them in their work. We're happy to also bring back the FARM HACK competition where you can show off the tools you've invented to better your farm operation and win a cash prize!

CT NOFA has also partnered with UConn Extension's Solid Ground and NCTFA to help make this event happen.

Other things on the line up for the learning season include the relaunching of our Soils Class with Kip Kolensinskas in January, more Ag-Mechanics classes, and another online class launching in January- The Business of Farming! Keep your eyes on our website for more info and on our listerv for when to sign up!

Sign up here: https://bit.ly/farmer-2-farmer

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