Survey of High Tunnel Practices in Northern New England

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Northeastern climate is changing, characterized by more extreme, unpredictable weather. Growing vegetables in protected environments is critical to ensure a stable supply of locally-grown produce year-round and for the sustainability and economic viability of diversified agriculture. While some growers have used high tunnels for decades, many are new, having grown crops in high tunnels for less than 10 years. Many lack knowledge about high-tunnel soil fertility demands and pest/disease management. A three-pronged educational project linking agricultural specialists from New Hampshire and Vermont was funded by the NE SARE program to introduce new growers to integrated approaches for managing arthropod pests, diseases, and soil fertility in high-tunnel vegetables. Current Best Management Practice information was compiled into one website and various outreach activities including farm visits, webinars and a conference on high-tunnel production were conducted. This project was an extension of a high-tunnel research and education project conducted from 2014-2016. In 2016, a grower survey was conducted to determine the needs of Northern New England high tunnel growers. This generated valuable baseline data on use of pest, nutrient and crop management practices. In 2025, a follow-up survey was conducted to determine the current status of grower needs and level of skills. We were particularly interested in identifying changes in grower production and pest/disease issues and what growers need in terms of educational or research activities to enhance their production. In many instances, the same questions were asked in 2016 and 2025. In these cases, we were able to assess changes over time.

Survey results are described below, using the following organization/layout.

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General Information/Cropping Practices.

The survey was sent out to over 4,000 growers and service providers through various email lists (Greengrower, VT Veg and Berry email list, etc.). Fifty-two completed surveys were received from growers, of which 25.5% were new high-tunnel growers (≤10 years of high tunnel production), and 74.5% were experienced high tunnel growers (>10 years). Most of the respondents were from New Hampshire (53.9%), with 17.31% each from Maine and Vermont, 4% each from Massachusetts and New York. When asked how much area they used for crop production, over half reported using 1,000-10,000 sq. ft (Table 1).

Table 1. Tunnel sq footage in use

Size	% of respondents
Less than 1,000 sq ft.	16%
1,000-10,000 sq ft	56%
10,000-25,000 sq ft	12%
Over 25,000 sq ft	16%

In 2025 32.7% of the respondents were entirely certified organic, compared to 42% in 2016. Sixty-five percent (65.4%) identified as not certified organic in 2025, compared to 51% using conventional practices in 2016.

However, a few respondents indicated they used to be certified organic, but due to the cost of certification they no longer certified, though they continue to follow organic practices.

Crops Produced. Greens and tomatoes were the most common crops grown in high tunnels in 2025, which was also reported from the 2016 survey (Table 2). In general, the percentage of growers producing these two crops increased from 2016 to 2025. As expected, the crops grown varied with the season. Greens were grown predominantly in spring, fall and winter, while tomatoes were grown in spring, summer and fall. Vegetable transplants and cucurbits were also frequently grown in high tunnels in spring, summer and fall. Many growers use high tunnels for early season transplant production in the spring, before transitioning to other crops in summer. Growers also listed several other minor crops produced in high tunnels, including eggplant, carrots and other root crops, ornamentals, various fruits (raspberry, blackberry and strawberry), ginger and cut flowers (Tables 2 and 3).

Table 2. Crops grown in high tunnels by season (% of total respondents in 2025 and 2016), highlighted % = most common crops grown in 2016 and 2025.

	Spring		Summer		Fall		Winter	
	2025	2016	2025	2016	2025	2016	2025	2016
Greens	61.5	50.5	25.0	17.9	51.9	47.4	46.2	47.3
Tomato	53.9	37.9	73.1	67.4	55.8	44.2	1.9	0.0
Pepper	17.3	20.0	67.3	56.8	34.6	28.4	0.0	0.0
Cucurbits	30.8	27.4	63.5	55.7	30.8	21.1	0.0	0.0
Transplants	42.3	48.4	23.1	26.3	13.5	0.0	7.7	0.0
Herbs	28.9	22.1	34.6	31.6	30.8	21.1	13.5	8.4
Eggplant	3.9	0.0	34.6	13.7	13.5	0.0	0.0	0.0

Table 3. Other crops mentioned (% of grower responses)

Crop	Season of production	17.3%
Strawberries, Raspberries & Blackberries	Spring and Summer	9.6%
Cut flowers	Spring, Summer and Fall	5.8%
Summer/winter squash and pumpkins	Spring, Summer and Fall	5.8%
Carrots and other root crops	Spring, Fall and Winter	3.9%

High Tunnel Pest and Disease Management

Among the pests common in high tunnel crops, aphids, tomato hornworm and striped cucumber beetle were most frequently cited as causing mild, moderate or severe problems (Table 4). These were the same highly ranked pests in 2016 as well, with some slight shifts. For example, a higher percentage of growers ranked aphids as moderate problems in 2025 than in 2016, but a lower percentage of growers identified them as severe in 2025. This could indicate that growers still have aphid problems but are better able to manage them. Tomato hornworm continues to be a moderate to severe pest. This is likely a result of insufficient scouting to detect the larvae early. Winter cutworm was not mentioned in the 2016 survey but surfaced as a mild to moderate problem in 2025, which suggests it is becoming established in this region. Whiteflies and thrips were also occasionally cited as causing mild or moderate problems. Mites (two-spotted spider, broad, and russet) and thrips were frequently noted as “don’t know”, suggesting that growers may not be able to identify these pests or the damage they cause. Other miscellaneous pests included spotted wing drosophila, earwigs, flea beetles, tarnished plant bug, fungus gnat and squash bug. These pests were not commonly noted, but when they were, they were often rated as severe.

Tomato leaf mold (*Cladosporium fulvum*) and spinach downy mildew greatly decreased in severity in 2025 compared with 2016 (Table 5). In contrast, the rating for cucurbit viruses increased in 2025 compared with 2016. That may reflect the increased production of cultivation of cucumber in high tunnels in 2025 compared with 2016. The severity of basil downy mildew declined in 2025 compared with 2016, which may be due to the availability of resistant varieties. Other occasional diseases noted were crown and root rot, spinach Cladosporium, brown rot, *Alternaria alternata*, white mold, *Cercospora* leaf spot and arugula bacterial spot. Rodents were identified as a mild to moderate pest among around 30% of the respondents in 2025 similar to results from the 2016 survey.

Table 4. Insect/mite problems identified by high tunnel growers in 2025 and 2016 (% of growers) Highlighted % = highest ranked insects in 2025.

	None		Mild		Moderate		Severe		Don't know[1]	
	2025	2016	2025	2016	2025	2016	2025	2016	2025	2016
Aphids	11.5	27.0	26.9	41.0	26.9	19.6	9.6	14.0	25.0	0.0
Two spotted spider mite	25.0	51.0	11.5	9.0	7.7	14.0	1.9	8.0	53.9	18.0
Thrips	19.2	56.0	17.3	13.0	9.6	13.0	0.0	3.0	53.9	16.0
Whiteflies	26.9	51.0	15.4	27.0	7.7	13.0	3.9	4.0	46.2	4.0
Tomato hornworm	13.5	27.0	30.8	38.0	25.0	22.0	5.8	12.0	25.0	1.0
Winter cutworm	17.3	ND[2]	15.4	ND	11.5	ND	5.8	ND	50.0	ND
Stripped cucumber beetle	21.2	39.9	23.1	23.0	13.5	26.0	11.5	11.0	30.8	1.0

[1] This value includes growers who don't grow crops affected by the pest. [2]ND = No data because this question was not asked in the 2016 survey.

Table 5. Disease problems identified by high tunnel production high tunnel growers in 2025 and 2016 (% of growers), highlighted % = highest ranked diseases in 2025.

	None		Mild		Moderate		Severe		Don't know[1]	
	2025	2016	2025	2016	2025	2016	2025	2016	2025	2016
Tomato leaf mold (*C. fulvum*)	11.5	27.0	21.2	18.0	5.6	22.0	9.6	22.0	52.0	12.0
Powdery mildew	7.7	27.0	30.8	31.0	25.0	21.0	3.9	11.0	32.7	2.0
Spinach downy mildew	25.0	70.0	17.3	9.0	3.9	9.0	1.9	2.0	51.9	9.0
Basil downy mildew	30.8	58.0	9.6	14.0	5.8	5.0	0.0	14.0	53.9	9.0
Cucurbit viruses	23.1	44.0	11.5	31.0	11.5	7.0	1.9	2.0	51.9	16.0
Tomato viruses	30.1	45.0	13.5	24.0	5.8	10.0	0.0	3.0	50.0	17.0

[1] This value includes growers who don't grow crops affected by the pest.

Pesticide use. In both 2025 and 2016, most respondents (37.5-100%, depending on the category of material) did not use pesticides in their high tunnels in the year prior to the survey (Table 6). Among those who did apply pesticides, most used general-use insecticides or fungicides, 1-3 times during the year. Herbicides were very rarely used in high tunnels.

Table 6. Use of general and restricted use pesticides and herbicides in 2025 and 2016 (% of growers who responded)

Frequency	Never		1-3 times		4-9 times		Over 9 times	
Type of pesticide	2025	2016	2025	2016	2025	2016	2025	2016
General use insecticide	37.5	49.0	42.5	42.0	12.5	6.0	7.5	3.0
Restricted use insecticide	82.3	83.0	12.5	16.0	3.1	1.0	3.1	0.0
General use fungicide	52.8	60.0	33.3	31.0	11.1	6.0	2.8	3.0
Restricted use fungicide	84.9	83.0	9.1	14.0	0.0	3.0	6.1	0.0
General use herbicide	96.0	95.0	3.3	5.0	0.0	0.0	0.0	0.0
Restricted use herbicide	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0

IPM use. Growers reported using a wide variety of IPM tactics in high tunnels in both survey years (Table 7). In general the percentage of growers using a particular practice increased from 2016 to 2025. Nearly all growers reported using routine scouting and good airflow management to reduce pest and disease problems. A high percentage of growers reported that their farm staff identify pest/disease problems. This demonstrates the importance of including staff in discussions at farm visits. The percentage of growers using resistant or less suceptible crop varieties also increased significantly in 2025.

The percentage of growers using plant-mediated systems such as habitat, guardian, banker plants, indicator or trap plants increased significantly from 2016 to 2025, as did the use of microbial insecticides and pesticides with low toxicity to non-target organisms. A few practices were not commonly utilized, including pesticide treatments (either spot or preventative), beneficial nematodes, soil sanitization, replacing soil or using new media, use of disinfectants and use of diagnostic pathogen test kits. These could be topics for future educational programs.

Table 7. Management practices growers reported using in 2025 and 2016, highlighted % = significant increase in 2025 (>10%)

Practice	2025	2016
Routine scouting	98.0	95.0
Use of sticky cards	31.1	27.0
Inspect plant material shipments for insect pests/diseases upon arrival	33.3	ND
Pest/disease identification by farm staff	66.7	73.0
Pest/disease identification by Extension specialist or commercial scout	40.0	35.0
Pest/disease identification from university diagnostic lab	29.0	ND
Plant disease (pathogen) test kits (such as immunostrips)	2.2	2.0
Biorational pesticides (such as soap, oil, potassium bicarbonate, etc.)	35.6	29.0
Microbial insecticides (such as Bt, insect-killing fungi, etc.)	48.9	38.0
Microbial disease control products (such as Trichoderma, Bacillus, etc.)	31.1	22.0
Pesticides with low toxicity to non-target organisms	24.4	16.0
Preventative pesticide treatments	13.3	8.0
Spot pesticide treatments	28.9	14.0
Predators (such as lady beetles, predatory mites, etc.)	33.3	39.0
Parasites (such as parasitic wasps or flies, etc.)	31.1	27.0
Beneficial nematodes	20.0	12.0
Indicator or trap plants (such as marigolds for thrips, beans for spider mites)	17.8	14.0
Aphid banker plants	11.1	7.0
Habitat or guardian plants (flowering plants to attract/sustain beneficials)	37.8	18.0
Resistant or less susceptible crop varieties	66.7	49.0
Good airflow and ventilation	77.8	88.0
Screening vents to exclude pests	26.7	14.0
Weed-free environment	53.3	60.0
Soil steaming	4.4	ND[1]
Soil sanitation (solarization, fumigation, etc.)	4.4	6.0
Use new media or replace soil	4.4	6.0
Disinfectants to clean surfaces and irrigation lines (Zerotol®, Greenshield®, Sanidate®)	8.9	ND
Crop rotation	58.0	60.0
Fallow periods between crops	31.0	34.0

[2]ND = No data because this option was not offered in the 2016 survey.

Nutrient management and irrigation practices used in high tunnels

In both 2025 and 2016, over 60% of the respondents reported testing their soil at least once a year or every other year, whereas 12% never tested the soil in 2025 compared with 8% in 2016 (Table 8). Around 35% tested for soluble salts annually or every other year, while at least 36% never tested. Over 75% of growers reported never doing the saturated media extract test. This test is not available to all university soil testing laboratories, including UNH and . Plant leaf tissue analysis and petiole sap testing was rarely done. Practices to leach salts from soil (i.e., irrigation or and removing plastic) was done by less than half of the growers. The frequency of remixing beds before planting varied but was commonly done once per year or every other year. Around 18% of the respondents never re-mix the soil.

Table 8. Nutrient management practices used by growers in 2025 and 2016 (% of growers responding)

Nutrient Testing or Fertility strategy	Never		Once/3 yr		Every other yr		Once/yr		Over once /yr	
	2025	2016	2025	2016	2025	2016	2025	2016	2025	2016
Soil test	12.2	8.4	19.5	21.7	34.2	22.9	34.2	47.0	0.0	0.0
Soluble salts test	36.4	45.0	24.2	12.5	12.1	7.8	27.3	26.3	0.0	0.0
Saturated media extract (SME) test	75.9	63.6	6.9	6.5	6.9	16.3	10.4	19.5	0.0	0.0
Plant leaf tissue analysis	72.4	75.6	17.2	12.8	3.5	7.8	6.9	5.1	0.0	0.0
Petiole sap testing	96.5	96.1	3.5	0.0	0.0	3.9	0.0	1.4	0.0	0.0
Removing plastic covering to leach salts from soil	41.4	50.7	37.9	24.7	3.5	24.7	17.2	15.6	0.0	0.0
Irrigation to leach salts from soil	40.6	45.5	18.8	13.0	9.3	13.0	25.0	22.1	6.3	0.0
Re-mix beds before planting each crop	18.9	17.1	2.7	1.2	16.2	1.2	27.0	47.6	35.1	0.0
Use cover crops	59.4	ND[1]	9.4	ND	12.5	ND	12.5	ND	6.3	0.0
Use soil, plant tissue or water test results to adjust nutrient levels	40.0	ND	6.7	ND	13.3	ND	30.0	ND	10.0	0.0

[1] ND = No data because this question was not asked in the 2016 survey.

Fertilizers used. Over 50% of the respondents used no synthetic granular or soluble fertilizers (Table 9). In contrast, over 50% used a little or some/mostly used organic fertilizer (including liquid products). Around 50% of the respondents used compost made on-farm, while around 60% used off-farm made compost. Over 45% used no animal manuares in either 2016 or 2025.

Fertilizer application and irrigation practices. Around 80% of growers in 2016 and 2025 applied some or all fertilizers pre-plant, while around 50% applied fertilizers through the irrigation/drip system (e.g. fertigated) (Table 10). Most respondents (83-92%) uses drip irrigation, and around 38% used a timer to control the duration of irrigation. Over 55% of the respondents determined the timing of irrigation by the feel of the soil. The percentage of growers using a tensiometer to schedule irrigation events increased by around 10% from 2016 to 2025.

Table 9. Fertility strategies used in high tunnels (% of growers by year), highlighted % = significant increase in 2025 (>5%)								
	None		A little		Some/Mostly		Entirely	
Strategy	2025	2016	2025	2016	2025	2016	2025	2016
Synthetic granular fertilizers (e.g. 10-10-10, etc.)	66.7	73.0	15.2	ND	15.2	27.0	3.0	0.0
Synthetic soluble fertilizers (e.g. 15-5-15 Ca Mg, etc.)	72.4	72.0	3.5	ND	24.1	25.0	0.0	3.0
Organic fertilizers (e.g. 5-3-4, soybean meal, sul-po-mag, etc.)	22.2	23.0	30.6	ND	27.8	63.0	19.4	14.0
Organic liquid fertilizers (e.g. fish emulsion, seaweed emulsion, etc.)	20.6	26.0	38.2	ND	23.5	68.0	17.7	5.0
Compost made on-farm	36.4	39.0	21.2	ND	24.2	50.0	18.2	11.0
Compost made off-farm	41.2	42.0	20.6	ND	23.5	49.0	14.7	8.0
Animal manures	44.8	56.0	31.0	ND	10.3	36.0	13.8	8.0
Cover crops	53.3	ND[1]	26.7	ND	13.3	ND	6.7	ND
[1] ND = No data because this question was not asked in the 2016 survey.								

Table 10. Fertilizing and irrigation practices in 2025 and 2016 (% of growers who responded), highlighted % = significant increase in 2025 (>10%)		
	% of responses by year	
Statement	2025	2016
Some or all fertilizers are applied before planting	83.3	79.0
Some or all fertilizers are applied through irrigation (fertigated)	47.6	49.0
Some or all fertilizers are applied in side-dress applications during the season	42.9	38.0
Irrigation is done by hand-watering, or overhead application	31.0	19.0
Irrigation is done using drip irrigation or emitters	83.3	92.0
Irrigation is scheduled with a timer	38.1	36.0
Irrigation is determined by the feel of soil/media	66.7	55.0
Irrigation is guided by the use of a tensiometer or other soil moisture meter	16.7	5.0

Impact, Resources and Educational Sources and Needs for High Tunnel Production and IPM

Growers were asked what project sponsored educational events or activities they participated in over the past 8 years. Over 48% attended presentations about IPM or nutrient management, viewed a webinette or read a report linked with the project or worked directly with a project team member to solve a problem (Table 11). Participation in other activities were less common.

Table 11. Percentage of respondents who participated in project-sponsored educational activities (%)	
2023 High Tunnel Conference in Manchester NH	24.3
2018 High Tunnel Conference in Manchester NH	18.9
2016 High Tunnel Conference in Manchester NH	13.5
Twilight Meetings focused on High Tunnel Production & Research	32.4
Worked directly with project team member to solve a problem on your farm	48.7
Requested identification of a pest, disease or plant disorder from a diagnostic lab	46.0
Watched a webinette or read a research report related to high tunnel IPM or nutrient management	48.7
Attended a presentation on high tunnel IPM or nutrient management	54.1

To help service providers better serve the needs of growers, they were asked what resources and educational sources they used for their high tunnel production, fertilization and pest and disease management, and where they get information now. Growers were asked if over the past 8 years, they had adopted any of the practices listed below learned at local/regional educational activities (website, newsletter, workshops, conferences, etc.) that changed their crop yield or revenues (Table 12). For adoption of IPM, crop yield and/or revenues increased by 42% , and only 9% of the respondents indicated no IPM practices were adopted. In contrast, 52% of growers reported that use of biological control increased their yield/revenues. Even more growers (63%) reported increased crop yields/revenues as a result of use of fertility amentments.

Table 12. Impact from grower adoption of production practices (% of growers)

	Increased crop yield/revenues	Did not change yield/revenues	Reduced crop yield/revenues	Didn't adopt practice	Don't know
Use of IPM	42.4	15.2	0.0	9.1	33.3
Use of biological control	51.5	6.1	0.0	24.2	18.2
Use of fertility amendments	63.0	3.7	0.0	0.0	33.3

When asked if they made other changes in their production learned at our educational events that resulted in increased crop yield or revenues, 52% said yes and some specified the changes as indicated in the comments below.

- About 5 years ago we adopted no till methods with compost and amendments and noticed higher yields every year.
- I gleaned a lot of info from various sources on cutworm management which has drastically improved crop production on my farm.
- Several growers mentioned that improved irrigation methods increased their yields.
- We added a weather station which increased our awareness of problems.
- Improved storage life of crops was obtained through variety selection and post-harvest handling
- I observed increased yields of tomatoes through improved pruning and plant management.
- On farm amendments showed benefits and reduced costs! Proper fertilizer program doubled our tomato yields.
- We added habitat crops (sweet alyssum) for the past 2 years resulting in increased predator biodiversity, decreased thrips damage and increased yields.
- Orchard structure so that fruit trees could be placed under cover. Has allowed us to grow high quality organic fruit in a hostile environment.
- I now look for resistant varieties and use a lot of biocontrol/predators.
- In my 3rd year of high tunnel production, I am learning every day and making changes as needed
- I learned better management options for thrips and cutworms, learned how to id my pests better and use of a bioinsecticides and netting. These changes resulted in better quality fruits and vegetables.
- I use a lot of the advice I learn to help with fertility and sales.
- Screening for striped cucumber beetle eliminated the pest and resulted in substantial improvement to crop yield.

Soil fertility resources. Around 65% of respondents indicated that they would find information on how to interpret high tunnel soil tests somewhat or very necessary (Table 13). However, only 62.5% thought receiving advice on how to interpret soil tests was needed. A greater percentage (80.5%) said local guidelines for high tunnel fertility management would be helpful. Information on how to identify nutrient deficiencies was also ranked highly (>90% somewhat or very needed). Over 77% of respondents rated information on managing irrigation would be somewhat or very necessary.

Table 13. Information growers need to improve fertility management (% of growers), highlighted % = greatest needs in 2025.			
Resources	Not needed	Somewhat needed	Very needed
Information on how to interpret high tunnel soil tests	35.0	47.5	17.5
Someone to advise me on how to interpret my high tunnel soil tests	37.5	46.9	15.6
Local guidelines for high tunnel fertility management	19.4	58.3	22.2
Guidelines for use of specific sources of fertility (e.g. composts)	18.9	54.1	27.0
Strategies to manage soluble salts levels in high tunnels	19.5	48.8	31.7
Information on how to identify nutrient deficiencies	7.7	46.2	46.2
Information on managing irrigation	22.9	60.0	17.1
Cover crop use	27.0	54.1	18.9

Pest/disease/abiotic issues. When growers were asked from where they obtained information on crop production and management, 88% said from other growers (Table 14). Other primary sources of information included from university Extension specialists, the web and university researchers.

Table 14. Sources of information for growers on crop production and management (% of growers), highlighted % = greatest needs in 2025.	
From the web	67.4
University Extension specialists	74.4
Biological control suppliers	23.3
Commercial product suppliers	30.2
Other growers	88.4
Regional conferences	60.5
University researchers	34.9
Textbooks	18.6
New England Vegetable Guide	55.8

Growers were asked what resources or information would help them manage insect and disease pests or abiotic issues in high tunnels. Over 30-40% of growers in 2025 rated the following as very needed: biological control guidelines, identification of diseases and pests, pest/disease id services and abiotic management (Table 15). A higher percentage of growers identified these subjects as very needed in 2016. Other subject ranked in 2025 as somewhat needed included scouting methods for specific pests, action thresholds, abiotic issue identification, and lists of pest-resistant varieties. Most growers indicated that they did not need information spray application methods. Many of the topics that had been rated as very needed in 2016 decreased in importance to somewhat needed, including biocontrol guidelines, scouting methods, pest/disease identification tools. This suggests that responding growers have gained knowledge or confidence in these topics over the past 8-9 years.

Table 15. Information needed to improve management of insect pests, disease problems and abiotic issues (% of growers), highlighted % = greatest needs in 2025.						
Subject	Not needed		Somewhat needed		Very needed	
Information on pest/disease/abiotic issues	2025	2016	2025	2016	2025	2016
Biological control guidelines for high tunnels in our region	8.3	2.0	52.8	40.0	38.9	58.0
Scouting methods for specific pests	17.2	8.0	72.4	34.0	10.3	58.0
Identification tools for diseases and pests	8.3	6.0	52.8	29.0	38.9	65.0
Pest and disease identification service	6.1	15.0	51.5	30.0	43.4	55.0

Table 15. Information needed to improve management of insect pests, disease problems and abiotic issues (% of growers), highlighted % = greatest needs in 2025.						
Information on pesticide/biocontrol compatibility	28.6	20.0	42.9	38.0	28.6	42.0
Lists of pest-resistant plant varieties	13.8	5.0	55.2	37.0	31.0	58.0
Pest/disease biology	14.3	12.0	53.6	38.0	32.1	50.0
Spray application methods	50.0	22.0	35.7	48.0	14.3	30.0
Degree-day monitoring	27.6	22.0	51.7	40.0	20.7	38.0
Action thresholds	3.7	6.0	66.7	40.0	29.6	54.0
Cost benefit analyses	28.0	12.0	40.0	46.0	32.0	42.0
Abiotic/physiological issue id	20.8	ND	50.0	ND	29.2	ND
Abiotic/physiological issue management	17.4	ND	47.8	ND	34.8	ND

Survey participants were also asked how they would like to receive information that would help them manage pests, diseases and crop and soil fertility. In 2025 the three highest rated were web-based resources, a website dedicated to high tunnel production and in-person workshops or conferences (Table 16).

Table 16. Resources growers identified that would improve pest disease management and crop and soil fertility (% of responses)		
Resources	2025	2016
Web-based resources	76.7	78.0
Printed resources	27.9	ND
Fact sheets focused on specific topics	46.5	81.0
Complete reference on high tunnel production for the Northeast	48.8	ND
Quarterly newsletter	7.0	ND
Twilight meetings at research or farm sites	41.9	58.0
Workshops and conferences in person	53.5	77.0
Workshops and conferences online	37.2	
On-farm visits from specialists	58.8	7.0
Webinars (typically 30m-1hr)	44.2	39.0
Short instructional videos or "webinettes" (5-10 minutes max)	48.8	57.0
Social media posts (on Instagram, Facebook, etc.)	9.3	ND
Grower email listserves	25.6	ND
Website dedicated to high tunnel production	60.5	ND
[1] ND = No data because this question was not asked in the 2016 survey.		

Conclusions

This survey provided valuable insights into the current status of adoption of IPM practices and soil fertility management by high-tunnel growers. It also demonstrated changes in skill levels and resource needs as identified by growers. Most respondents used between 1,000-10,000 sq ft of high tunnels, which is likely equivalent to 2-4 high tunnels per operation, though it all depends on the tunnel dimensions. Tomatoes and greens continue to be the crops most commonly grown in high tunnels, though crop diversification is expanding and use of tunnels in the winter has increased since 2016.

Though aphids continued to rank #1 among the arthropod pests, they appeared to be less of a problem than in 2016. Powdery mildew was the #1 disease, similar to 2016. Tomato hornworm continued to be an issue in high tunnel tomatoes as well. Cucurbit viruses surfaced as a moderate problem, which may indicate an increase in production of cucumbers in high tunnels. General use insecticides and fungicides were commonly applied 1-3

times over the season, while restricted use pesticides were less often used. Minimal changes in pesticide use were observed from 2016 to 2025.

In general, the management practices growers reported using remained similar in both survey years, with almost all using routine scouting, relying on farm staff to identify pests and diseases, ensuring good ventilation and following recommended crop rotation methods. A few notable changes were observed however. For example, from 2016 to 2025 use of habitat or guardian plants increased over 19%, while use of resistant or less susceptible crop varieties increased ~18% and spot pesticide sprays increased 15%.

Around 88% of growers surveyed tested their soil at least every 3 years, which is slightly more than in 2016. In contrast only 64% tested for soluble salts and 24% completed the saturated media extract test (a test that is not readily offered by university soil testing labs in our area). Around 81% of respondents re-mix their beds before planting, which was similar to 2016. Only 60% used soil, plant tissue or water test results to adjust nutrient samples. Most growers who responded used a mixture of organic fertilizers and compost, and the percentages increased from 2016 to 2025. Specifically, a 12.5% increase in the proportion of growers using organic liquid fertilizers entirely was observed. A 6-7% increase in the use of compost (made on- or off farm) entirely was also reported. The growing of cover crops in high tunnels is relatively rare, with over 50% never growing them. This is a topic worth further investigation given its positive impact on soil fertility. Most growers surveyed apply fertilizers before planting and use drip irigation, similar to in 2016. The percentage using a soil moisture meter increased over 11% from 2016 to 2025.

Between 42-63% of the responding growers indicated that their crop yield or revenues increased as a result of adopting practices they learned through our SARE-funded high tunnel project. Given the extensive time iunvested in outreach for this project over the past 5 years, it is gratifying to Growers identified a wide range of information they need to improve management of fertility, insects and disease and abiotic issues. Regarding fertility and irrigation they requested information on irrigation, id of nutrient deficiencies and local guidelines for high tunnel fertility. For mangement of insect pests, diseases and abiotic issues, growers requested local biocontrol guidelines for high tunnels and tools for identification of diseases and pests. Over 76% of respondents requested web-based resources located on a site dedicated to high tunnel production. Over 90% identified workshops and conferences in person (53.5%) and on line (37.2%) as resources they would value to enhance their high tunnel crop production practices.

This survey will serve as a valuable guide for developing future research and outreach activities to continue to meet the needs of high tunnel growers in terms of improving the quality and quantity of their crops and enhancing the cost-effectiveness and environmental sustainability of their production.

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