

Survey of Energy Use and Energy Conservation in Greenhouse Production in Northern New England

Summary of Results December 2011

by

Margaret Skinner & Bruce L. Parker
University of Vermont Entomology Research Laboratory
661 Spear Street, Burlington, VT 05405-0105



This survey was conducted among growers in Maine, New Hampshire and Vermont in 2010-2011 to obtain baseline information on energy consumption and conservation measures used in greenhouses. Results will provide key information on the current status of energy use in the region, and lead to targeted programs that effectively meet grower needs. A total of 53 surveys were completed from the 2,000 sent out, the results of which are summarized below.

Key outcomes:

Responses differed significantly in the three states, but for simplicity, below are the results averaged among all states.

- 56.6% of the growers surveyed were retail vegetable growers, 66% were retail ornamental growers and 52.8% were co/owners of a horticultural business
- 34.0% had 1-2 full time employees, 26.4% had over 6, 13.2% had 3-4 and 17% had none.
- Bedding plants accounted for 28.5% of revenue for the growers surveyed, 11.8% were vegetables, 11.7 were flowering potted plants, 11.3 were perennials and 9.5 were vegetable starter plants.
- About 50% of the operations had less than 10,000 ft² of greenhouse space; 26.4% had 10,000-25,000 ft².
- Across all three states, the percentage of greenhouse space used increases from January to May. Usage peaks in May to 95.3% and gradually decreases over the rest of the year
- 49.1% of the growers surveyed use oil to heat their greenhouses, 47.2% used propane gas, and 22.6% used wood fired heaters.
- 62.3% of those surveyed spent less than \$10,000 on fuel annually; 5.7% used \$25,000-50,000.
- To save energy 58.49% of the growers surveyed adjust their planting dates, 56.6% seal gaps around doors and vents, 51% get their boiler or furnace checked annually, 45% insulate the endwalls, 28% use bottom heat, 23% use energy efficient light bulbs. 47.2% use electronic thermostats and horizontal air flow systems, The most popular energy saving measure for all states surveyed was adjusting planting dates (of total)
- When asked what limits them from improving energy conservation, 37.7% said it was too expensive, 17% said they didn't have time or didn't know the cost benefits, 15% didn't know if they qualified for tax incentives and 11% didn't know what to do.
- When asked what would help them adopt more energy conservation measures, **51% said providing tax incentives** would be the most helpful; **43% said providing free energy audits**, **40% felt they needed assistance with learning what programs were available** to help them.
- When asked what research information would help them adopt more energy conservation, **39.6% said cost benefit analyses** would be the most helpful, 34% said learning what benefits they would receive from making changes would help, and 21% felt guidelines on what to do to reduce energy use was needed.

Personnel at the UVM Entomology Research Laboratory are working with growers in Maine, New Hampshire and Vermont to arrange for energy audits through various state and federal programs. Growers who are interested in having an energy audit should contact Margaret Skinner to learn how to get involved. Tel: 802-656-5440; email: mskinner@uvm.edu

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Data tables by survey question

1. What is your type of business?

Response	All States	ME	NH	VT	Other
Retail vegetable grower	56.6	54.55	45.45	68.42	0
Retail ornamental grower	66	59.09	63.64	78.95	0
Landscaper	22.6	18.18	27.27	26.32	0
Head grower	39.6	36.36	45.45	42.11	0
Research tech.	1.89	4.55	0	0	0
Wholesale vegetable grower	30.2	36.36	18.18	31.58	0
Wholesale ornamentals grower	32.1	40.91	18.18	26.32	100
Garden center	47.2	31.81	63.63	52.63	100
Greenhouse worker	17	9.09	27.27	21.05	0
Interiorscapes	5.66	4.55	9.09	5.26	0
Cut flower grower	25	13.64	36.36	33.33	0
Co/Owner	52.8	59.09	45.45	47.37	100
Univ. researcher	3.77	9.09	0	0	0
Other (specify)	15.1	18.18	9.09	15.79	0

2. Where is your business located?

State	% Total	Number surveyed
Maine	41.5	22
New Hampshire	20.8	11
Vermont	35.8	19
Other (PA)	1.89	1

3. How many full time employees do you have?

Response	All States	ME	NH	VT	PA
None	17	27.27	0	15.79	0
1-2	34	45.45	27.27	21.05	100
3-4	13.2	13.64	0	21.05	0
5-6	7.55	9.09	18.18	0	0
Over 6 (number)	26.4	4.55	54.55	36.84	0
NA	1.89	0	0	5.26	0

4. What percentage of your revenue comes from greenhouse crops?

Response	All States	ME	NH	VT	PA
Bedding plants	28.5	33.41	33	20.79	20
Flowering potted plants	11.7	8.5	7.64	15.74	50
Foliage plants	3.83	2.5	2.09	6.58	0
Perennials	11.3	9	20.27	9.47	0
Cuttings/plugs	4.34	9.09	0	1.58	0
Cut flowers	3.34	2.14	1.91	5.74	0
Vegetables	11.8	5.68	11.73	18.05	30
Vegetable starter plants	9.51	12.86	3.45	9.63	0
Other (3-4)	6.62	8.18	7.27	4.79	0
Other (5-7)	2.21	0.23	3.36	3.95	0

5. How many square feet of greenhouse do you have (ft.²)?

Response	All States	ME	NH	VT	PA
1-10,000	50.9	68.18	27.27	47.37	0
10,001-25,000	26.4	27.27	36.36	15.79	100
25,001-50,000	15.1	4.55	18.18	26.32	0
50,001-75,000	1.89	0	9.09	0	0
75,001-100,000	1.89	0	0	5.26	0
Over 100,000	1.89	0	9.09	0	0

6. What percentage of greenhouse space do you use per month

Month	All States	ME	NH	VT	PA
Jan	20.8	18.05	30	18.21	30
Feb	28.2	22.73	40.45	25.74	60
Mar	60	60	67.64	53.47	100
Apr	87.2	87.5	89	85.26	100
May	95.3	95.45	100	92.11	100
Jun	79.7	75	90.91	80.21	50
Jul	52.6	44.77	74.73	51.63	0
Aug	42.3	36.36	65	38.37	0
Sept	39.8	32.95	53.18	42.21	0
Oct	33.1	25.45	50	33.79	0
Nov	25.7	25.23	43.18	17.58	0
Dec	22.6	18.64	40.91	16.53	0

7. What kind of heating and cooling systems do you use?

Response	All States	ME	NH	VT	PA
Oil fired heater	49.1	63.64	54.55	31.58	0
Propane gas fired heater	47.2	36.36	27.27	68.42	100
Wood fired heater	22.6	22.73	0	36.84	0
Pellet fired heater	9.43	4.55	18.18	10.53	0
Solar powered heater	0	0	0	0	0
Swamp cooler	0	0	0	0	0
Horizontal air vents	37.7	18.18	54.55	47.37	100
Geothermal heating syst.	3.77	4.55	0	5.26	0
Electronic thermostats	41.5	45.45	36.36	36.84	100
Horizontal air flow syst.	41.5	31.82	45.45	47.37	100
Manure heating systems	0	0	0	0	0
Wind generator system	0	0	0	0	0
Bottom heat	22.6	13.64	27.27	31.58	0
Biodiesel fired heater	0	0	0	0	0
None	3.77	4.55	9.09	0	0
Other	17	18.18	18.18	15.79	0
Other	7.55	13.64	9.09	0	0
Other	0	0	0	0	0

8. How much do you spend per year on fuel?

Response	All States	ME	NH	VT	PA
Less than \$10,000	62.3	81.82	36.36	52.63	100
\$10,001-25,000	24.5	18.18	45.45	21.05	0
\$25,001-50,000	5.66	0	9.09	10.53	0
\$50,001-75,000	1.89	0	0	5.26	0
Over \$100,000	1.89	0	9.09	0	0

9. How much do you spend per year on electricity?

Response	All States	ME	NH	VT	PA
Less than \$10,000	90.6	95.45	90.91	84.21	100
\$10,001-25,000	1.89	4.55	0	0	0
\$25,001-50,000	1.89	0	0	5.26	0
\$50,001-75,000	1.89	0	9.09	0	0
Over \$100,000	0	0	0	0	0

10. How many energy saving measures do you use in your greenhouses?

Response	All States	ME	NH	VT	PA
High efficiency boiler	9.43	0	18.18	15.79	0
High efficiency furnace	24.53	27.27	9.09	31.58	0
Insulation energy curtain	13.21	18.18	18.18	5.26	0
Oil heater	26.42	36.36	36.36	10.53	0
Solar water storage	3.77	4.55	0	5.26	0
Use DIF	22.64	13.64	36.36	21.05	100
High insulation plastic	42.31	50	60	26.32	0
Seal gaps around doors & vents	56.6	50	72.72	52.63	100
Electronic thermostats	47.17	54.55	36.36	42.11	100
Bottom heat	28.3	22.73	27.27	36.84	0
Horizontal air flow system	47.17	22.73	72.73	57.89	100
Geothermal heating system	1.89	0	0	5.26	0
Energy efficient light bulbs	22.64	27.27	9.09	26.32	0
Wind generator	1.89	0	0	5.26	0
Bubble insulation system	20.75	31.82	9.09	10.53	100
Solar panels	1.89	0	0	5.26	0
Energy audit	7.55	4.55	18.18	5.26	0
Annual furnace/boiler checkup	50.94	63.64	63.63	26.32	100
Don't grow cold sensitive plants	16.98	22.73	18.18	5.26	100
Remay covering over crops	22.64	13.64	27.27	31.58	0
Plastic covering over crops	9.43	9.09	9.09	10.53	0
Adjust planting dates	58.49	50	63.64	63.16	100
Grower cool-temperature plants	30.19	31.82	45.45	15.79	100
Side wall insulation	33.96	27.27	36.36	42.11	0
End wall insulation	45.28	36.36	45.45	52.63	100
Other type of heat storage	0	0	0	0	0
Other	9.43	13.64	9.09	5.26	0

11. What limits you from improving your energy conservation (1=least limiting, 3=most limiting)?

Response	All States			ME			NH			VT			PA		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
No limits	11.3	0	0	13.6	0	0	18.2	0	0	5.3	0	0	0	0	0
Too expensive	15.1	20.8	37.7	9.1	22.7	45.5	0	27.3	36.4	31.6	10.5	31.6	0	100	0
Negative impact on production	37.7	3.8	3.8	36.4	9.1	9.1	54.5	0	0	31.6	0	0	0	0	0
Don't have time to make the changes	24.5	15.1	17.0	40.9	9.1	13.6	18.2	27.3	18.2	10.5	15.8	21.1	0	0	0
Don't know what to do	24.5	26.4	11.3	27.3	13.6	22.7	18.2	45.5	0	26.3	26.3	5.3	0	100	0
Don't know the cost benefits	13.2	26.4	17.0	18.2	22.7	27.3	0	45.5	18.2	15.8	21.1	5.3	0	0	0
Don't know if I qualify for tax incentives	24.5	20.8	15.1	27.3	18.2	18.2	36.4	27.3	18.2	15.8	21.1	10.5	0	0	0
It is too complicated	20.8	18.9	7.5	22.7	27.3	4.5	27.3	18.2	18.2	10.5	10.5	5.3	100	0	0
Other	13.2	0	3.8	18.2	0	0	18.2	0	0	5.3	0	10.5	0	0	0
Other	1.9	0	1.9	4.5	0	0	0	0	0	0	0	5.3	0	0	0

12. What would help you adopt more energy conservation measures (1= little helpful, 3=very helpful)?

Response	All States			ME			NH			VT			PA		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Provide free energy audits	22.6	17.0	43.4	13.6	0	0	18.2	36.4	45.5	21.1	10.5	36.8	100	0	0
Provide tax incentives	17.0	18.9	50.9	9.1	22.7	45.5	18.2	9.1	72.7	10.5	26.3	36.8	0	100	0
Information fact sheets	30.2	26.4	17.0	36.4	9.1	9.1	36.4	27.3	27.3	26.3	26.3	5.3	100	0	0
Demonstration programs	28.3	34.0	13.2	40.9	9.1	13.6	18.2	54.5	18.2	45.5	26.3	5.3	0	0	0
Educational workshops	28.3	26.4	24.5	27.3	13.6	22.7	18.2	27.3	45.5	21.1	21.1	15.8	0	0	100
Assistance with learning of available programs	11.3	28.3	39.6	18.2	22.7	27.3	9.1	27.3	63.6	10.5	21.1	31.6	0	100	0
Create professional energy advising service	20.8	32.1	17.0	27.3	18.2	18.2	18.2	45.5	27.3	10.5	31.6	15.8	0	0	0
Conduct efficacy trials and publish results	32.1	20.8	18.9	22.7	27.3	4.5	45.5	18.2	27.3	26.3	15.8	15.8	0	0	0
Computer links to communicate problems	39.6	20.8	9.4	18.2	0	0	54.5	18.2	18.2	31.6	26.3	0	0	0	0
Other	3.8	1.9	0	4.5	0	0	0	9.1	0	5.3	0	0	0	0	0

13. What research/information is needed to help you implement more energy conservation (1=low need, 3=great need)?

Response	All States			ME			NH			VT			PA		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Cost benefit analysis	5.7	34.0	39.6	9.1	18.2	50	9.1	45.5	45.5	0	42.1	26.3	0	100	0
Energy saving benefits	13.2	37.7	34.0	13.6	27.3	45.5	27.3	27.3	45.5	5.3	52.6	15.8	0	100	0
Negative production aspects	28.3	35.9	7.5	27.3	36.4	13.6	27.3	54.5	9.1	31.6	21.1	0	0	100	0
Production guidelines that reduce energy use	24.5	35.9	20.8	22.7	40.9	22.7	27.3	36.4	27.3	26.3	26.3	15.8	0	100	0
Degree day monitoring	37.7	28.3	7.5	40.9	27.3	4.5	36.4	27.3	27.3	31.6	26.3	0	10	0	0
Other	3.8	0	0	0	0	0	0	0	0	10.5	0	0	0	0	0