Overview of High Tunnels



Pretty good definition of a high tunnel.
Vermont Department of Taxes, bulletin TB-21

SUBJECT: Removable Greenhouses

ISSUED: 5/3/2000

REFERENCE: 32 V.S.A. § 3618

A greenhouse owned and used by a commercial nursery that is removable without material injury to the underlying realty is business personal property under 32 V.S.A. § 3618. A greenhouse that is affixed to the underlying realty in a manner that would result in material injury to the realty were it to be removed is, in most cases, an improvement to the underlying real estate and its value should be included in the parcel's real property assessment.

Greenhouses with concrete floors are not high tunnels



Longwind Farm, E. Thetford

“Caterpillar” tunnels are not really high tunnels



Root5 Farm, Fairlee

Plastic-covered hoops (low tunnels) are not high tunnels



Adam's Berry Farm, Charlotte

In the mid-1980's Dr. Otho Wells at UNH established the first high tunnel research program on a U.S. experimental farm

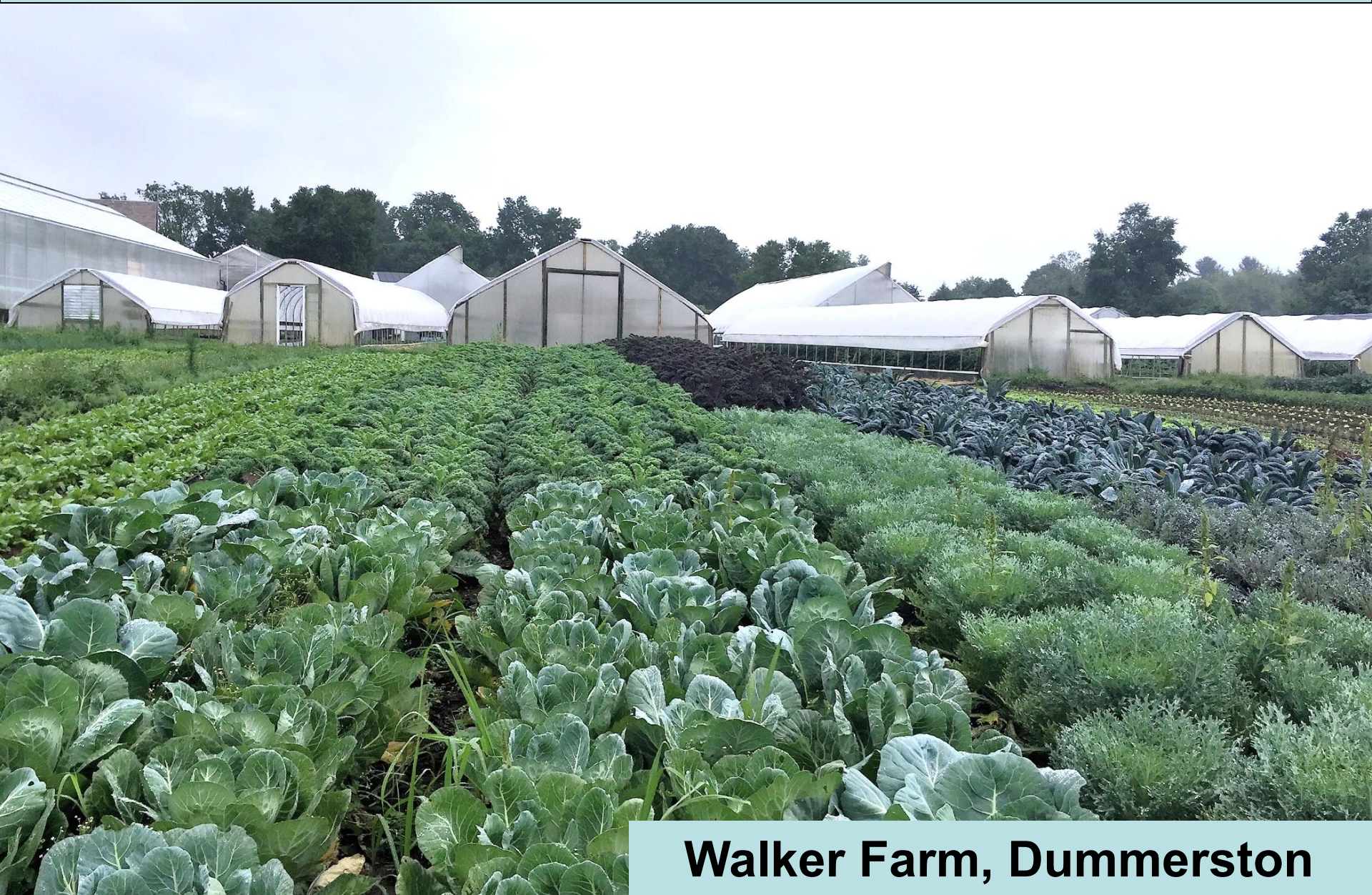


Ed Person, NH high tunnel pioneer and frame fabricator, started Ledgewood Farm Greenhouse Frames in 1987



Over 30+ years he’s produced 8,000 tunnel frames

Today, high tunnels have many shapes, sizes, and systems



Walker Farm, Dummerston





Systems vary to meet the needs of crop, markets, grower





Lots of high tunnels in the Northeast

Table 2. Number, area, and value of high tunnel funding provided by US Department of Agriculture Natural Resources Conservation Service in New England and New York from 2010 to 2019. Data provided by LeRoy Hall, Data Services Branch.

	Tunnels completed	Square footage completed	Payments, completed tunnels	Tunnels planned	Square footage planned	Obligated, planned tunnels	Total Tunnels	Total square footage	Total paid and obligated
CT	214	487,305.4	$2,021,767	37	90,244.0	$410,442	251	577,549.4	$2,432,209
ME	532	1,075,212.7	$4,225,069	193	473,860.1	$2,162,903	725	1,549,072.8	$6,387,972
MA	293	690,556.2	$2,770,036	62	156,688.1	$729,072	355	847,244.3	$3,499,108
NH	378	712,072	$2,935,707	53	129,204.1	$580,625	431	841,276.1	$3,516,332
NY	475	991,936	$3,242,753	92	224,689.1	$1,046,203	567	1,216,625.1	$4,288,956
RI	138	309,005.4	$1,248,560	47	104,942.0	$483,157	185	413,947.4	$1,731,717
VT	323	711,351.5	$2,536,072	101	267,995.1	$1,239,493	424	979,346.6	$3,775,565
Total	2,139	4,490,134	$16,958,197	548	1,357,379	$6,241,453	2,687	5,847,512	$23,199,650

Economics and Policy Analysis Division Farm Production and Conservation Business Center, US Department of Agriculture, Beltsville, MD, USA, 20 Nov 2018. Data Source: NRCS ProTracts Data FY18.

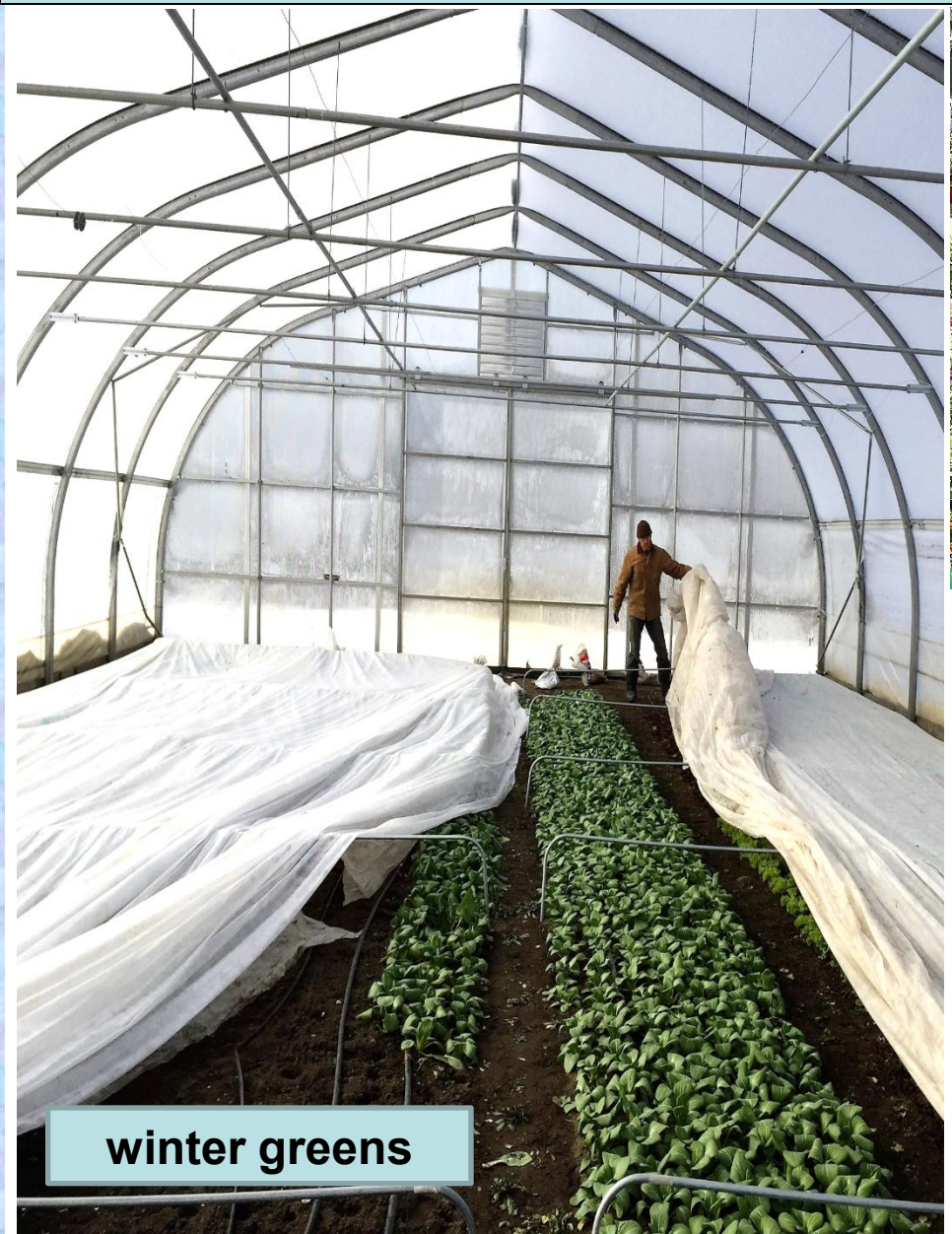
CT = Connecticut; MA = Massachusetts; ME = Maine; NH = New Hampshire; NY = New York; RI = Rhode Island; VT = Vermont.

Proof Only

Since 2010, many have been funded by NRCS

A Current View of High Tunnel Tomato Production in New England
Grubinger and Maden, 2025. 10.21273/HORTTECH05779-25

Three common high tunnel production systems







KISS summer crops: unheated, passive ventilation, drip



Unity Farm, Charlotte

KISS winter crops: unheated, passive ventilation, row covers



Footprint Farm, Starksboro


Two furnaces, fans, auto vents, thermostats, irrigation, etc.
Intervale Community Farm, Burlington

Moveable tunnels:
Allow overlap of summer and winter crops



Joe's Brook Farm, Barnet



Tunnel set up for seedling production



Sweetland Farm, Norwich

Three-season gutter-connected ‘Haygrove’ tunnels



Four Corners Farm, S. Newbury

Low cost ‘caterpillar-ish’ tunnels



Pomykala Farm, Grand Isle

Season extension of fall raspberries



High Meadows Farm, Putney

Keeping the rain off grapes



Northeast Vine Supply, Pownal

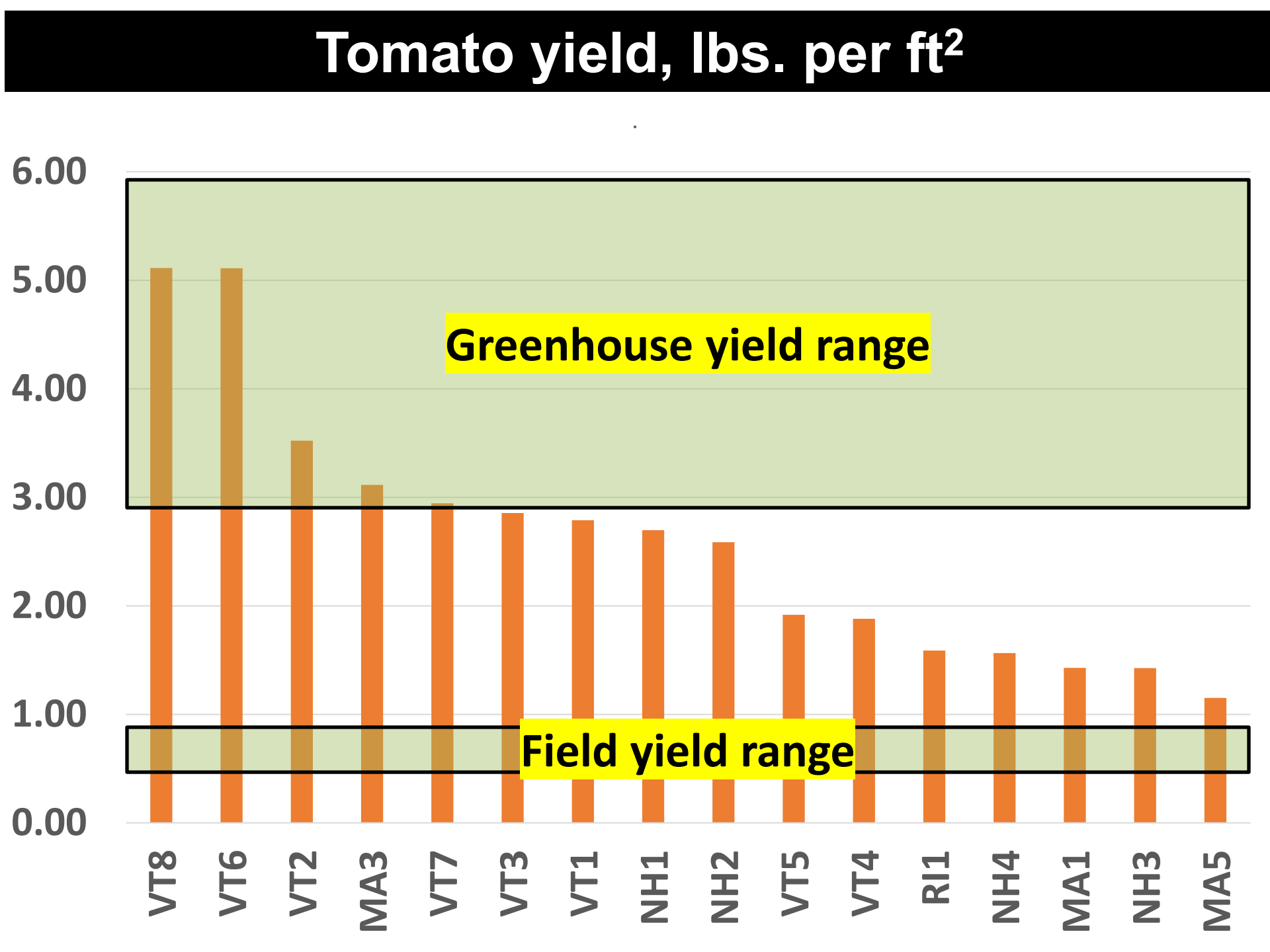

Really early potatoes!

Tomatoes have strong market demand, use vertical space, and quality and yield are much improved in high tunnels.



Woods Market Garden, Brandon

Tomato yield, lbs. per ft^2



May – November growing season is not uncommon



May 1st



June



July



August



September



November

Conventional growers can use “grow bags’” or other systems that provide a known quantity of available nutrients



Sam Mazza’s Farm Market, Colchester

It’s more challenging to optimize in-ground soil fertility




Feed me now…and feed me later =
soluble and reserve nutrients

Best to use both the Saturated Media Extract (SME) test AND the modified Morgan's field soil test: to measure soluble AND reserve nutrients

ANALYSIS OF SATURATION EXTRACT

pH: 6.9
Soluble Salts (mS/cm): 2.27

Macronutrients	mg/L
Nitrate-N (NO3-N):	162
Ammonium-N (NH4-N):	3
Phosphorus (P):	8
Potassium (K):	112
Calcium (Ca):	211
Magnesium (Mg):	116
Sulfur (S):	96

Micronutrients	mg/L
Zinc (Zn):	0.04
Boron (B):	0.18
Manganese (Mn):	0.04
Copper (Cu):	0.10
Iron (Fe):	0.69
Sodium (Na):	83.19

SME also measures nitrate-N, ammonium-N, soluble salts

Evaporation brings salts to surface



Mix soil deeply to distribute salts (and nutrients)
or take tunnel cover off an allow rain to leach salts

Build tunnels on raised pads, especially with heavy soil



Leave adequate space between tunnels: shading, snow removal, mowing



Cate Farm, Plainfield

Build for worst case snow, rain, wind



Nola's Gardens, Ripton

Perimeter insulation keeps tunnel edges warmer



Boyd Family Farm, Dover

Fuel use and heating costs can be significant



Propane and oil heating systems are common





“Renewable energy” heat systems can be a lot of work



Blais Farm, Springfield

Automated wood pellet / shell corn boiler and bin



Lewis Creek Farm, Starksboro

Moving heat to tunnel air, benches, and/or the ground



Chris Callahan, UVM Extension agricultural engineer



Raised beds warm up earlier without heat,
also make sense on sites with poor soil conditions


Chickweed can be a big problem in winter tunnels

Soil steaming can suppress weeds, and soil diseases



Picadilly Farm, Winchester NH


Steam applied under a tarp

Many growers use grafted tomato plants, rootstocks tolerate soil disease and increase vigor





show me the money



High tunnel tomato enterprise budgets

source	net returns / sq. ft.
Cornell 2009	**$3.61**
Washington State 2011	**$2.90**
Utah State 2011	**$1.29**
Iowa State 2013	**$3.18**
Northern NY Ag. Devel. 2015	**$2.50**
Penn State 2020	**$0.48**

Average = $2.33 / sq. ft.

30’ x 96’ high tunnel = $6,710 net returns

Equivalent to $101,495 net returns / acre


Thank you
THE UNIVERSITY OF VERMONT
EXTENSION