



A Comparison of Northern Utah High Tunnel Strawberry Production Costs and Returns with Low Tunnels and Supplemental Heating

Tiffany Maughan, Research Associate, Department of Plants, Soils and Climate
Kynda Curtis, Associate Professor and Extension Specialist, Department of Applied Economics
Brent Black, Professor and Extension Specialist, Department of Plants, Soils and Climate
Dan Drost, Professor and Extension Specialist, Department of Plants, Soils and Climate

Introduction

High tunnels have been shown to be successful and profitable when used for strawberry production in Utah. This publication uses partial budgets to compare the costs, returns and resulting changes in net income when supplemental heating is added to a high tunnel plus low tunnel system. Data for two soil heating temperatures (45 and 60 °F) for two different strawberry cultivars, 'Seascape' and 'Chandler,' were collected through a research study conducted at Utah State University across a two year period. Costs and returns for the baseline high tunnel strawberry production system are taken from Rowley et al. (2010). Practices, yields, costs, and pricing are not applicable to all situations as management, cultural practices, markets, and growing conditions vary across the region.

Tunnels, Supplies and Labor

The expenses presented in the partial budgets are based on a 14 x 96 foot high tunnel with an annual hill growing system. In addition to the high tunnel, each bed was covered with a low tunnel. A complete description of low tunnel construction can be found in (Maughan et al., 2014). Heavy-duty electric heating cables were used to heat the soil, see Image 1 (Wrap-On Company Inc., Bedford Pak, IL). The remaining supply costs were priced based on the 2013 average cost through local suppliers in Logan, UT. Labor was priced at \$10 per hour. Quantity of hours needed per activity was recorded and averaged over the study period, although depending on tools and experience, time needed may vary. The additional costs of the low tunnel and the supplemental heating are detailed in Table 3.

Crop Pricing

Early strawberries typically command price premiums over in-season production. Based on interviews with strawberry growers in Utah, the pricing used is \$4.50 per pound for in season and \$6.00 per pound for early season strawberries sold through direct markets. Price per pound will vary by market and geographical area.



Image 1. Electric heating cable partially buried in soil.

Calculated Yield

Yield data (quantity of one pound clamshells) were collected in North Logan, UT. Figure 1 shows total yield per plant for both cultivars under each treatment. Early yields used for the comparison analysis were 373 and 225 pounds per unheated high tunnel for 'Chandler' and 'Seascape' respectively. In-season yields were 472 and 379 pounds per unheated high tunnel for 'Chandler' and 'Seascape' respectively. Early yield was calculated as

the total amount of strawberries produced before non-protected field production begins. Some heat treatments resulted in very early yield. Although partial budgets were based off of one price for all early yields, both very early and early, if a market could be secured to sell the very early fruit at a higher price, net income may be increased. For the high tunnel only system, the yield amount was averaged over the study period. High tunnel plus low tunnel system yield was based on 2012 production data only.



Depreciation

Asset depreciation of the low tunnels and heating cables was calculated using straight line depreciation and assumed no salvage value at the end of the useful life. Total cost of investment was divided by the number of years the asset is assumed to be useful resulting in the annual depreciation cost.

Straight Line Depreciation Computation

$$\left(\frac{\text{Purchase Price} - \text{Salvage Value}}{\text{Useful Life}} \right)$$

Summary of Results

For both cultivars ('Chandler' and 'Seascape') and both heating levels (45 and 60 °F), net income was increased with the application of supplemental heating. The increase was more dramatic for 'Chandler' than 'Seascape' (Tables 1 and 2, respectively). The addition of 45 °F heating resulted in a \$940.14 higher net income than the high tunnel only system for 'Chandler' and a \$93.69 higher net income for 'Seascape' per 96 foot high tunnel. Supplemental heating set at 60 °F resulted in a \$1,073.29 increase in net income over the high tunnel only system for 'Chandler' and a \$318.84 increase for 'Seascape' per 96 foot high tunnel.

References

- Maughan, T., D. Drost, B. Black. 2014. Low Tunnels: A Low-cost Protected Cultivation Option. Utah State University Fact Sheet, Horticulture/HighTunnels/2014-03pr.
- Rowley, D., B. Black and D. Feuz. 2010. High Tunnel June-bearing Strawberry Budget 2010, Based on a 14' x 96' High Tunnel. 2010 Utah Agriculture Statistics and Utah Department of Agriculture and Food Annual Report. p. 94.

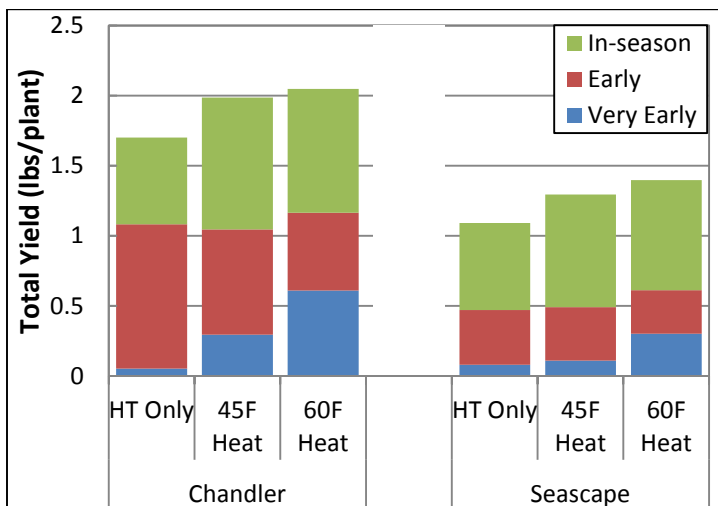


Figure 1. Total yield across treatments and cultivars, 2012. Very early: February – April, **Early:** May, **In-season:** June – July

Table 1. Comparison of Supplemental Root Zone Heating at 45 and 60 °C on Chandler' June-bearing Strawberry

Partial budget comparing 'Chandler' high tunnel+low tunnel strawberry production with and without the use of 45 °C supplemental heating.

Revenues	
Unheated High Tunnel	
Early Out-of Season Strawberries	\$2,238.70
In-Season Strawberries	\$2,122.61
Unheated Total	\$ 4,361.31
Heated High Tunnel + Low Tunnel	
Early Out-of Season Strawberries	\$ 3,154.34
In-Season Strawberries	\$ 2,568.38
Heating Total	\$ 5,722.72
Costs	
Added Costs of Low Tunnel*	\$ 192.47
Added Costs of Heating Material*	\$ 228.79
Resulting Change in Net Income	
Difference in Revenue	\$ 1,361.40
Difference in Costs	\$ (421.26)
Total Change	\$ 940.14

*See Table 3 for breakdown of material costs.

Partial budget comparing 'Chandler' high tunnel+low tunnel strawberry production with and without the use of 60 °C supplemental heating.

Revenues	
Unheated High Tunnel	
Early Out-of Season Strawberries	\$2,238.70
In-Season Strawberries	\$2,122.61
Unheated Total	\$ 4,361.31
Heated High Tunnel + Low Tunnel	
Early Out-of Season Strawberries	\$ 3,599.74
In-Season Strawberries	\$ 2,360.28
Heating Total	\$ 5,960.02
Costs	
Added Costs of Low Tunnel*	\$ 192.47
Added Costs of Heating Material*	\$ 332.95
Resulting Change in Net Income	
Difference in Revenue	\$ 1,598.71
Difference in Costs	\$ (525.42)
Total Change	\$ 1,073.29

Table 2. Comparison of Supplemental Root Zone Heating at 45 and 60 °C on ‘Seascape’ Day-Neutral Strawberry

Partial budget comparing 'Seascape' high tunnel+low tunnel strawberry production with and without the use of **45 °C** supplemental heating.

Revenues	
Unheated High Tunnel	
Early Out-of Season Strawberries	\$ 1,336.21
In-Season Strawberries	\$ 1,705.86
Unheated Total	\$ 3,042.07
Heated High Tunnel + Low Tunnel	
Early Out-of Season Strawberries	\$ 1,365.42
In-Season Strawberries	\$ 2,191.61
Heating Total	\$ 3,557.03
Costs	
Added Costs of Low Tunnel*	\$ 192.47
Added Costs of Heating Material*	\$ 228.79
Resulting Change in Net Income	
Difference in Revenue	\$ 514.95
Difference in Costs	\$ (421.26)
Total Change	\$ 93.69

*See Table 3 for breakdown of material costs.

Partial budget comparing 'Seascape' high tunnel+low tunnel strawberry production with and without the use of **60 °C** supplemental heating.

Revenues	
Unheated High Tunnel	
Early Out-of Season Strawberries	\$ 1,336.21
In-Season Strawberries	\$ 1,705.86
Unheated Total	\$ 3,042.07
Heated High Tunnel + Low Tunnel	
Early Out-of Season Strawberries	\$ 1,788.92
In-Season Strawberries	\$ 2,097.42
Heating Total	\$ 3,886.34
Costs	
Added Costs of Low Tunnel*	\$ 192.47
Added Costs of Heating Material*	\$ 332.95
Resulting Change in Net Income	
Difference in Revenue	\$ 844.26
Difference in Costs	\$ (525.42)
Total Change	\$ 318.84

Table 3. Annual and Depreciation Costs for Low Tunnel and Supplemental Heating Material

	Units	Useful Life (yrs)	Quantity	Unit Cost	Total
Low Tunnel – Depreciation Expense					
10' Low Tunnel Supports (1/2" conduit)	Each	6	30	\$1.65	\$49.50
2'' Binder clips	Box of 60	6	1	\$10.00	\$10.00
1/2"X24" rebar	Each	6	60	\$1.55	\$93.00
Depreciation Total					\$152.50
Total Annual Depreciation Cost of Low Tunnel					\$25.42
Low Tunnel – Annual Expense					
2 mil Plastic for Low Tunnels 1000' Bailing	10' x 100' Sheet		3	\$27.00	\$81.00
Twine	Each		1	\$8.55	\$8.55
Installation and Removal	Labor Hours		7.75	\$10.00	\$77.50
Annual Expense Total					\$167.05
Total Low Tunnel Cost					\$192.47
Additional Heating - Depreciation Expenses					
Cables (250' HD. Gro-Quick)	Each		3	\$154.27	\$925.62
Thermostat	Each		6	\$89.95	\$89.95
Extension Cord (20')	Each		6	\$7.98	\$7.98
Additional Heating Total					\$1,023.55
Total Annual Depreciation Cost of Additional Heating					\$170.59
Additional Heating - Annual Expense					
Installation and Removal	Labor Hours		3.5	\$10.00	\$35.00
Electricity (45 °F amount)					\$23.20
Electricity (60 °F amount)					\$127.36
45 °F Annual Expense					\$58.20
60 °F Annual Expense					\$162.36
Total Additional Heating Cost (45 °F)					\$228.79
Total Additional Heating Cost (60 °F)					\$332.95

This project is funded in part by the Utah Department of Agriculture and Food under a specialty crop black grant, Utah State University Extension, and the Utah Agricultural Experiment Station

Utah State University is committed to providing an environment free from harassment and other forms of illegal discrimination based on race, color, religion, sex, national origin, age (40 and older), disability, and veteran's status. USU's policy also prohibits discrimination on the basis of sexual orientation in employment and academic related practices and decisions.

Utah State University employees and students cannot, because of race, color, religion, sex, national origin, age, disability, or veteran's status, refuse to hire; discharge; promote; demote; terminate; discriminate in compensation; or discriminate regarding terms, privileges, or conditions of employment, against any person otherwise qualified. Employees and students also cannot discriminate in the classroom, residence halls, or in on/off campus, USU-sponsored events and activities.

This publication is issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Kenneth L. White, Vice President for Extension and Agriculture, Utah State University.