



Strawberries: Season Extension

Growing Day-Neutral Strawberries in High Tunnel Table Top Systems



Double T Acres high tunnel table top strawberries

Todd and Tracy Linbo purchased **Double T Acres** in the fall of 2019. Formerly a 5-acre U-pick blueberry, cherry, and raspberry farm, they expanded the business in 2021 to include day-neutral (DN) strawberries. The Linbos now market a variety of fruit for 3 months each year at their farm, offering U-pick and pre-pick options under the tagline: "Life is sweet, making memories is even sweeter."

The Linbos both grew up in rural southern MN and have lived in Iowa, South Carolina, and North Dakota while working full time for agribusiness firms. They often visited Nisswa, MN spending time at a cabin they purchased in 2013 and fell in love with the area. When a nearby berry farm went up for sale, they decided to make a change. Neither Todd nor Tracy had ever grown fruit. "The first year was a big learning curve," says Todd. "We spent a lot of time on the phone with Annie [Klodd, UMN Extension] and doing research. We went to the MN Fruit and Vegetable Growers Conference in winter 2020 and asked a lot of questions."

The Linbos had envisioned growing strawberries from the very beginning and heard about DN varieties in the course of their learning. "We were attracted to day-neutral varieties because of their long fruiting season," says Todd, explaining "We figured they would provide a niche market and generate income above and beyond June-bearing strawberries."

DAY-NEUTRAL STRAWBERRIES

Day-neutral (DN) strawberries are not sensitive to day length, which means that the plants flower and fruit continuously during moderate temperatures. Consequently, DN varieties produce fruit from July through October or until the first killing frost. They often have a rest period in mid-summer when temperatures are too hot for fruit.

June-bearing strawberries, on the other hand, are sensitive to day length. They produce fruit during a short 2-6 week window in late June to early July.

Day-neutral strawberries have been found to yield best when grown on plastic mulch and under high tunnels (HTs), low tunnels or using table top systems. They can be grown in open fields but are susceptible to disease. In the upper Midwest, DN strawberries are grown as annuals and can be incorporated into any specialty crop rotation.

A number of DN varieties are available for production in Minnesota. Varieties that have performed well in University of Minnesota trials under HTs and open fields include Albion, Cabrillo, Evie-II, Monterey, Portola, San Andreas and Seascape. Generally, DN varieties are just as sweet as June-bearing varieties. Of those field-tested at the University of Minnesota, Albion and San Andreas were found to be the sweetest while Portola had the highest overall yields.

For more information about growing DN strawberries in Minnesota, visit <https://extension.umn.edu/strawberry-farming/day-neutral-strawberries>.



TABLE TOP PRODUCTION

After settling on DN strawberries, Todd and Tracy gravitated towards the table top (TT) production system because they felt it was “innovative” and would allow them to “manage weeds and harvest more comfortably.”

Table top or “gutter” growing systems are raised off the ground; plants are grown in long bags or pots of soilless growing media atop gutters, which are supported by posts. The irrigation system is attached to an intensively-controlled drip fertigation system that moderates the water pH and provides the plants with nutrients multiple times per week. Advantages of the TT system include ease of harvest and potential yield increases if the system is managed well and temperatures remain ideal for strawberry production. The upfront labor and costs are significant, and growers must develop some technical expertise with fertigation.

The Linbos installed TT systems within plastic covered high tunnels (HTs). Todd built two HTs in 2020. High tunnel material costs totaled \$30,000 and it took Todd and three helpers four days to put up the frames, install the irrigation and drainage equipment, and cover with plastic (128 hours). “It took us a lot longer to put up the first one,” says Todd. “Once we figured it out, the second one went a lot faster.”

In the larger tunnel, measuring 96'X30' (2,880 square feet), he installed nine rows of TT gutters each measuring the full length of the HT. This TT system accommodates 2,500 plants or one plant per 1.15 square feet of gutter space. In the second HT, Todd and Tracy initially planted raspberries. However, after a successful strawberry season in 2021 with “more demand than [they] knew what to do with,” the Linbos moved the raspberries outside and installed another TT gutter system in the second, smaller HT measuring 72'X30' (2,160 square feet).

Based on his experience with the first TT system, Todd experimented by expanding the width of the gutters to accommodate more plants per square foot in the second HT. Using this layout, the HT holds 2,000 plants or one plant per 1.08 square foot. It took Todd and three helpers one day to install the second TT system, including the fertigation equipment.



Todd Linbo with fertigation system (left)
Pollinator box inside **Double T Acres** high tunnel (right)

In spring Todd and Tracy purchase “strawberry grow bags” for \$6.79 each from BVB Substrates. Each bag measures 36”X18” and arrive filled with a growing mix and pre-cut planting and drainage holes. Todd installs the bags on the PVC gutters and waters them for 3 days to saturate before planting begins.

The strawberries are ordered in advance as bare root plants and kept chilled using a walk-in cooler until planting around mid-May. The Linbos grow the Albion variety exclusively, citing its sweet flavor. “Most of our customers are looking to eat the strawberries fresh so we focused on flavor,” says Todd. It takes Todd and three helpers approximately 16 hours to install 4,500 plants (<1 min per plant). Flowers and runners are removed for the first month to improve vegetative growth and ensure root establishment.

Pollination is accomplished by opening the HT end walls to welcome natural pollinators, and by installing purchased bumblebee hives from Natupol® each season. One hive, costing \$240, will pollinate each HT (up to 15,000 square feet).

Fertility is maintained by a fertigation system on the irrigation line. A Dosatron® fertilizer doser mixes a set concentration of fertilizer with water - applying a precise amount of nutrients in to the water line. The Linbos, like many TT strawberry growers, fertigate every time they irrigate so that the plants receive nutrients multiple times per week. Todd’s background in the agriculture industry provided the technical knowledge he needed to use fertigation systems.

MARKETING

Thanks to the extended production season of DN varieties, the Linbos have strawberries to market 12 weeks each summer, from mid-July to mid-October. The Linbos estimate they spend 48-50 hours during the summer and fall months on advertising and marketing via word-of-mouth, Facebook,[™] Instagram[™] and their own [website](#). They sell pre-picked berries direct from the farm four days per week and at the nearby Nisswa farmers market one day per week. "We arrive at the farmers market at 7:30AM and sell out by mid-morning," says Tracy. "Once we are sold out, we hand out flyers to direct people to the farm for U-Pick."

The Linbos offer U-pick from one of the two HTs four days per week. "U-pick is wildly popular," says Tracy. "The number of people wanting to pick fresh strawberries is unreal. I think we could put up 10 HTs and sell out." The Linbo's experience is not uncommon. A 2021 survey of 84 farmers market managers by the University of Wisconsin Extension found that fruit demand outpaced supply at more than half of the markets surveyed (Atucha, unpublished). Similarly, in a University of Minnesota survey of 101 MN strawberry growers that same year, respondents said "meeting demand" was one of their top challenges (DiGiacomo, unpublished).



Tracy and Todd Linbo at their farm, **Double T Acres**, in Lake Shore, MN

PERFORMANCE

In 2021, the Linbos' first year of DN strawberry production, the large HT yielded 1,080 lbs (0.432 lbs per plant). The entire harvest was marketed pre-picked at \$8/lb grossing \$8,640. After deducting annual material and labor expenses (\$3,933.20), the Linbos net \$4,706.80 in 2021. This does not account for fixed costs (HT, irrigation and TT system). The fixed costs, including the labor needed to erect the structure, run irrigation lines and set up the TTs, totaled \$27,445.

During 2022, the Linbos' second year of production, they harvested 1,350 lbs of strawberries. Yields dipped to 0.30 lbs per plant on average due to a 3-week late start on planting. Gross income for 2022 from the two HTs was \$8,900. The majority of strawberries (85%) were marketed pre-picked at \$6/lb - \$8/lb depending on the month (berries were priced lower in the fall due to less vacation traffic in the area). The remaining 15% of strawberries were marketed as U-Pick at \$5.00/lb. Any unsold berries were donated to food shelves and other local non-profit organizations.

Typical DN strawberry yields for plants grown on plastic under HTs during UMN field trials (2013-2014) were 1.0-1.5 lbs/plant, or 20,049 lbs/acre compared with June-bearing strawberry yields averaging 6,995 lbs/acre. The Linbos expect to see higher yields in future years as they gain experience and plant earlier in the season. If the Linbos can triple their DN yields to 1.0 lb/plant, net income (after subtracting annual costs and labor) will increase five-fold from \$2,150 per year to \$21,033 per year. With improved yields, the Linbos could pay back their upfront costs in 3 years. However, due to the steep learning curve during their first few years, Todd anticipates that it will take them approximately 5-6 to recover their upfront investments.

Reflecting on his experience with DN strawberries and the TT system, Todd offered some words of advice for other growers considering the same system: "Build your high tunnel and table tops in the fall so that you are ready to go in spring when it's time to plant. It takes a lot of work; more work than you would think!"

Double T Acres: High Tunnel Table Top Strawberry Budget

	ACTUAL YIELD 2022 1/3 lb/plant	PROJECTED YIELD 1 lb/plant
Area under HT (square feet)	5,040	5,040
Number of plants	4,500	4,500
Yield, Pre-Pick, lbs	1,150	2,300
Yield, You-Pick, lbs	200	400
INCOME		
Pre-picked, \$8.00/lb	\$4,000	\$12,848
Pre-picked, \$6.00/lb	\$3,900	\$12,774
U-Pick, \$5.00/lb	\$1,000	\$3,825
Gross income	\$8,900	\$29,447
UP FRONT COSTS		
30X96 HT (excluding plastic)	\$16,485	\$16,485
30X72 HT (excludng plastic)	\$13,085	\$13,085
Other Supplies (irrigation tables)	\$20,000	\$20,000
Labor for Installation (HTs, TTs, irrigation)	\$1,536	\$1,536
Plastic for HTs (annual cost, 5 yr life, no salvage)	\$2,000	\$2,000
Interest on fixed costs (5% for five years)	\$7,966	\$7,966
Total Fixed Costs	\$61,072	\$61,072
ANNUAL COSTS		
Bags (\$6.70 ea, \$0.08/square foot)	\$2,701	\$2,701
Plants (4500 plants for both HT, 0.16/plant)	\$720	\$720
Fert Cost (\$/yr, \$4.44 per treatment, 45 treatments per year)	\$200	\$200
Packaging (\$0.20/1 lb container w/label, pre-pick only)	\$230	\$747
Total Annual Costs	\$3,851	\$4,368
LABOR		
Planting, Fertilizing, Maintenance (trimming, HT management)	\$1,788	\$1,788
Harvest (2 hours every other day, 1 FTE @ \$12/hr)	\$511	\$1,658
Marketing (50 hours per season @ \$12/hr)	\$600	\$600
Total Annual Labor Costs	\$2,899	\$4,046
ANNUAL NET INCOME AFTER ANNUAL COSTS	\$5,049	\$25,079
ANNUAL NET INCOME AFTER ANNUAL COSTS & LABOR	\$2,150	\$21,033

Resources

- Growing Table Top Day-Neutral Strawberries in Minnesota. Kate Fessler. August 2021. YouTube.
- Yield and Quality Characteristics of Day-Neutral Strawberry in the United States Upper Midwest Using Organic Practices. Andy Petran, Emily Hoover, Laura Hayes and Steve Poppe. 2017. Biological Agriculture & Horticulture, 33(2).

