

Focal Crop: Tomatoes

Tomato Cultural Practices	
Cultivars:	2002: 'Daybreak' and 'Red Sun' 2003: 'Red Sun'
Fertilization:	2002: Plow-down rye/vetch, Sul-Po-Mag (440 lbs./acre) 2003: Plow-down red clover. Colloidal phosphate (1000 lbs./acre), Sul-Po-Mag (440 lbs./acre)
Planting:	Transplanted 4 week old seedlings. 2002: 5/29. 2003: 5/27.
Spacing:	Beds 29" wide with 43" between beds. Two rows per bed, 12" apart, with 18" between plants in a row. Beds are approximately 100' long.
Harvest:	Twice weekly. 2002: 8/22 – 9/12. 2003: 8/21-9/29.
Acreage:	2002: 1800 sq. ft., 0.041 acre 2003: 1128 sq. ft., 0.026 acre

Crop establishment and management: Field preparation for tomatoes begins with plow-down of the preceding cover crop in late April – early May, followed by disking, fertilization (Sul-Po-Mag both years, colloidal phosphate in 2003), and disking again. After waiting about two weeks for the stale seedbed, the beds are rotovated, then the black plastic mulch is laid, and the 4-week old transplants set. Plastic covers on a frame of PVC pipe go over the plants right away. About 3 weeks later, cages are set up, and the aisles between the beds are weeded then mulched with clover hay. Dave also sets up a basket-weave system with stakes and twine. Any irrigation needed is done by hand with a wand. Tomatoes are harvested twice weekly, with 90% of the crop sold to restaurants and natural food stores, and 10% going to the CSA.

Pest and disease management and sampling: As mentioned above, Dave's system of growing tomatoes under plastic covers and mulched with black plastic and hay in the aisles reduces the exposure of the tomato plants to disease inoculum (as well as having benefits for season extension and weed management). In 2002, Dave did not spray at all for disease management on tomatoes, but did spray Bt once for management of hornworms (Table 4). In 2003, he did spray the tomatoes several times with a variety of organic materials for disease management, and once with an organic insecticide for management of hornworms. In NEON sampling, few insects pests and beneficial insects were seen.



Cages support tomato plants under covered low tunnels. Clover hay is spread between plastic mulched beds to conserve moisture, add fertility and reduce soil splash onto plants.

Table 4. Pest Management Materials applied to focal crops at New Leaf Farm, 2002-2003. No sprays were applied to winter squash or to the salad mix components studied.

Brand name	Type of material and labeled use	Crop and target pest
Dipel DF™	<i>Bacillus thuringiensis</i> subsp. <i>kurstaki</i> . Insecticide for use against caterpillars	Tomato for tomato hornworm (8/17/2002)
Plantshield HC™	<i>Trichoderma harzianum</i> Rifai, biological fungicide	Tomato for early blight and other diseases (7/2/2003, 7/15/2003)
Champion WP™ combined with fish oil	Copper hydroxide fungicide and bactericide	Tomato for early blight and other diseases (7/25/2003)
Entrust™	Spinosad Insecticide	Tomato for tomato hornworm (8/1/2003)
Storox™	Hydrogen peroxide fungicide and bactericide	Tomato for early blight and other diseases (8/13/2003)
Pyganic	Insecticide	Lettuce

In both years, there were symptoms of early blight on every plant by August, and by September, in 2003, the symptoms were rated as “moderate” on 64% of the plants. Only 20% of the plants had symptoms of disease on any of their fruit, all at a “light” level. The combination of cultural methods, supplemented with sprays kept tomato diseases from causing much loss of fruit yield until the end of the season. Dave estimated a cull rate of 25% for the tomatoes from all causes in 2002.

Weed sampling: Weed biomass was minimal and no weeds went to seed in either year of sampling (Table 5). Dave’s whole-farm system of weed management, combined with the use of plastic and hay mulch in the tomato beds, allowed him to achieve this level of weed control with a modest amount of hand weeding – 6 hours of combined hand-weeding and mulching in 2002 and 2 hours in 2003 for NEON study plots of 1800 and 1128 sq. ft., respectively.

Yield: Tomato yields averaged 23,750 lb/acre over the two years (Table 6).

Table 5. New Leaf weed density and dry weight.

Crop	Year	Weed density, all species (plants/acre)	Weed aboveground dry weight (lb/acre)	Main weed species	Important weed seed producers
Salad mix	2002	6,300 (3,300)	2.2 (1.8)	Lambsquarters Hemp nettle Clover	None
	2003	5,200 (2,800)	0.4 (0.2)	Witchgrass Lambsquarters Corn spurry	None
Tomato	2002	6,600 (1,300)	3.2 (0.2)	Annual ryegrass Cultivated mustard	None
	2003	22,000 (3,000)	11.9 (0.2)	witchgrass grass Foxtail	None
Butternut squash	2002	0 (0)	0 (0)	No weeds in sampled areas	None
	2003	190,000 (100,000)	440 (150)	Crabgrass Corn spurry Wormseed mustard	Crabgrass Corn spurry Wormseed mustard

Table 6. Focal Crop Yields from New Leaf Farm, 2002-2003. Mean with (standard error)

Crop	Year	Cultivar	Stand count (plants/acre)	Yield from farm records (lbs/acre)	Neon sampled yield (lbs/acre)	Market-able number per acre	% market-able yield by wt	Average wt per fruit (lb.)	Yield per plant (lbs)
Tomato	2002	Daybreak/Red Sun	4840	24,900		41,000	na	0.6	3.7
	2003	Red Sun	4840	22,600		54,300	na	0.5	5.6
Salad Mix	2002	Mixed Greens ¹		4,100 (1 st cutting for salad mix)	5,800 (1000)		99%		
				1,200 (2 nd cutting for braising mix)	na				
	2003	Mixed greens ¹		NA	8,400 (2000)		100%		
Butternut Squash	2002	Waltham	1,800	16,600		7,800		2.1	9.1
	2003	Waltham	1,800	11,100	15,100 (3100)	4300 (400)	88	3.4 (0.4)	8.3 (1.7)

¹Mixed Greens included Arugula, Tatsoi, Mizuna, "Red Russian" kale, "Red Giant" mustard

Economics: Tomatoes had the same overhead and marketing costs per acre as given above for salad greens, and these were 54% of the total costs in 2002, and 44% in 2003 (Fig. 3). The largest production costs were:

- purchase of plastic row cover materials (\$1525 per acre each year)
- hand irrigation (\$1452 per acre in 2002, \$726 per acre in 2003)
- purchasing and setting up cages (in 2002 purchase for \$907 and set up for \$881 per acre, in 2003 cages were combined with basket weave and stakes for a materials cost of \$1724 and set up cost of \$661 per acre).
- spraying (in 2002 \$484 per acre for labor, in 2003 materials for \$690 and labor for \$1089 per acre),
- labor in transplanting (\$661 in 2002, \$413 per acre in 2003)
- harvest labor (\$440 per acre in 2002, \$1387 in 2003).

For tomatoes, at the average yield of 23,750 lbs/acre, the break-even price would be \$0.86 per lb (Fig. 4). At the mean New Leaf price for the two years of \$2.38, the break-even yield would be 8,590 lbs/acre, 36% of their average yield.

Based on New Leaf records of yields and average prices and NEON calculations of the cost of production, revenues were projected (Table 7). Keep in mind that these calculations were for field-grown tomatoes,

occupying a fraction of an acre (0.026-0.041 acre). Most of New Leaf tomato production happens in the greenhouse, but these costs of production were not estimated.

Figure 3. Overall cost allocation for focal crops at New Leaf Farm, 2002-2003.

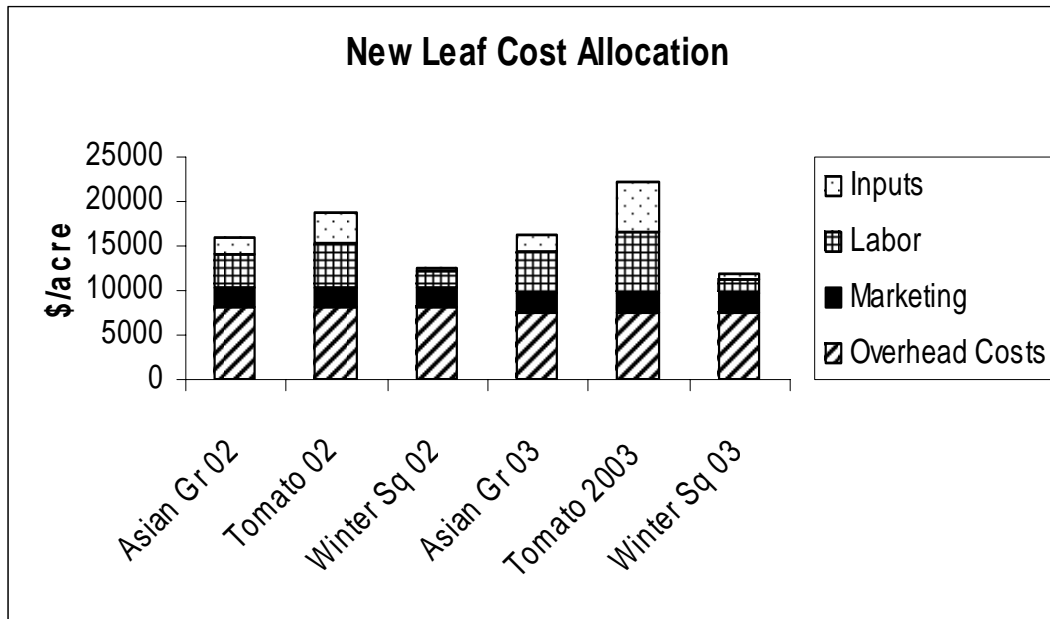


Table 7. Revenues for Salad Greens, Tomatoes, and Winter Squash at New Leaf Farm, 2002-2003. Note that we do not have an enterprise budget for the lettuce, which composes one-half of the salad mix.

Crop	Year	Amount Sold (lbs per acre)	Average price per lb.	Revenue	Total Cost of Production per acre	Profit per acre
Salad greens	2002	4,100 mix 1,200 2 nd harvest	\$7.45 for mix \$4.50 (2 nd harvest)	\$30,800 \$5,400	\$15,800	\$20,400
	2003	8,400 (NEON sampled yield)	\$7.50	\$62,500	\$15,500	\$47,000
Tomato	2002	24,900	\$2.57	\$63,900	\$18,900	\$45,000
	2003	22,600	\$2.20	\$49,700	\$22,100	\$27,700
Winter squash	2002	16,600	\$0.69	\$11,500	\$12,500	-\$1,000
	2003	15,100 (NEON sampled yield)	\$0.75	\$11,300	\$11,900	-\$600

Figure 4. Break-Even Analysis, New Leaf Farm focal crops, 2002-2003. Costs are averaged over the two years.

