



Current and potential strawberry growers need production, marketing, and financial information to make informed decisions about starting, expanding, or leaving a direct-market business. Like all business owners, their main objective should be to make a profit so their farms will be financially successful. Ideally, growers should keep detailed records that they can use to estimate production, harvest, and marketing costs. But many growers don't have time to keep detailed records.

Likewise, marketing is a key factor in the success of horticultural enterprises that sell produce directly to consumers. Successful direct marketers know how to target their potential customers, they know why consumers buy their products, and they are better prepared to provide the goods and services necessary to be successful. Few direct-market growers, however, have the time or resources to conduct extensive consumer surveys and develop the information they need to improve their marketing efforts.

Therefore, this publication has two components. First, it provides information about the costs and returns of growing, harvesting, and marketing strawberries through direct markets: pick-your-own fields and fruit stands that sell prepicked berries. Second, it identifies direct-market strawberry customers and presents information about their buying behaviors. The expense, revenue, and marketing information reported here is based on research conducted by the authors at NC State University. A complete description of the data is published in HortTechnology (January-March 2004).

THE COSTS AND RETURNS OF A DIRECT-MARKET STRAWBERRY CROP

The cost analysis presented here relied on a complete cost model for a plasticulture production system developed for a 5-acre strawberry planting. Production practices were defined based on above-average management practices recommended by NC State Extension and research horticultural specialists, tempered with information from growers about the practices used on real farms.

Equipment costs were based on 2001 purchase prices for new equipment. The equipment defined for this analysis included some machinery that could be used for farming enterprises other than growing strawberries on a typical diversified farm. Therefore, the equipment expenses reflect the costs for a total farm business and not just for strawberry production. Exceptions to this are the fumigation and irrigation equipment, which were considered as used solely for strawberry production. The overhead irrigation system was defined as a hand-moved sprinkler system used primarily for frost and freeze protection, and a drip irrigation system was included for soil moisture.

Prices for other materials were obtained from local dealers who regularly supply North Carolina strawberry growers. Land values vary throughout the state, so a land charge was not included in this budget. Growers who wish to apply the budget presented here should include a land charge that represents current land values in their region. Labor costs were based on rates of \$8.25 per hour for hired employees and \$16.39 per hour for an owner-operator. These labor rates include workers' compensation, unemployment, FICA taxes, and other overhead expenses as well

as the base wage rate. Thus, they represent the real costs of labor and not just a base wage.

The harvest season was assumed to last 6 weeks, starting in the third week of April and continuing through May. Marketing obviously bears a cost that varies considerably depending on the marketing system growers decide to use. The marketing costs presented here were based on the assumption that all of the fruit would be sold at the farm, with two-thirds of the strawberries sold through a pick-your-own (PYO) field and one-third sold as prepicked berries at a fruit stand. A labor charge of \$1.15 per 4-quart basket was added to the cost of the fruit-stand strawberries, and a supervision labor charge was added at a rate of \$8.25 per hour for someone to oversee picking and checkout as well as manage the direct-market operations.

The information used in the pricing analysis and customer profile was collected during a customer survey conducted at eight direct-market strawberry farms throughout the state in the spring of 1999 (Safley et al., 2002). These farms represented typical strawberry farms in North Carolina's major production areas, from the coastal to the mountain regions. Because normal harvest dates vary by region, the surveys were completed in April in the coastal region, May in the piedmont, and June in the mountain region. Interviewers visited each location for 6 continuous days, Monday through Saturday, interviewed the customers, and gathered pricing and buying information. Interviews were not conducted on Sunday. Some direct-market farms do open on Sunday, which could alter the customer buying patterns reported here based on 6 days of operation a week.

Operation	Labor (\$/acre)	Equipment (\$/acre)	Materials (\$/acre)	Total (\$/acre)
Preharvesting				
Pull plants through plastic	\$ 123.75	\$ 0.00	\$ 0.00	\$123.75
Herbicide aisles with paraquat and crop oil concentrate	2.29	3.46	10.15	15.90
Scout for mites, strawberry clipper weevil, and red fire ants	65.56	0.00	0.00	65.56
Spray for two-spotted spider mites with bifenthrin (two applications)	4.58	6.92	248.00	259.50
Connect drip system	49.50	0.00	0.00	49.50
Check overhead irrigation system	8.20	0.00	0.00	8.20
Inject mefenoxam (two applications)	32.78	27.36	210.00	270.14
Spray for strawberry clipper weevil with chlorpyrifos	2.29	3.46	11.60	17.35
Collect tissue sample (three collections)	6.18	0.00	12.00	18.18
Pull plants and weeds	82.50	0.00	0.00	82.50
Inject fertilizer (Sul-Po-Mg, boron, liquid nitrogen)*	16.39	13.68	169.30	199.37
Re-apply row covers for freeze	198.00	0.00	0.00	198.00
Protect from freezes—overhead irrigation (four applications)	52.44	399.98	0.00	452.42
Control botrytis fruit rot with captan	2.22	3.78	14.00	20.00
Release honeybees for pollination	0.00	0.00	70.00	70.00
Inject fertilizer (Su-Po-Mg, calcium nitrate)*	16.39	13.68	168.83	198.90
Control botrytis fruit rot with fenhexamide	2.29	3.78	51.56	57.63
Inject fertilizer (Sul-Po-Mg, calcium nitrate)*	16.39	13.68	19.29	49.36
Spray for two-spotted spider mites with abamectin	2.29	3.46	83.04	88.79
Control botrytis fruit rot control with fenhexamide, and control powdery mildew with myclobutanil	2.29	3.78	74.06	80.13
Inject fertilizer (potassium nitrate)*	<u>16.39</u>	<u>13.68</u>	<u>14.54</u>	<u>44.61</u>
Total annual preharvesting costs per acre	\$702.72	\$510.70	\$1,156.37	\$2,369.79
Total production costs per acre				\$10,277.23
Harvesting				
Supervise picking and fruit-stand baskets	\$693.00	\$0.00	\$466.90	\$1,159.90
Pick berries for fruit-stand sales	1,534.10	0.00	0.00	1,534.10
Apply drip irrigation (six applications = 18 hours)	19.68	92.88	0.00	112.56
Spray for two-spotted spider mites with abamectin	2.29	3.46	83.04	88.79
Control botrytis fruit rot with captan	2.29	3.78	14.00	20.07
Collect tissue sample	2.06	0.00	4.00	6.06
Inject fertilizer, potassium nitrate, and calcium nitrate (two applications)	32.78	27.36	26.73	86.87
Implement evaporative cooling – overhead (three applications)	24.60	22.83	0.00	47.43
Control botrytis fruit rot with fenhexamide and control powdery mildew with myclobutanil (two applications)	4.58	3.78	148.12	156.48
Disassemble irrigation system	<u>49.50</u>	<u>1.03</u>	<u>0.00</u>	<u>50.53</u>
Total annual harvesting costs per acre	\$2,364.88	\$155.12	\$742.79	\$ 3,262.79
Total annual harvesting and production costs per acre				\$ 13,540.02

*The fertilizer formulations referred to in this table are as follows:

ammonium nitrate = 34N-0P-0K
boron = 0N-0P-0K-20B
calcium nitrate = 15N-0P-0K-19Ca-1Mg
liquid nitrogen = 30N-0P-0K

potassium nitrate = 13N-0P-35.5K
potassium sulfate = 0N-0P-36.5K-1Mg-18S
Sul-Po-Mg = 0N-0P-17.8K-10.5Mg-21S
triple superphosphate = 0N-22P-0K-12Ca-1S



HOW MUCH DOES IT COST TO PRODUCE, HARVEST, AND MARKET STRAWBERRIES?

Based on the cost estimates collected in 2001, the total annual production, harvest, and marketing costs for a plasticulture production system were estimated to be \$13,540 per acre. As Figure 1 illustrates, material inputs (including miscellaneous materials, such as plants, plastic, fertilizers, pesticides, and herbicides) accounted for almost half of the total costs (49.8 percent). Labor costs made up slightly more than 38 percent of the total, and the costs associated with owning and operating the equipment amounted to almost 12 percent of the total annual expenses.

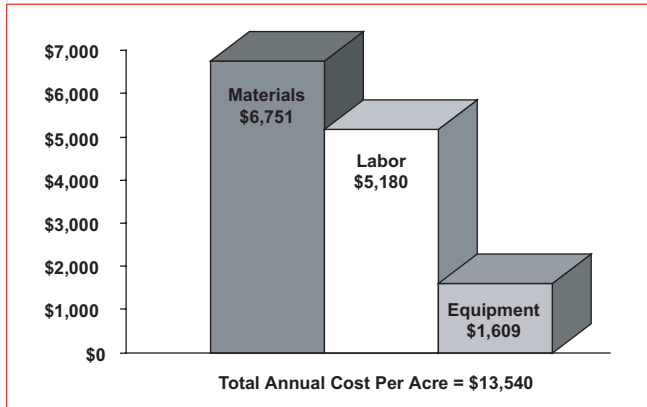


Figure 1. Annual production and harvesting costs per acre by expense category for plasticulture production of direct market strawberries in North Carolina.



Costs by production phase

Expenses were separated into six production phases: land preparation, preplanting, transplanting and postplanting, dormancy, preharvesting, and harvesting. The tasks associated with each phase are listed in Table 1.

Based on the cost figures collected in 2001, preplanting and harvesting are the most expensive phases of production (Figure 2). Preplanting comprised almost a third of the total costs (32.5 percent), making it the most expensive phase of production at an estimated \$4,399 per acre. Harvesting was the second most expensive phase, amounting to \$3,263 per acre, almost a fourth of the total annual expenses (24.1 percent). Preharvesting expenses accounted for 17.5 percent of the total costs, at \$2,370 per acre, whereas transplanting and postplanting amounted to 14.9 percent of the total at \$2,015 per acre.

Costs by month

Estimates of monthly expenses for the major cost categories can give growers an idea of their potential cash flow obligations. Based on the cost figures collected in 2001, growers can expect to spend most of their budget for producing, harvesting, and marketing strawberries during key months in the late summer, fall, and spring.

As Table 2 illustrates, production costs were highest in August and September, totaling \$4,741 per acre, slightly more than a third (35.2 percent) of the total expenses. Expenses estimated for April and May amounted to \$3,683 per acre, or a little more than a fourth of the total production cost (27.2 percent).

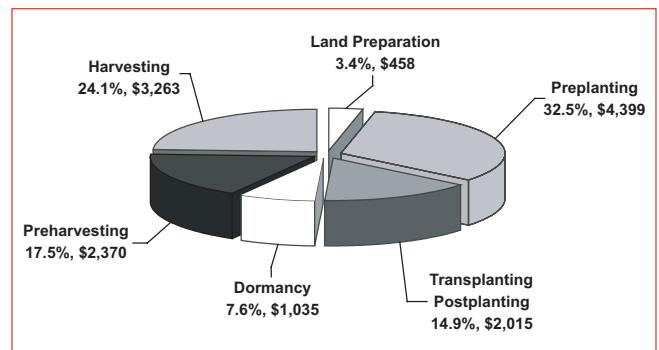


Figure 2. Annual production and harvesting costs per acre by production phase for plasticulture production of direct market strawberries in North Carolina.

Preplanting and transplanting-postplanting costs made up most of the expenses in August and September, while harvesting made up the majority of the costs in April and May. March expenditures were estimated at \$1,473 per acre, or almost 11 percent of the total costs, and November expenses totaled \$1,266 per acre, slightly more than 9 percent of the total.



Table 2. Estimated Monthly Costs Per Acre by Expense Category for Plasticulture Production of Direct-Market Strawberries in North Carolina

Year and Month	Equipment Costs (\$/acre)	Materials Costs (\$/acre)	Labor Costs (\$/acre)	Total Monthly Costs (\$/acre)	% of Total Costs
First Year					
June	\$ 184	\$ 78	\$ 200	\$ 462	3.4
July	0	225	6	231	1.7
August	132	2,078	435	2,645	19.5
September	576	967	553	2,096	15.5
October	34	132	34	200	1.5
November	5	1,208	53	1,266	9.3
December	0	5	297	302	2.2
Second Year					
January	10	115	518	643	4.8
February	24	262	254	540	4.0
March	344	722	406	1,472	10.9
April	159	405	617	1,181	8.7
May	141	554	1,807	2,502	18.5
Total Annual Costs	\$1,609	\$ 6,751	\$5,180	\$13,540	
% of Total Costs	11.8	49.8	38.3		100.0

HOW DO YIELDS AND PRICING AFFECT REVENUE FOR A DIRECT-MARKET STRAWBERRY BUSINESS?

To cover their production expenses, growers need to maintain adequate yields and prices. Net revenue will depend on a farm’s marketable yield and the price growers receive for their strawberries. As in most farming ventures, growers can have a tremendous influence on their crop yields. The better care they give the crop, the more likely they will have higher yields of high quality fruit. Nevertheless, local markets will determine the maximum price growers can receive for their berries.

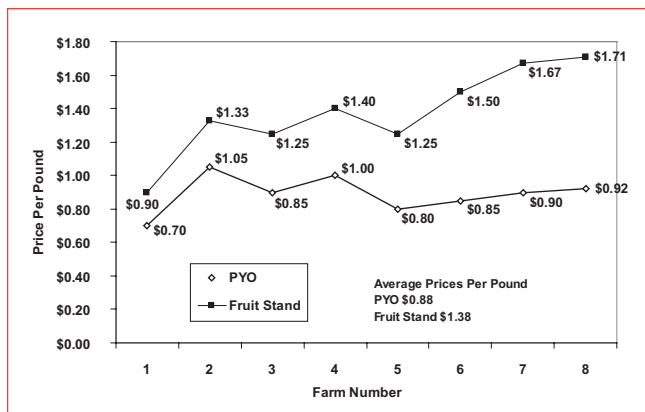


Figure 3. Price comparisons for pick-your-own (PYO) and fruit-stand strawberries at eight North Carolina direct markets.

Variations in price

The consumer survey conducted in 1999 revealed significant variations in the prices that eight cooperating growers charged for their PYO and fruit-stand strawberries (Figure 3). PYO prices ranged from \$0.70 to \$1.05 per pound and averaged \$0.88 per pound, while fruit-stand

prices ranged from \$0.90 to \$1.71 per pound and averaged \$1.38 per pound. On average, the fruit-stand berries sold for \$0.49 more per pound than the PYO berries.

The growers who cooperated in the consumer survey were not specifically asked how they set the prices for their PYO and fruit-stand berries. But when these price spreads were presented, some growers offered that they set the price spread based on the additional costs that they believed they incurred by selling the berries at the fruit stand.

Another grower said that he set his fruit-stand price based on the price charged at the local grocery store for fresh strawberries. It is interesting to note that 89 percent of the customers surveyed at Farm 1, where the price difference between PYO and fruit-stand berries was smallest, purchased the fruit-stand berries.

The wide range of prices charged by growers in the same state suggests that many of the cooperators were unaware of the prices that growers in other regions were charging for their fruit. Not surprisingly, some of the growers indicated that they were going to reconsider their prices for the next season.



YIELDS AND PRICING

Table 3. Estimated Net Revenues Per Acre for Varying Pick-Your-Own and Fruit-Stand Strawberry Prices and Marketable Yields*

Pick-Your-Own Price	Fruit-Stand Price	Marketable Yield (lbs/acre)				
		8,000	12,000	16,000	20,000	24,000
		Net Revenue Per Acre				
(\$/lb)	(\$/lb)	(\$/acre)	(\$/acre)	(\$/acre)	(\$/acre)	(\$/acre)
0.65	1.20	-5,077	-2,193	691	3,576	6,460
0.70	1.25	-4,677	-1,593	1,491	4,576	7,660
0.75	1.30	-4,277	-993	2,291	5,576	8,860
0.80	1.35	-3,877	-393	3,091	6,576	10,060
0.85	1.40	-3,477	207	3,891	7,576	11,260
0.90	1.45	-3,077	807	4,691	8,576	12,460
0.95	1.50	-2,677	1,407	5,491	9,576	13,660

*The calculation assumes that two-thirds of the yield will be sold as pick-your-own and one-third will be sold as prepicked berries at a fruit stand.

Variations in yield

As the prices collected for this analysis indicate, prices for direct-market strawberries vary dramatically. But what about yields, the other factor in calculating revenue for a strawberry farm?

Yield estimates for the eight cooperating farms ranged from a low of 8,000 pounds per acre to a high of 24,000 pounds per acre. Projected net revenues were calculated for this analysis using various combinations of direct-market prices and marketable yields. Based on these calculations, a grower would not make a profit if the farm achieved a yield of only 8,000 pounds per acre using the plasticulture production system (Table 3). Given a marketable yield of 12,000 pounds per acre, a grower would make a profit only if the PYO price was equal to or greater than \$0.85 per pound and the fruit-stand price was \$1.40 per pound or higher. Revenue would be positive for all of the price combinations if yields of 16,000, 20,000 or 24,000 pounds per acre were attained.

Breakeven marketable yields

It is also important for a strawberry grower to determine

the breakeven marketable yield, the minimum volume of fruit that must be sold to cover projected production, harvest, and marketing costs. Selling less fruit than the breakeven marketable yield will result in a net loss, while selling more will generate enough revenue to cover a grower's estimated expenses.

Breakeven yields of marketable fruit were calculated for each combination of direct-market prices used in this analysis. This breakeven analysis was based on these assumptions: two-thirds of the marketable yield would be sold through the PYO field, and one-third would be sold as prepicked berries at a fruit stand.

Obviously, the lower the prices charged at each direct-market farm, the larger the volume of fruit that must be sold to cover the estimated costs. For example, a PYO price of \$0.65 per pound combined with a price of \$1.20 per pound for fruit-stand berries means that a grower would have to sell a minimum of 15,041 pounds of fruit per acre to cover the projected expenses. In contrast, if a grower can receive \$0.95 and \$1.50 per pound for the PYO and fruit-stand fruit, respectively, only 10,622 pounds of berries must be sold per acre to break even (Figure 4).

Figure 4. Breakeven marketable yield in pounds per acre for each pick-your-own (PYO) and fruit-stand strawberry price combination.

These breakeven marketable yields in pounds per acre are based on these assumptions: Two-thirds of the berries sold would be pick-your-own, and one-third would be fruit-stand berries. Total annual production and harvesting costs per acre would be \$13,540.

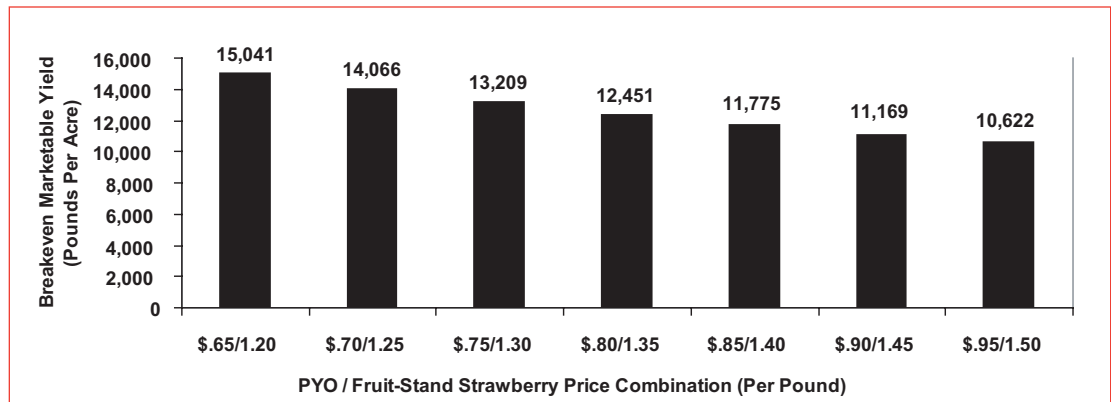




Table 4. Annual Breakeven Sales Volumes and Numbers of Customers Per Acre of Direct-Market Strawberries Produced Using Plasticiculture*

Annual Breakeven Sales Volume (pounds per acre)			Annual Breakeven Number of Customers (number per acre)		
Total	PYO	Fruit Stand	Total	PYO	Fruit Stand
15,041	10,027	5,014	1,572	865	707
14,066	9,377	4,689	1,470	809	661
13,209	8,806	4,403	1,381	760	621
12,451	8,301	4,150	1,301	716	585
11,775	7,850	3,925	1,220	677	553
11,169	7,446	3,723	1,166	642	524
10,622	7,081	3,541	1,110	611	499

*The calculation assumes that two-thirds of the yield will be sold as pick-your-own and one-third will be sold as prepicked berries at a fruit stand.

Attracting enough customers

An important assumption underlies this analysis of pricing, yields, and profit: the existence of a market—an accessible population of customers for the berries. Selling enough berries to make a profit depends on an ample number of customers visiting the farm to make purchases. If fewer customers visit the farm, the unsold berries will not bring money into the business. This increases the actual per-pound cost of the berries that are sold because the costs of production, harvesting, and marketing must be allocated to fewer pounds of sold berries. Therefore, it is extremely important for a grower to attract enough customers to a direct-market farm.

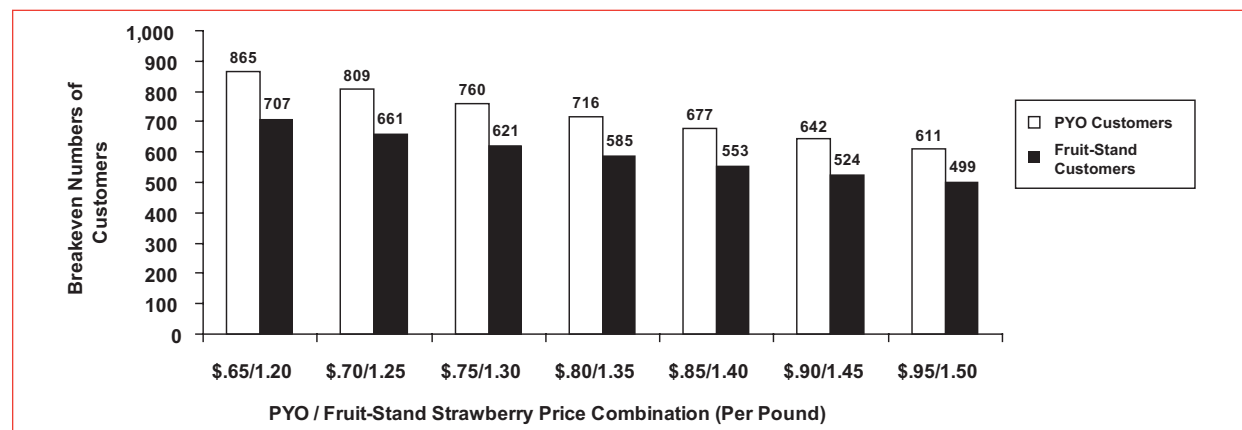
Estimating a required customer volume requires some assumptions about the berries sold and how many pounds of berries each customer will buy (Table 4). This estimate of customer volume assumes that two-thirds of the strawberries would be sold through PYO fields and one-third would be sold at a fruit stand. Second, the PYO customers would buy an average of 11.6 pounds of strawberries per visit,

and fruit-stand customers would purchase an average of 7.1 pounds. (These amounts represent the average volumes of fruit purchased by customers interviewed at the eight direct markets in 1999.)

Given a PYO price of \$0.65 per pound and a fruit-stand price of \$1.20 per pound, 865 customers would have to buy 10,027 pounds of berries from the PYO fields and 707 customers must buy 5,014 pounds at the fruit stand for the grower to sell a breakeven volume of 15,041 pounds per acre.

If the grower charged a PYO price of \$0.95 per pound and a fruit-stand price of \$1.50 per pound, the number of customers needed to sell the breakeven volume of 10,622 pounds per acre decreases considerably: 611 customers would have to buy 7,081 pounds at the PYO field, and 499 consumers must purchase 3,541 pounds at the fruit stand. Based strictly on the conditions described here and depending on the actual price combination charged for the strawberries, a grower must attract between 1,110 and 1,572 customers per acre to break even (Figure 5).

Figure 5. Breakeven numbers of customers required per acre for each pick-your-own (PYO) and fruit-stand strawberry price combination.



These breakeven numbers of customers per acre are based on these assumptions: Two-thirds of the customers would buy 11.6 pounds of pick-your-own berries, and one-third would buy 7.1 pounds of fruit-stand berries. Total annual production and harvesting costs per acre would be \$13,540.

