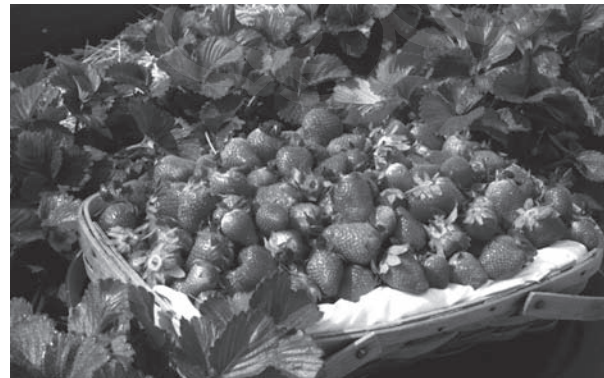


# strawberries



## WHAT MAKES DIRECT-MARKET STRAWBERRY FARMS SUCCESSFUL?

THIS PUBLICATION PROVIDES INFORMATION THAT STRAWBERRY GROWERS CAN USE TO:



**CALCULATE**  
PRICES, AND



**DEVELOP**

PRODUCTION, HARVESTING,  
AND MARKETING COSTS



**MARKET**  
STRAWBERRIES



**C**urrent 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

**T**he 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.

**Table 1. Estimated Costs Per Acre for Plasticulture Production and Harvesting of Direct-Market Strawberries in North Carolina**

Operation	Labor (\$/acre)	Equipment (\$/acre)	Materials (\$/acre)	Total (\$/acre)
<b>Land Preparation</b>				
Treat old crop with paraquat	\$ 14.85	\$ 20.52	\$ 7.38	\$ 42.75
Remove and dispose of plastic	158.40	68.80	0.00	227.20
Disk	2.52	5.86	0.00	8.38
Lime	0.00	0.00	26.00	26.00
Plant soybeans for cover crop	<u>24.75</u>	<u>89.13</u>	<u>39.33</u>	<u>153.21</u>
Total annual land preparation costs per acre	\$ 200.52	\$ 184.31	\$ 72.71	\$ 457.54
<b>Preplanting</b>				
Order plant material, fumigant, plastic mulch (10% deposit)	\$ 5.74	\$ 0.00	\$219.80	225.54
Rotovate cover crop	56.04	118.02	0.00	174.06
Pull greenhouse shade-cloth	4.95	0.00	187.74	192.69
Set up misting system	9.48	0.00	0.00	9.48
Purchase plug supplies (tips, trays, soil)	2.06	0.00	1,884.44	1,886.50
Stick runner tips for plugs	315.81	0.00	0.00	315.81
Handle trays	33.01	0.00	0.00	33.01
Subsoil	14.85	8.15	0.00	23.00
Disk (break up soil clods)	2.52	5.86	0.00	8.38
Moisten soil media	8.25	0.00	0.00	8.25
Irrigate and fertilize plugs (20N-8.8P-16.6K)	8.25	0.84	0.72	9.81
Spray for two-spotted spider mites with hexakis	8.25	0.17	28.00	36.42
Assemble irrigation system	99.00	2.04	0.00	101.04
Irrigate for fumigation	0.83	7.61	0.00	8.44
Rotovate for fumigation	28.03	59.01	0.00	87.04
Fertilize (ammonium nitrate, potassium sulfate, triple super phosphate)	7.43	10.42	48.46	66.31
Fumigate (methyl bromide + chloropicrin) (67% + 33%)	39.34	288.06	873.70	1,201.10
Seed annual ryegrass in aisles	<u>0.84</u>	<u>0.63</u>	<u>11.00</u>	<u>12.47</u>
Total annual preplanting costs per acre	\$ 644.68	\$ 500.81	\$ 3,253.86	\$ 4,399.35
<b>Transplanting and Postplanting</b>				
Transplant plugs and replant	\$ 255.75	\$ 39.18	\$ 0.00	\$ 294.93
Irrigate plug establishment (3 applications)	101.48	169.53	0.00	271.01
Apply drip irrigation (three 2-hour applications)	4.95	30.96	0.00	35.91
Spray for two-spotted spider mites with bifenthrin	4.58	6.92	248.00	259.50
Collect tissue sample	2.06	0.00	4.00	6.06
Winterize drip system	16.50	0.00	0.00	16.50
Apply floating row covers	<u>50.48</u>	<u>2.04</u>	<u>1,079.00</u>	<u>1,131.52</u>
Total annual transplanting and postplanting costs per acre	\$435.80	\$248.63	\$1,331.00	\$2,015.43
<b>Dormancy</b>				
Order Internet and weather service (annual fee)	\$ 0.00	\$0.00	\$ 83.88	\$ 83.88
Remove and reapply row covers	297.00	0.00	0.00	297.00
Control white-tail deer	24.75	0.00	96.25	121.00
Order containers, fertilizers, and other materials	12.30	0.00	0.00	12.30
Remove row cover and dead foliage; mow leaves	478.50	6.30	0.00	484.80
Apply dormant spray (captan)	2.29	3.46	14.00	19.75
Scout for two-spotted spider mites	<u>16.39</u>	<u>0.00</u>	<u>0.00</u>	<u>16.39</u>
Total annual dormancy costs per acre	\$ 831.23	\$ 9.76	\$ 194.13	\$ 1,035.12

Operation	Labor (\$/acre)	Equipment (\$/acre)	Materials (\$/acre)	Total (\$/acre)
<b>Preharvesting</b>				
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)*	16.39	13.68	14.54	44.61
Total annual preharvesting costs per acre	\$702.72	\$510.70	\$1,156.37	\$2,369.79
Total production costs per acre				\$10,277.23
<b>Harvesting</b>				
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	49.50	1.03	0.00	50.53
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:

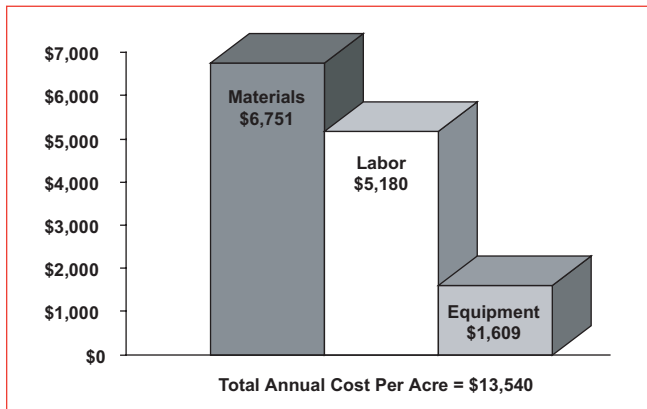
ammonium nitrate = 34N-0P-0K  
boron = 0N-0P-0K-20B  
calcium nitrate = 15N-0P-0K-19Ca-1Mg  
liquid nitrogen = 30N-0P-0K

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

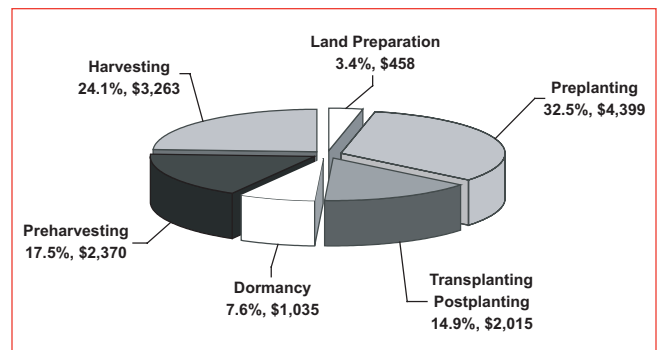
Expenses were separated into six production phases: land preparation, preplanting, transplanting and postplanting, dormancy, preharvesting, and harvesting. The tasks associated with each phase are listed in Table 1.

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.

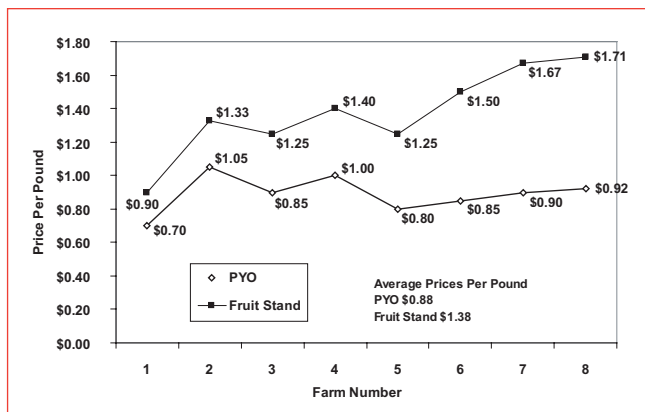


**Table 2. Estimated Monthly Costs Per Acre by Expense Category for Plasticulture Production of Direct-Market Strawberries in North Carolina**

Year and Month	Equipment Costs (\$/acre)	Materials Costs (\$/acre)	Labor Costs (\$/acre)	Total Monthly Costs (\$/acre)	% of Total Costs
<b>First Year</b>					
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
<b>Second Year</b>					
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
<b>Total Annual Costs</b>	<b>\$1,609</b>	<b>\$ 6,751</b>	<b>\$5,180</b>	<b>\$13,540</b>	
<b>% of Total Costs</b>	<b>11.8</b>	<b>49.8</b>	<b>38.3</b>		<b>100.0</b>

**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

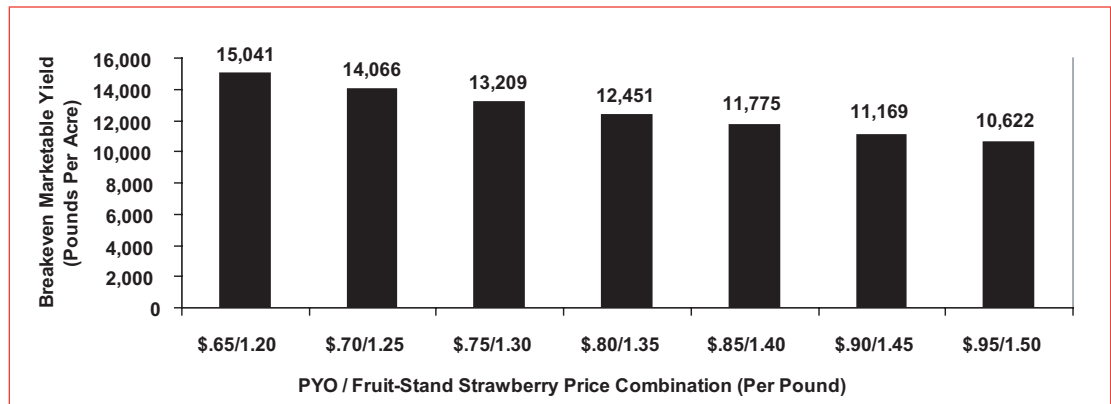
the breakeven marketable yield, the minimum volume of fruit that must be sold to cover projected production, harvest, and marketing costs. Selling less fruit than the breakeven marketable yield will result in a net loss, while selling more will generate enough revenue to cover a grower's estimated expenses.

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 Plastics\***

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.

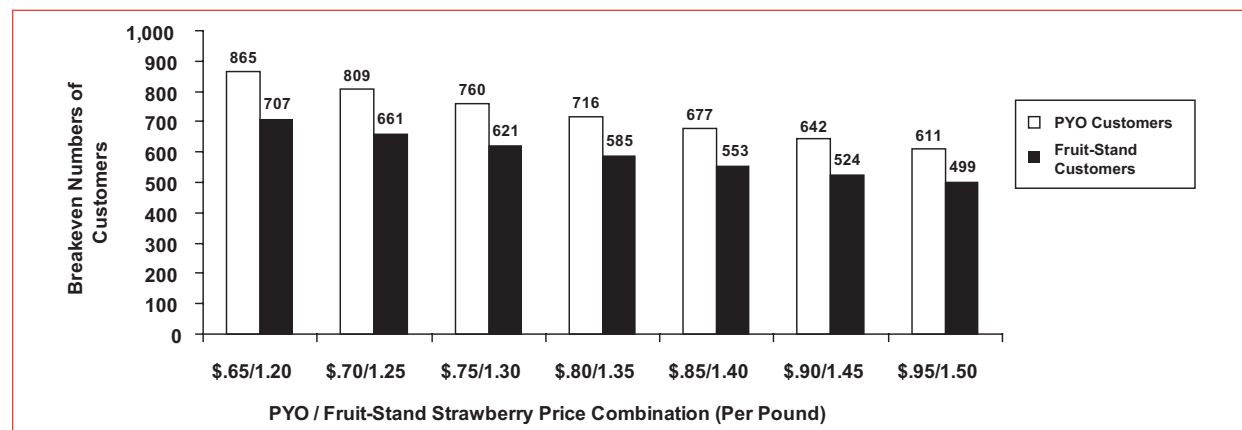
Estimating a required customer volume requires some assumptions about the berries sold and how many pounds of berries each customer will buy (Table 4). This estimate of customer volume assumes that two-thirds of the strawberries would be sold through PYO fields and one-third would be sold at a fruit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





## STRAWBERRY DIRECT-MARKET CUSTOMERS: A MARKETING ANALYSIS

Knowing who the customers are, why they buy strawberries, and why they come to a particular farm can help growers generate the customer traffic needed to be successful. The customer profiles provided here were developed from interviews with customers who visited the eight cooperating direct-market strawberry farms. Customers could either pick their own strawberries from the grower's field, or they could buy prepicked berries at the grower's fruit stand.

The interviewers who gathered information about the prices charged for berries also interviewed the customers about their buying habits and reasons for choosing a direct-market farm. As customers arrived, the interviewers asked them about their previous experiences with picking strawberries, whether they planned to pick their own berries or buy fruit-stand berries, and the effect advertising had on their decision to visit a particular farm. As the customers left the farm, the interviewers asked about their actual purchases, how the berries were to be used, and the quality of the fruit and services received at the strawberry farm. The interviewers also collected socioeconomic information from customers, such as age and household income, to identify the various market segments. Although some respondents did not answer every question, 1,647 usable questionnaires were collected. Table 5 provides demographic profiles of these customers that growers can compare with census data from their regions.

**Table 5. Strawberry Direct-Market Customers: Demographic Profiles\***

	All Customers (%)	PYO Customers (%)	Fruit-Stand Customers (%)
<b>Years of age</b>			
Less than 18	0.6	0.6	0.3
18 - 24	2.5	3.3	1.9
25 - 44	34.5	43.1	25.2
45 - 54	18.3	15.2	21.8
55-64	16.9	14.3	19.7
65 or older	27.2	23.5	31.1
Average age	51.7 yr	49.2 yr	54.3 yr
<b>Household Income</b>			
Less than \$15,000	7.8	9.1	6.5
\$15,000 - \$29,999	16.8	14.7	18.9
\$30,000 - \$44,999	21.5	23.8	19.3
\$45,000 - \$59,999	15.2	15.0	15.2
\$60,000 - \$74,999	17.3	18.9	15.4
\$75,000 or more	21.4	18.5	24.7
<b>Adults working 40 or more hours per week</b>			
None	29.6	27.1	32.4
1	40.0	43.9	36.0
2	25.6	24.3	26.7
3 - 4	4.1	3.8	4.3
More than 4	0.7	0.9	0.6
<b>Total miles traveled</b>			
0 - 4.9 miles	21.3	20.4	22.6
5 - 9.9 miles	33.3	35.6	30.9
10 - 19.9 miles	27.9	28.8	27.0
20 - 49.9 miles	12.9	12.1	13.3
50 miles or more	4.6	3.1	6.2
<b>Average miles traveled</b>			
Including customers traveling 50 miles or more	19.7 miles	17.5 miles	23.5 miles
Excluding customers traveling 50 miles or more	9.9 miles	9.8 miles	9.9 miles

\*Based on interviews completed in 1999 with 1,647 customers at eight direct-market strawberry farms in North Carolina.



**WHO BUYS DIRECT-MARKET STRAWBERRIES?**

The data collected during the consumer survey revealed some slight differences between PYO and fruit-stand customers: Those who bought fruit-stand berries were slightly older and reported higher incomes than the PYO customers.

The typical PYO customer was between 25 and 44 years old and had an annual household income of between \$30,000 and \$44,999. At least one family member in the picker’s household worked 40 hours or more per week. The second largest age group included pickers who were age 65 years or older, and the second most frequent income category was \$60,000 to \$74,999 per year. A significant number of customers earned \$75,000 per year or more; this income category ranked a close third. Excluding those who drove more than 50 miles to pick berries, the average number of miles PYO customers drove to the farm was 9.8 miles, with 35.6 percent driving between 5 and 9.9 miles and 28.8 percent driving between 10 and 19.9 miles.



The typical fruit-stand customer was also between 25 and 44 years old, and was living in a household with at least one family member working 40 hours or more per week. The typical fruit-stand customer, however, had a household income of \$75,000 per year or more. The second largest age group included those age 65 or older, and the second most frequent income category was \$30,000 to \$44,999 per year. The average age of the fruit-stand buyers was 54.3 years old, and almost a third (32.4 percent) of these customers were retirees. Again, excluding those who drove more than 50 miles to buy fruit-stand berries, the average mileage that

fruit-stand customers drove to the fruit stand was 9.9 miles, with 30.9 percent driving between 5 and 9.9 miles and 27.0 percent driving between 10 and 19.9 miles.

Females shopping alone made up the largest population of shoppers followed by shopping parties composed of males shopping alone, male and female couples, and females with children. Most females and males shopping alone bought berries at the fruit stand, while the majority of the shopping parties that included children frequented PYO fields. In fact, females who came with children made up the second largest group of PYO customers.

Overall, a third of the respondents had never previously visited the direct-market farm where they were interviewed. The remaining two-thirds were repeat customers. PYO fields accounted for the highest percentage of new customers, 39.1 percent, whereas the fruit stands had the highest percentage of repeat customers, 74.3 percent. Slightly more than 42 percent of the repeat PYO customers had picked strawberries earlier in the season at the same operation compared to 47.8 percent of the fruit-stand buyers who had purchased berries at the same fruit stand. Slightly more than 11 percent of the consumers had either picked or bought strawberries at other direct-market farms earlier in the year.

**Table 6. A Comparison of Customers at Eight North Carolina Strawberry Direct Markets**

	Pick-Your-Own Customers	Fruit-Stand Customers
Number of customers	847	800
Average age	49.2 years	54.3 years
Percentage who were retired	27.1 %	32.4 %
Mean annual income level	\$30,000 to \$44,999	\$75,000 or more
Average miles traveled*	9.8	9.9
Average volume purchased	11.6 pounds	7.1 pounds
Average purchase amount	\$10.30	\$9.40
Percentage who were repeat customers	60.9 %	74.3 %
Average time at the farm	15 to 30 minutes	Less than 15 minutes

\*Excludes the few customers who traveled 50 miles or more (4.6 percent).



# USE AND PURCHASING PATTERNS

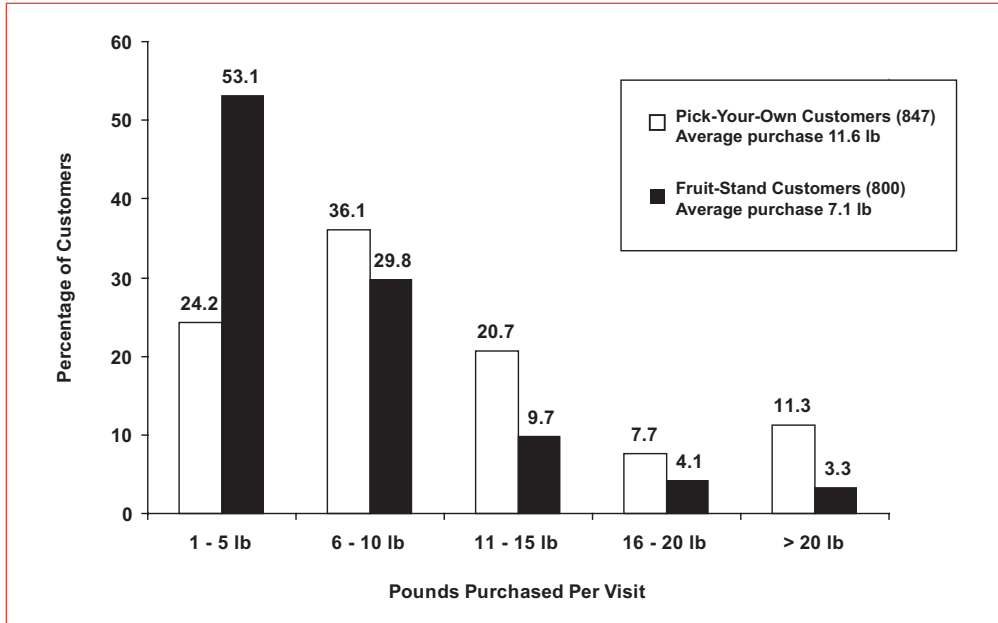


Figure 6. Pounds of strawberries purchased per visit by customer type.

## Use patterns

Not surprisingly, the majority of the customers planned to consume the strawberries fresh. Freezing the berries was the second most popular use, and processing the fruit for jam or jelly was the third most common use. A higher percentage of the PYO customers intended to process the strawberries compared to the fruit-stand customers: More than 35 percent of the PYO customers were going to freeze the strawberries versus 17.3 percent of the fruit-stand customers, and 14.2 percent of the PYO consumers were going to use the fruit to make jam or jelly versus 6.5 percent of the fruit-stand customers.

## Purchasing patterns

PYO customers picked an average of 11.6 pounds of berries per trip, whereas fruit-stand customers bought an average of 7.1 pounds. More than a third (36.1 percent) of the PYO customers picked 6 to 10 pounds of berries while more than half (53.1 percent) of the fruit-stand customers bought less than that (Figure 6). It is also significant to note that a higher percentage of the PYO customers (39.7 percent) than fruit-stand customers (17.1 percent) purchased 11 or more pounds of strawberries.

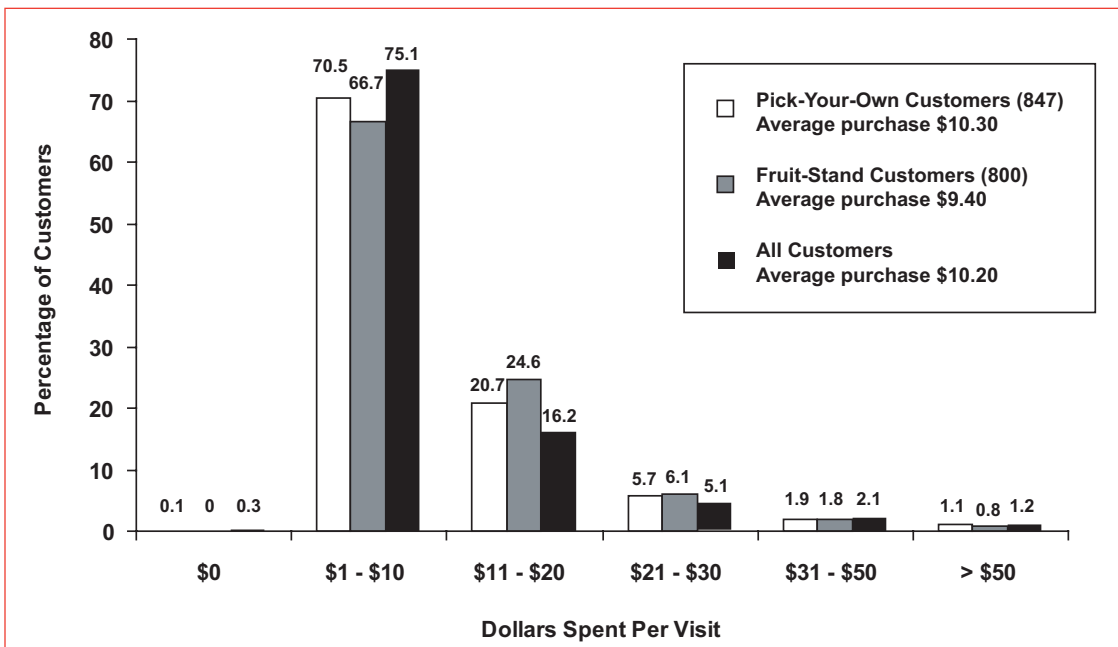


Figure 7. Dollars spent per visit by customer type.



Overall, consumers spent an average of \$10.20 for strawberries, with PYO customers spending slightly more than fruit-stand customers: an average of \$10.30 versus an average of \$9.40. Two-thirds of the PYO customers spent between \$1 and \$10, while one-third spent more. In contrast, about three-fourths of the fruit-stand customers spent less than \$10 and almost one-fourth spent more.

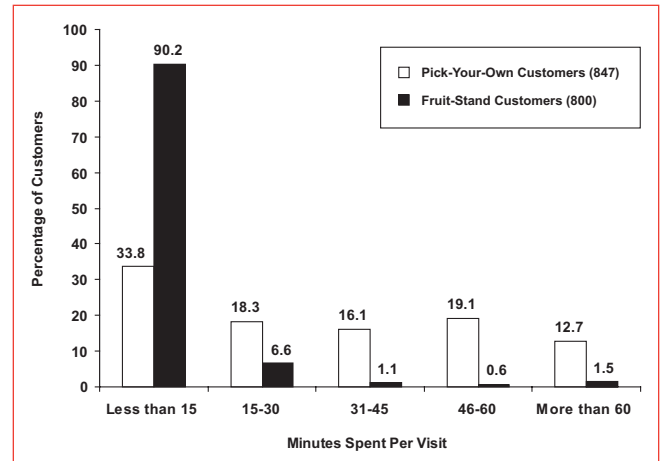
**Shopping times**

For PYO operations, Friday barely edged out Saturday as the busiest day of the week, with almost half of all the PYO customers shopping on Friday (24.3 percent) or Saturday (24.1 percent). For all practical purposes, there was no difference between these two days.

The shopping pattern for the fruit stands, on the other hand, followed the “typical” commercial supermarket shopping pattern for strawberries. That is, customer traffic started slow on Monday and Tuesday, “built up” on Wednesday and Thursday, peaked on Friday, and dropped off on Saturday. Data were not collected on Sunday, and that could prove to be a busy day for growers who choose to open that day.

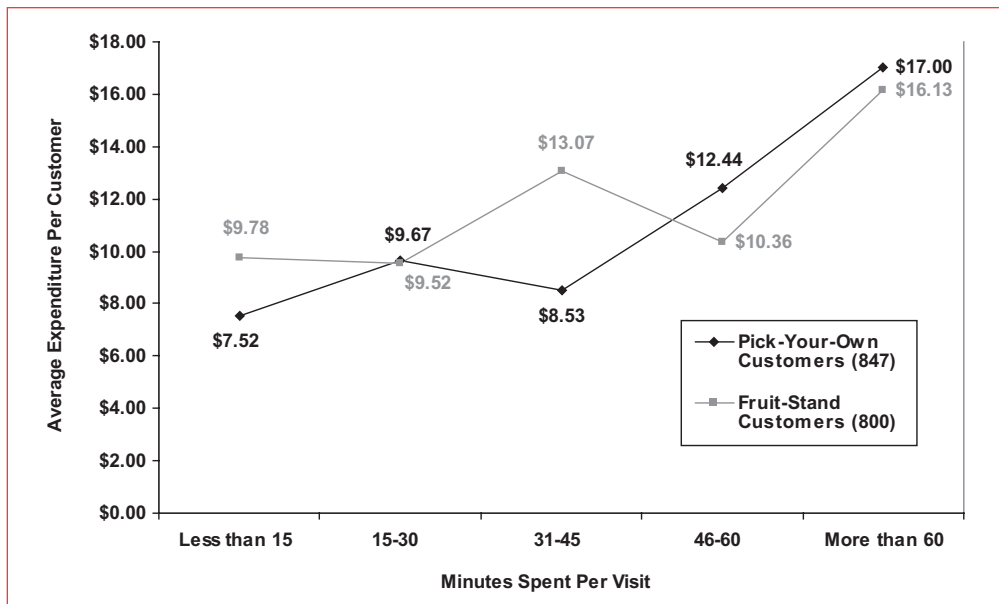
Over 90 percent of the customers who purchased strawberries at the fruit stands completed their transactions within 15 minutes, while a few (6.6 percent) took between 15 to 30 minutes to make their purchases (Figure 8). It is interesting to note that many of the customers who reported staying longer than 30 minutes at the fruit stand initially started picking strawberries at the PYO field. These individuals grew tired of picking and finished buying at the fruit stand, where they completed the second part of the interview.

**Figure 8. Minutes spent per visit by customer type.**



Predictably, most of the PYO customers stayed at the farm longer. While about a third of the pickers took less than 15 minutes to pick their berries and checkout, slightly more than 19 percent of them needed between 46 and 60 minutes to complete their transactions. Almost 13 percent stayed longer than an hour. Also not surprisingly, the PYO customers who picked longer typically spent more money. The average amount PYO customers spent gradually increased from an average of \$7.52 for those who stayed less than 15 minutes to \$17.00 for those individuals who stayed longer than an hour (Figure 9). The only exceptions to this trend were the consumers who stayed between 31 and 45 minutes; they spent an average of \$8.53 per customer.

**Figure 9. Average expenditures per customer by time spent.**





## WHY DO CONSUMERS BUY DIRECT-MARKET STRAWBERRIES?

Both PYO and fruit-stand customers ranked freshness as the most important factor in their decision to purchase strawberries at a farm, followed by taste, firmness, fruit color, and fruit size in that order. Price was the lowest-ranked consideration. Good fruit quality was also the major reason consumers said that they decided to pick more strawberries than they had anticipated, and poor quality was the major reason for a consumer’s decision to pick less fruit than expected.

Consumers who discovered that the strawberries were easier to pick than they had expected ranked the “ease of picking” as having a positive impact on how much fruit they eventually picked, but “picked over fields” or the lack of strawberries had the second largest negative impact on consumer picking decisions. Hot weather, small berries, hard-to- pick berries, and muddy fields likewise had a negative effect on picking.

Although price did not have a major impact on the amount of strawberries the consumers purchased, a statistical analysis indicated that price had a major impact on their decision to pick fruit or buy the berries at the fruit stand. Customers who thought that the price of the fruit-stand berries was too high relative to the price of the PYO berries decided to pick their fruit rather than buying the strawberries at the fruit stand. Conversely, if consumers saw relatively little difference between the two prices, they opted to buy their berries at the fruit stand rather than picking the fruit.

### Choosing a farm

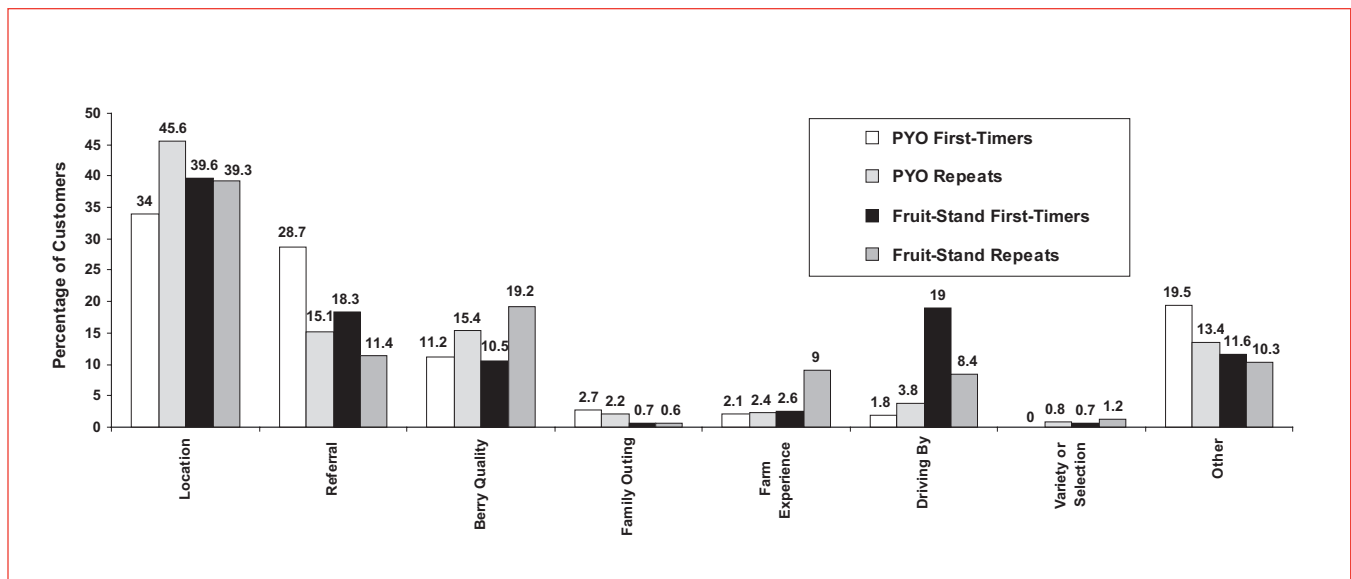
When asked what prompted their visit to the farm where they were interviewed, less than 23 percent of all the respondents said that advertising influenced their

shopping decision. Thus, the majority of customers (77 percent) indicated that an advertisement did not influence their decision.

Of the 379 customers who were influenced by a specific ad, more than half (56.8 percent) said that a sign or billboard prompted the visit. Newspaper advertisements had the second largest impact with a 22.4 percent response rate, while direct mailers were a distant third with a 5.7 percent response rate. Newspaper inserts, radio commercials, and commercial television advertisements each recorded a response rate of less than 2.0 percent. Only two people referred to an advertisement on cable TV, and two individuals located a direct-market farm via the Internet.

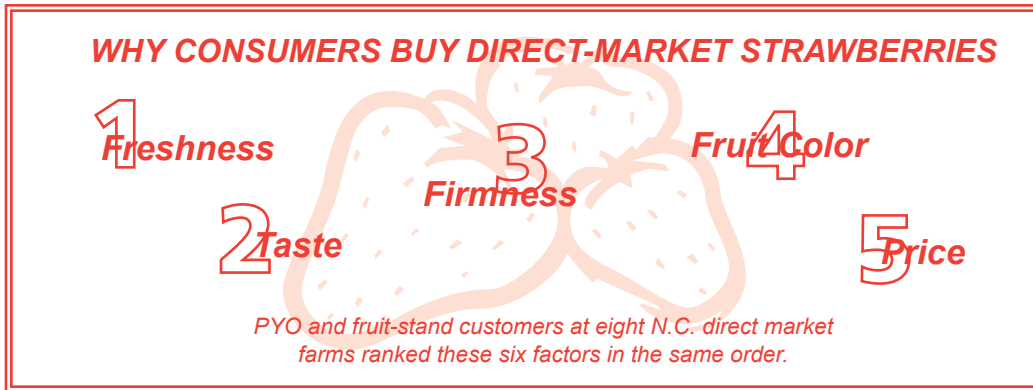
Yellow page ads and the PYO directory published by the North Carolina Strawberry Association and North Carolina Department of Agriculture and Consumer Services (NCDA&CS) were not mentioned by any of the consumers interviewed in 1999. But during the 6-week strawberry season in 2003, more than 8,000 visits were made to NCDA &CS’s new Internet farm market directory, at [www.NCFarmFresh.com](http://www.NCFarmFresh.com) (NCDA&CS, 2003). This suggests that more consumers are now using the Internet to locate direct-market operations.

Figure 10. Primary reasons for selecting a farm by customer type.





When asked what information in the advertisement attracted them to the strawberry farm, 62.4 percent of the customers said that the phrase “fresh strawberries” influenced their decision and 33 percent said that information about the farm’s location affected their decision. Publicizing information about strawberry prices and the hours of operation or offering redeemable coupons collectively persuaded only a few (1.5 percent) of these respondents to visit a direct-market farm.



Because so many of the customers interviewed did not respond to an advertisement, it could help growers promote their farms if they know why these individuals decided to buy berries at a particular farm. Customers whose visits were not motivated by advertising were presented a list of possible reasons for selecting a direct-market farm and asked to select the primary reason that influenced their decision to stop.

First-time PYO customers said that convenient location was the influence; a referral from a family member or friend was second (Figure 10). Convenient location was also the most significant factor that influenced repeat PYO customers to return to the same farm, more than double the percentage


of buyers who listed fruit quality as a prime consideration.


Likewise, convenient location was the major reason that fruit-stand customers decided to visit a fruit stand. More than a third of both the first-time (36 percent) and repeat (39 percent) fruit-stand customers listed this factor as the main reason for selecting a fruit stand. In addition, 19 percent of the first-time customers just happened to drive by the fruit stand and decided to stop, while 18.3 percent selected the fruit stand based on a referral from family members or friends. The second most frequent factor for repeat fruit-stand customers was the quality of the strawberries followed by referrals.







## RECOMMENDATIONS FOR GROWERS

 Based on the analysis described in this report, a North Carolina grower can expect to spend about \$13,540 per year for each acre of strawberries grown using standard practices for a plasticulture production system. With these costs considered, a net revenue analysis revealed that a grower would have to charge at least \$0.85 and \$1.40 per pound for PYO and fruit-stand berries, respectively, and sell a minimum of 12,000 pounds of strawberries per acre simply to cover the estimated costs. Breakeven analysis also indicated that a grower would have to sell a minimum of 15,041 pounds of berries per acre at the lowest combination of direct-market prices considered in this report and at least 10,622 pounds per acre at the highest prices to cover total expenses.


 Furthermore, based on the consumer interviews undertaken for this analysis, a grower can expect to sell an average of 11.6 pounds of berries to each PYO customer and an average of 7.1 pounds to each customer who visits the fruit stand. Under these assumptions, the breakeven marketable yield of 15,041 pounds per acre translates into a requirement to sell berries to at least 1,572 customers per acre of strawberries sold at the lowest combination of prices. In contrast, when the highest prices are charged, a breakeven marketable yield of 10,622 pounds per acre translates to a minimum of 1,110 customers per acre.


 Middle-aged, middle-income customers living within 10 miles of the farm made up the largest percentage of customers surveyed at the PYO fields. But customers with lower household incomes generally spent more money. Middle-aged, high-income individuals who live within 10 miles of the farm also made up the largest group of respondents at the fruit stands, whereas customers with annual household incomes greater than \$60,000 typically accounted for the largest expenditures.


 Thus, the initial site selected for the direct-market farm can have a long-term effect on the success of the business. Growers should locate close to population areas where the demographic characteristics of consumers resemble those identified in Table 5. They should also monitor demographic changes within their market areas so they can adjust their operations to meet their customers' changing needs. For example, as the population near a direct-market farm changes from primarily young couples with children to primarily retirees, customer purchase patterns would change as well based on customer age, family composition, and income.






 Overall, convenient location was the major reason that customers decided to patronize a specific direct-market outlet and a personal referral was second. Because referrals by family members or friends are so important in attracting new customers, growers who satisfy customer expectations with high-quality fruit and good service will have a comparative advantage in attracting new consumers. Satisfied customers give positive referrals. Given that 67 percent of the patrons are repeat customers, growers should incorporate these individuals into their marketing strategy by actively encouraging regular customers to tell their friends about the farm. For example, growers could provide brochures about the farm for customers to give to their friends or offer discount incentives to regular customers who bring in new customers.

 Impulse buying was the second most important reason that a first-time customer decided to select a fruit stand. That is, someone happened to be driving by a fruit stand, found the stand attractive, and decided to stop. This high percentage of impulse buyers reinforces the importance of selecting a convenient location and using effective signs to attract customers to a strawberry farm. It also supports the notion that managers should be sensitive to how their business is viewed by the public. Other research has shown that neat, clean direct-market farms with ample parking, safe access off and onto the highway, and attractive fruit displays help persuade customers to stop at these businesses.

 Those customers who visited a strawberry farm because of an advertisement said that the phrase “fresh strawberries” and information about the farm’s location in the advertisement were most important. Therefore, managers should highlight this information in any print and radio advertisements and ensure that it is clearly visible on their signs. Emphasizing the availability of fresh fruit-stand strawberries may also help because some potential customers may not realize that local strawberry growers operate a fruit stand as well as a pick-your-own field. There is no guarantee that any form of advertisement will be effective. But other consumer studies have found that retail managers who repeatedly focused their media ads on a simple, specific message recorded higher response rates than those who did not.

 Although Fridays and Saturdays are still the preferred shopping days, the consumer survey described here indicated that many customers find other days convenient. (Sunday customers were not included in the survey, so Sunday’s importance as a shopping day was not determined.) Growers should assess individual market areas, determine when their customers prefer to shop, and adjust their operating hours accordingly. Consumer interviews indicated that some customers left the PYO fields between 31 and 45 minutes after they arrived because they became hot and tired of picking berries. Growers may be able to counteract this by placing “comfort stations” where customers can sit down to rest and get a drink of water at strategic locations in the strawberry field. In other situations, the grower could direct customers to the fruit stand where they could buy additional berries.

The cost and marketing data provided in this publication can provide a basis for making informed management decisions. Strawberry growers, those considering entering the direct-market strawberry business, and professionals who are advising strawberry growers should remember that any budget is only a guide, not a substitute for individuals calculating their own costs and estimating their own breakeven yields and sales volumes. Costs vary from one producer to another because of market conditions, labor supply, age and condition of equipment, managerial skill, land costs, and many other factors. Because every situation is unique, growers should estimate their individual production, marketing, and harvest costs based on their own production techniques, price expectations, and local market situations.





# BUDGET PLANNING GUIDE

Operation	Labor	Equipment	Materials	Total
<b>Land Preparation</b>				
Treat old crop with paraquat				
Remove and dispose of plastic				
Disk				
Lime				
Plant soybeans for cover crop				
Total land preparation costs				
<b>Preplanting</b>				
Order plant material, fumigant, plastic mulch (10% deposit)				
Rotovate cover crop				
Pull greenhouse shade-cloth				
Set up misting system				
Purchase plug supplies (tips, trays, soil)				
Stick runner tips for plugs				
Handle trays				
Subsoil				
Disk (break up soil clods)				
Moisten soil media				
Irrigate and fertilize plugs (20N-8.8P-16.6K)				
Spray for two-spotted spider mites with hexakis				
Assemble irrigation system				
Irrigate for fumigation				
Rotovate for fumigation				
Fertilize (ammonium nitrate, potassium sulfate, triple super phosphate)				
Fumigate (methyl bromide + chloropicrin) (67% + 33%)				
Seed annual ryegrass in aisles				
Total preplanting costs				
<b>Transplanting and Postplanting</b>				
Transplant plugs and replant				
Irrigate plug establishment (3 applications)				
Apply drip irrigation (three 2-hour applications)				
Spray for two-spotted spider mites with bifenthrin				
Collect tissue sample				
Winterize drip system				
Apply floating row covers				
Total transplanting and postplanting costs				
<b>Dormancy</b>				
Order Internet and weather service (annual fee)				
Remove and reapply row covers				
Control white-tail deer				
Order containers, fertilizers, and other materials				
Remove row cover and dead foliage; mow leaves				
Apply dormant spray (captan)				
Scout for two-spotted spider mites				
Total dormancy costs				

# BUDGET PLANNING GUIDE



Operation	Labor	Equipment	Materials	Total
<b>Preharvesting</b>				
Pull plants through plastic				
Herbicide aisles with paraquat and crop oil concentrate				
Scout for mites, strawberry clipper weevil, and red fire ants				
Spray for two-spotted spider mites with bifenthrin (two applications)				
Connect drip system				
Check overhead irrigation system				
Inject mefenoxam (two applications)				
Spray for strawberry clipper weevil with chlorpyrifos				
Collect tissue sample (three collections)				
Pull plants and weeds				
Inject fertilizer (Sul-Po-Mg, boron, liquid nitrogen)*				
Re-apply row covers for freeze				
Protect from freezes—overhead irrigation (four applications)				
Control botrytis fruit rot with captan				
Release honeybees for pollination				
Inject fertilizer (Su-Po-Mg, calcium nitrate)*				
Control botrytis fruit rot with fenhexamide				
Inject fertilizer (Sul-Po-Mg, calcium nitrate)*				
Spray for two-spotted spider mites with abamectin				
Control botrytis fruit rot control with fenhexamide, and control powdery mildew with myclobutanil				
Inject fertilizer (potassium nitrate)*				
Total preharvesting costs				
Total production costs				
<b>Harvesting</b>				
Supervise picking and fruit-stand baskets				
Pick berries for fruit-stand sales				
Apply drip irrigation (six applications = 18 hours)				
Spray for two-spotted spider mites with abamectin				
Control botrytis fruit rot with captan				
Collect tissue sample				
Inject fertilizer, potassium nitrate, and calcium nitrate (two applications)				
Implement evaporative cooling – overhead (three applications)				
Control botrytis fruit rot with fenhexamide and control powdery mildew with myclobutanil (two applications)				
Disassemble irrigation system				
Total harvesting costs				
Total harvesting and production costs				

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