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STRAWBERRY ECONOMICS: COMPARING THE COSTS AND RETURNS OF ESTABLISHING AND PRODUCING FRESH AND PROCESSED MARKET JUNE BEARING STRAWBERRIES IN A PERENNIAL MATTED ROW SYSTEM TO DAY-NEUTRALS IN A PERENNIAL HILL, PLASTICULTURE SYSTEM, IN THE WILLAMETTE VALLEY

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Top Photo: Perennial June-Bearing Strawberries in a matted row system. Bottom: Day-neutral variety 'Albion' Strawberry planted in a perennial hill, plasticulture system, both taken in Washington County, Oregon by Jason Myer & Tom Peerbolt, respectively, of Peerbolt Crop Management.

Oregon State University OSU Extension Service

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Cora Wahl[1], Lora Liegel[2] and Clark F. Seavert[1]

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INTRODUCTION

The production of strawberries in Oregon decreased by 23 percent, from 2,600 acres in 2003 to 2,000 acres in 2012. Figure 2, shows a 36 percent decline in the production of processed strawberries over the last 10 years. In contrast, the production of fresh strawberries has increased 18 percent during that same time.

In recent years there has been a resurgence of buyers for fresh Oregon strawberries. To capture this increased demand, industry leaders are encouraging growers to plant fresh market strawberries. As a result, growers are interested to learn more about the economics of growing fresh market strawberries using technologies to increase yields and lengthen the market season.

This study compares the typical per-acre costs associated with growing processed and fresh market June-bearing strawberries in a perennial matted row system to day-neutral types grown using a perennial hill system with plastic mulch "plasticulture". Growers should use this information as a guide to estimating their own costs. The assumptions used to construct the enterprise budgets are discussed in the next section. An attempt has been made to report typical cultural practices used in growing both production systems; however, they do not represent the only production methods. Assistance by area producers, the Oregon Strawberry Commission and OSU reviewers was greatly appreciated.

Figure 1. Acres of Strawberries Grown in Oregon

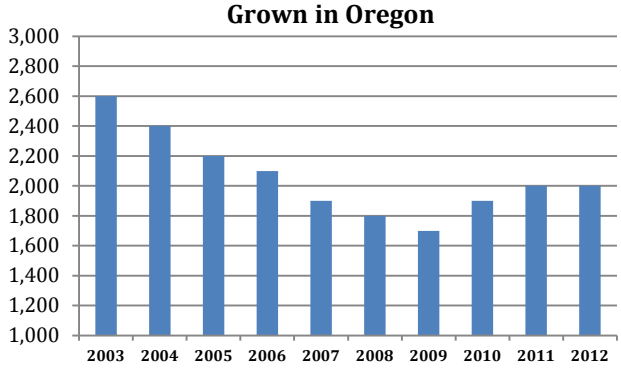
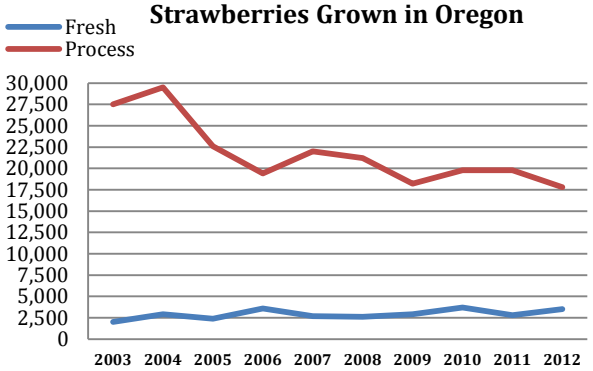


Figure 2. Tons of Fresh & Processed Strawberries Grown in Oregon



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ASSUMPTIONS

In this study, the authors made a set of assumptions that provided a basis for the analysis. These assumptions include:

1. A representative berry farm in the Willamette Valley consists of 200 acres. The berry crops on this farm include 20 acres of blueberries, 20 acres of trailing blackberries, 20 acres of strawberries and 140 acres used to rotate berry crops and rented to other growers on an annual cash-rent basis. The strawberries are grown as fresh and processed berries.
2. The owner and another family member manage the farm.
3. General labor is hired at a rate of $12.00 per hour; tractor drivers and irrigation labor are paid $12.50 per hour, all of which include workers' compensation, unemployment insurance, and other labor overhead expenses.
4. The land is owned and valued at $10,000 per acre, with $25 per acre property taxes, and $35 per acre property insurance.
5. Interest on operating capital (6 percent) is treated as a cash expense. One-half of the cash expenses are borrowed for a 6-month period. Interest on intermediate and long-term capital (6 percent) is treated as a non-cash opportunity cost to the owner.
6. The machinery and equipment on this farm reflect the typical machinery complements of a farm growing 60 acres of blueberries, trailing blackberries and strawberries, Table 1. Certain equipment used specifically for blueberry and trailing blackberry production are not included.
7. A detailed breakdown of machinery values is shown in Table 2. Estimated machinery costs are shown in Table 3. The machinery costs are estimated based on the total farm use of the machinery. Table 4 shows the per acre labor, variable, and fixed costs for certain machinery operations in the field.
8. Gasoline costs $3.82 per gallon, and off-road diesel $3.43 per gallon.
9. The cultural operations are listed approximately in the order in which they are performed. A 100-hp tractor is used to pull the rototiller, field cultivator, row crop cultivator, light disc, Dixon harrow, plow and roller. A 60-hp tractor is used to pull the 2-row rototiller, sub-soiler, rotary mower, fertilizer spreader, boom and band sprayers, and band spreader. A three-quarter ton pickup is used to pull the 4-wheel trailer at harvest.
10. The farm has a shop, machine shed, and tools valued at $47,500.
11. Price inflation for the time period, family living expenses, federal and state income tax consequences are ignored in this study.

MATTED ROW PRODUCTION

12. Fresh market strawberries are valued at $1.60 per pound and processed $0.65 per pound to the grower.
13. Plants are $0.10 per plant and planted at 10,000 plants per acre, totaling $1,000 per acre.
14. Harvesting the berries require 3 pickings.
15. Strawberries are irrigated with a hand-line irrigation system valued at $400 per acre.
16. Labor hours to irrigate plants require 1.0 hour per set.
17. The life of a perennial matted row system is three years, the establishment year and two full production years.

PLASTICULTURE PRODUCTION

18. Fresh market strawberries are valued at $1.60 per pound and processed $0.30 per pound to the grower. The processed price is lower than in conventional production systems because the day-neutral types are less desirable for the processing market and typically turned into juice. In the matted row production systems processing strawberries are more likely to be sold for IQF or puree, which are sold at a higher price.
19. Plants are $0.12 per plant and planted at 20,000 plants per acre, totaling $2,400.
20. Harvesting the berries require 16 pickings.
21. Strawberries are irrigated with a drip line irrigation system valued at $500 per acre. Additionally, a filter system valued at $11,000, injection pump at $2,000, and sub-mains at $300 per acre are used with the drip irrigation system.
22. Labor hours to irrigate plants require 1/4 hour per set.
23. The life of this system is two years, the first year of establishment and the subsequent year.
24. Fresh market strawberry plasticulture in the Willamette Valley is relatively new and the numbers gathered for this study were thus based on a small grower sample. Individual practices and inputs may vary.

Table 1. Machinery Cost Assumptions.

Machine	Size or Description	Current Market Value	Hours or miles of Annual Use	Expected Life
Tractor	4 wheel dr 100hp, new	$23,885	1,019	10
Tractor	2 wheel dr 60hp, old	15,000	405	20
Row Crop Cultivator	2-row	2,500	6	20
2-row Rototiller	2-row	12,000	19	20
Rototiller	7 ft	11,000	39	20
Disc - Light Duty	9 ft	5,200	5	20
Dixon Harrow	8 ft	2,500	3	20
Field Cultivator	16 ft	6,750	4	20
Plow	2 - 18"	3,000	8	20
Roller	8 ft	1,800	3	20
Sprayer, Boom	20 ft	4,000	167	20
Sprayer, Band	2-row	2,580	96	20
Spreader, Broadcast	20 ft	3,618	136	20
Spreader, Band	2-row	1,900	39	20
Mower, Rotary	6 ft	2,500	6	20
Subsoiler	3.67 ft	900	46	20
Pickup	3/4 ton 4x4, new	35,000	*12,000*	10
Truck	2 ton, used	18,000	*3,500*	20
ATV	4 wheel, new	8,000	*3,000*	5
Flatbed Trailer		5,000	3,500	20
Irrigation system	Handlines, per acre	400	N/A	25
Irrigation system	Drip System, per acre	500	N/A	2
Irrigation Filter		11,000	N/A	10
Injection Pump		2,000	N/A	10
Irrigation Submain	Installation & Parts	300	N/A	10
Shop & Machine Shed	40ft x 80ft Pole barn w/ partial slab floor	40,000	N/A	30
Shop Tools		7,500	N/A	10

Table 2. Machinery Cost Calculations.

Machine	Size or Description	------- Variable ------- Fuel & Lube	Repairs & Maint.	-- Fixed -- Deprec. & Interest	Total Cost
			----- Costs per hour -----		
Tractor	4 wheel dr 100hp, new	$11.63	$0.73	$2.56	$14.92
Tractor	2 wheel dr 60hp, old	6.78	0.85	2.82	10.45
Row Crop Cultivator	2-row	0.00	0.31	30.17	30.48
2-row Rototiller	2-row	0.00	2.30	49.46	51.76
Rototiller	7 ft	0.00	3.07	22.13	25.20
Disc - Light Duty	9 ft	0.00	0.19	80.69	80.87
Dixon Harrow	8 ft	0.00	0.22	68.96	69.18
Field Cultivator	16 ft	0.00	0.70	124.13	124.84
Plow	2 - 18"	0.00	0.19	31.03	31.22
Roller	8 ft	0.00	0.16	49.65	49.81
Sprayer, Boom	20 ft	0.00	2.36	1.87	4.22
Sprayer, Band	2-row	0.00	1.29	2.09	3.38
Spreader, Broadcast	20 ft	0.00	3.08	2.07	5.15
Spreader, Band	2-row	0.00	1.11	3.84	4.94
Mower, Rotary	6 ft	0.00	0.12	30.17	30.29
Subsoiler	3.67 ft	0.00	0.24	1.52	1.76
			----- Costs per mile -----		
Pickup	3/4 ton 4x4, new	$0.32	$0.05	$0.30	$0.67
Truck	2 ton, used	0.64	0.57	0.40	1.61
ATV	4 wheel, new	1.10	0.02	0.41	1.53
			----- Costs per acre -----		
Flatbed Trailer		$0.00	$1.67	$4.17	$5.83
Irrigation system	Handlines, per acre	0.00	0.13	0.27	0.40
Irrigation system	Drip System, per acre	0.00	0.17	4.17	4.33
Irrigation Filter		0.00	3.67	18.33	22.00
Injection Pump		0.00	0.67	3.33	4.00
Irrigation Submain	Installation & Parts	0.00	0.10	0.50	0.60
Shop & Machine Shed	40ft x 80ft Pole barn w/ partial slab floor	0.00	13.33	22.22	35.56
Shop Tools		0.00	2.50	4.17	6.67

Table 3. Estimated Cost of Each Operation with Power Unit.

Operation	Tractor	Miles per hour	Acres per hour	Labor Cost per	------- Machine Costs ------- Variable Cost per acre	Fixed Cost per acre	Total Cost per acre
Row Crop Cultivator	100 HP 4WD Tractor	3.00	2.16	$5.78	$12.67	$33.04	$51.49
2-row Rototiller	100 HP 4WD Tractor	2.00	1.44	8.66	14.66	54.33	77.65
Rototiller	100 HP 4WD Tractor	2.00	1.44	8.66	15.43	27.76	51.86
Disc - Light Duty	100 HP 4WD Tractor	3.00	2.78	4.49	12.54	83.44	100.47
Dixon Harrow	100 HP 4WD Tractor	3.00	2.47	5.05	7.86	72.00	84.91
Field Cultivator	100 HP 4WD Tractor	3.00	4.95	2.53	13.06	127.40	142.99
Plow	100 HP 4WD Tractor	2.00	0.93	13.48	12.55	33.79	59.82
Roller	100 HP 4WD Tractor	3.00	2.47	5.05	12.52	52.38	69.95
Sprayer, Boom	60 HP 2WD Tractor	3.50	6.36	1.96	9.99	7.04	19.00
Sprayer, Band	60 HP 2WD Tractor	3.00	2.04	6.14	13.64	5.94	25.73
Spreader, Broadcast	100 HP 4WD Tractor	3.00	5.82	2.15	15.44	7.71	25.30
Spreader, Band	60 HP 2WD Tractor	4.00	2.72	4.60	8.74	7.76	21.11
Mower, Rotary	100 HP 4WD Tractor	3.00	2.16	5.78	7.75	33.10	46.63
Subsoiler	100 HP 4WD Tractor	2.00	0.76	16.53	12.60	4.33	33.45

RESULTS OF ESTABLISHING AND PRODUCING FRESH AND PROCESSED MARKET JUNE-BEARING STRAWBERRIES IN A PERENNIAL MATTED ROW SYSTEM

The budgets in this study are divided into variable cash and fixed costs. Variable cash costs are out-of-pocket expenses that can vary by productivity of the crop and also divided into stages of field operations. The fixed costs are paid regardless of productivity and divided into cash and non-cash, while the non-cash fixed costs can also be opportunity costs to the owner.

Establishment Year

Table 4 shows the variable cash and fixed costs for the first year to establish a perennial matted row strawberry system, for both fresh and processed market strawberries. The variable cash costs are divided into land preparation, pre-plant, plant, post-plant and miscellaneous costs.

The total costs for land preparation are $220 per acre, $214 for pre-plant, $1,365 to plant, $830 for post-plant and $417 for miscellaneous costs for a total variable cash costs of $3,046 per acre. The most significant cost in the first year is the cost of the strawberry plants – 10,000 plants per acre at $0.10 per plant and $200 to custom plant for a total of $1,200 per acre. The total labor costs in year 1 are $595 per acre, $309 for fuel, lube and repairs for machinery and $1,724 for materials.

The total fixed costs in year 1 are $932 per acre, $60 for fixed cash costs and $872 in fixed non-cash costs. The largest fixed cost is a land ownership charge of $600 per acre, which can include a return on the grower's investment in the land as an opportunity cost, principal and interest payments for a loan or a combination of the two.

The total variable and fixed costs in year 1 to establish a matted row strawberry planting are $3,978 per acre. This cost is carried forward to the full production years and as an amortized establishment cost of $2,170 per acre, which is spread over the full production years of the strawberry planting of two-years at an interest rate of 6 percent.

Full Production Years

Table 5 shows the variable cash and fixed costs during the full production years for both perennial matted row fresh and processed market strawberries. The variable cash costs are divided into pre-harvest, renovation and miscellaneous costs.

The total pre-harvest costs are $891 per acre, $593 for renovation, and $392 for miscellaneous costs for a total variable cash cost of $1,875 per acre. The total labor costs are $392 per acre, $348 for fuel, lube and repairs for machinery and $1,136 for materials.

Total fixed costs are $3,101 per acre consisting of $60 in fixed cash costs and $3,041 in fixed non-cash costs. The total variable and fixed costs in full production years are $4,977 per acre.

The variable and fixed costs to establish and produce perennial matted row fresh and processed market strawberries are the same. However the yields, prices received by the grower and harvesting costs do differ between the two market types and are shown in Tables 6 and 7. Each of these tables include the projected yield, expected market price received by the grower, the gross income per acre, variable harvest costs and other variable and fixed costs from Table 5, to provide the economic returns and costs to produce fresh and processed market strawberries in a matted row production system.

Fresh Market Strawberries

Table 6 shows the economic returns and costs for fresh market strawberries, with a projected yield of 13,000 pounds per acre at a market price of $1.60 per pound for fresh market and $0.65 per pound for processed. The total gross income is $18,330 per acre. Hired labor harvests the strawberries three times and is paid $0.50 for each pound. The picking labor cost to harvest 13,000 pounds of strawberries is $6,500 per acre. Once harvested, strawberries are put into cartons and baskets at a cost of $1.75 per flat. For this yield, 1,200 flats are required for a total cost of $2,100 per acre. Total variable costs to harvest fresh market strawberries are $9,019 per acre.

The total variable costs to grow and harvest fresh market strawberries are $10,894 per acre, including the non-harvest costs in Table 5. The income remaining after paying all variable costs is $5,746 per acre. Total fixed costs from Table 5 are $3,101 per acre for a total of all costs per acre of $13,995. The net projected returns to the grower are $2,645 per acre.

Processed Market Strawberries

Table 7 shows the economic returns and costs for processed market strawberries, with a projected yield of 13,000 pounds per acre at a market price of $0.65 per pound. The total gross income is $8,450 per acre. Hired labor harvests the strawberries two times and is paid $0.40 for each pound. The picking labor cost to harvest 13,000 pounds of strawberries is $5,200 per acre. Total variable costs to harvest processed market strawberries are $5,638 per acre.

The total variable costs to grow and harvest processed market strawberries are $7,513 per acre, including the non-harvest costs in Table 5. The income remaining after paying all variable costs is $937 per acre. Total fixed costs from Table 5 are $3,101 per acre for a total of all costs per acre of $10,614. The net projected returns to the grower are -$2,164 per acre.

Table 4. Strawberries, Perennial Matted Row System, Establishment Year.

VARIABLE CASH COSTS	Description	Labor	Machinery	Materials	Total
LAND PREPARATION (Spring)					
Soil Test	1.0 appl.	$0.00	$0.00	$2.90	$2.90
Subsoil	1.0 appl.	16.53	12.60	0.00	29.13
Disc	1.0 appl.	4.49	12.54	0.00	17.04
Plow	1.0 appl.	13.48	12.55	0.00	26.03
Dixon Harrow	1.0 appl.	5.05	7.86	0.00	12.91
Rototill	1.0 appl.	8.66	15.43	0.00	24.10
Lime	1.0 appl.	2.15	15.44	90.00	107.59
Dolomite & Application	$90 /acre				
Total LAND PREPARATION		$50.37	$76.42	$92.90	$219.69
PRE-PLANT					
Herbicide	1.0 appl.	$1.96	$9.99	$20.00	$31.96
Materials	$20 /acre				
Disc	1.0 appl.	4.49	12.54	0.00	17.04
Fertilize	1.0 appl.	2.15	15.44	100.00	117.59
Materials	$100 /acre				
Insecticide	1.0 appl.	1.96	9.99	11.00	22.96
Material	$11 /acre				
Rototill	1.0 appl.	8.66	15.43	0.00	24.10
Total PRE-PLANT		$19.23	$63.39	$131.00	$213.63
PLANT					
Plants	10,000 /acre	$0.00	$0.00	$1,200.00	$1,200.00
Strawberry Plants	$0.10 /plant				
Custom Planting	$200 /acre				
Roll Plants	1.0 appl.	5.05	52.38	0.00	57.43
Herbicide, Band	1.0 appl.	6.14	13.64	50.00	69.78
Materials	$50 /acre				
Irrigate	1.0 sets	12.50	0.00	25.00	37.50
2 inch set	2.0 acre-inches				
Water	$12.50 /acre-inch				
Labor	1.0 hours				
Total PLANT		$23.69	$66.02	$1,275.00	$1,364.71
POST-PLANT					
Cultivate	3.0 appl.	$17.33	$38.00	$0.00	$55.33
2-row Rototill	2.0 appl.	17.33	29.32	0.00	46.65
Insecticide	1.0 appl.	6.14	13.64	10.50	30.28
Materials	$10.50 /acre				
Fertilizer	1.0 appl.	4.60	8.74	100.00	113.35
Materials	$100 /acre				
Irrigate	4.0 sets	50.00	0.00	100.00	150.00
0.50 inch set	2.0 acre-inches				
Water	$12.50 /acre-inch				
Labor	4.0 hours				
Hand Hoe	2.0 times	400.00	0.00	0.00	400.00
Labor	16.0 hours/time				
Herbicide, Band	1.0 appl.	6.14	13.64	15.00	34.78
Materials	$15 /acre				
Total POST-PLANT		$501.54	$103.34	$225.50	$830.38

Table 4. Strawberries, Perennial Matted Row System, Estabablishment Year (continued).				
VARIABLE CASH COSTS	Labor	Machinery	Materials	Total
MISCELLANEOUS				
General Overhead			$150.00	$150.00
Operating Capital Interest			67.02	67.02
Pickup, Truck, ATV			200.29	200.29
Total MISCELLANEOUS			$417.31	$417.31
Total VARIABLE COSTS	**$594.83**	**$309.18**	**$1,724.40**	**$3,045.72**
FIXED COSTS		Unit		Total
CASH Costs				
Property Insurance		acre		$35.00
Property Taxes		acre		25.00
Total CASH Costs				$60.00
NON-CASH Cost				
Machinery & Equipment - Depreciation &		acre		$145.78
Pickup, Truck, ATV - Depreciation & Interest		acre		103.83
Shop and Machine Shed - Depreciation &		acre		22.22
Land Ownership Charge		acre		600.00
Total NON-CASH Costs				$871.83
Total FIXED Costs				**$931.83**
Total of ALL Costs				**$3,977.56**

Table 5. Strawberries, Perennial Matted Row System, Full Production Years.

VARIABLE CASH COSTS	Description	Labor	Machinery	Materials	Total
PRE-HARVEST					
Herbicide	1.0 appl.	$1.96	$9.99	$50.00	$61.96
Materials	$50 /acre				
Fungicide	1.0 appl.	1.96	9.99	30.00	41.96
Materials	$30 /acre				
Fertilizer, Band	2.0 appl.	12.28	27.29	30.00	69.56
Phosphate (Aug & Oct)	$15 /acre				
Frost Control	1.0 appl.	12.50	0.00	25.00	37.50
1.0 inch	2.0 acre-inches				
Water	$12.50 /acre-inch				
Labor	1.0 hours				
Irrigate	1.0 sets	12.50	0.00	18.75	31.25
1.5 inch set	1.5 acre-inches				
Water	$12.50 /acre-inch				
Labor	1.0 hours				
Cultivate	1.0 appl.	5.78	12.67	0.00	18.44
Rototill	1.0 appl.	8.66	15.43	0.00	24.10
Hand Hoe	1.0 time	200.00	0.00	0.00	200.00
Labor	16.0 hours				
Insecticide	2.0 appl.	3.93	19.98	50.00	73.91
Materials	$25 /acre				
Fungicide	2.0 appl.	3.93	19.98	100.00	123.91
Materials	$50 /acre				
Foliar Fertilizers	3.0 appl.	6.44	46.31	90.00	142.76
Materials	$30 /acre				
Fertilize	2.0 appl.	4.30	30.87	30.00	65.17
Phosphate	$15 /acre				
Total PRE-HARVEST		$274.24	$192.52	$423.75	$890.51
RENOVATION					
Mow	1.0 appl.	$5.78	$7.75	$0.00	$13.53
Narrow Rows	1.0 appl.	2.42	3.22	0.00	5.64
Subsoil	1.0 appl.	16.53	12.60	0.00	29.13
Fertilizer	1.0 appl.	2.15	15.44	150.00	167.59
Materials	$150 /acre				
Insecticide	1.0 appl.	1.96	9.99	25.00	36.96
Materials	$25 /acre				
Herbicide, Band	1.0 appl.	6.14	13.64	25.00	44.78
Materials	$25 /acre				
Irrigate	3.0 sets	37.50	0.00	56.25	93.75
0.50 inch set	1.5 acre-inches				
Water	$12.50 /acre-inch				
Labor	3.0 hours				
Rototill	2.0 appl.	17.33	30.86	0.00	48.19
Subsoil	1.0 appl.	16.53	12.60	0.00	29.13
Insecticide	1.0 appl.	1.96	9.99	9.00	20.96
Materials	$9 /acre				
Herbicide, Band	1.0 appl.	4.60	8.74	25.00	38.35
Materials	$25 /acre				
Fertilizer	2.0 appl.	4.30	30.87	30.00	65.17
Phosphate	$15 /acre				
Total RENOVATION		$117.19	$155.72	$320.25	$593.16

Table 5. Strawberries, Perennial Matted Row System, Full Production Years (continued).				
VARIABLE CASH COSTS	Labor	Machinery	Materials	Total
MISCELLANEOUS				
General Overhead			$150.00	$150.00
Operating Capital Interest			41.26	41.26
Pickup, Truck, ATV			200.29	200.29
Total MISCELLANEOUS			$391.56	$391.56
Total VARIABLE COSTS	**$391.44**	**$348.24**	**$1,135.56**	**$1,875.23**
FIXED COSTS		Unit		Total
CASH Costs				
Property Insurance		acre		$35.00
Property Taxes		acre		25.00
Total CASH Costs				$60.00
NON-CASH Costs				
Amortized Establishment Cost		acre		$2,169.51
Machinery & Equipment - Depreciation &		acre		145.78
Pickup, Truck, ATV - Depreciation & Interest		acre		103.83
Shop and Machine Shed - Depreciation &		acre		22.22
Land Ownership Charge		acre		600.00
Total NON-CASH Costs				$3,041.34
Total FIXED Costs				**$3,101.34**
Total of ALL Costs				**$4,976.57**

Table 6. Strawberries, Fresh Market, June-Bearing, Full Production Years.

GROSS INCOME Description			Quantity	Unit	$/Unit	Total
Strawberries, Fresh (80%)			10,400	lb	$1.60	$16,640.00
Processed (20%)			2,600	lb	0.65	1,690.00
Total GROSS Income						$18,330.00
VARIABLE CASH COSTS	Description		Labor	Machinery	Materials	Total
HARVEST						
Labor	3.0	picks	$6,500.00	$0.00	$0.00	$6,500.00
	$0.50	/lb				
Carton & Baskets	1,200	flats	0.00	0.00	2,100.00	2,100.00
Materials: Flats	$1.75	/flat				
Load and Haul	$0.025	/lb	0.00	0.00	260.00	260.00
Field Sanitation	$24	/acre	0.00	0.00	24.00	24.00
Clean-up	1.0	appl.	12.50	0.00	0.00	12.50
Labor	1.0	hour				
Operating Capital Interest			0.00	0.00	53.64	53.64
Assessment	$0.0081	/lb	0.00	0.00	68.45	68.45
Yield	13,000	lbs				
Total HARVEST			$6,512.50	$0.00	$2,506.09	$9,018.59
Total VARIABLE cost, including Table 5						**$10,893.81**
GROSS INCOME minus VARIABLE COST						**$5,746.19**
Total FIXED cost from Table 5						**$3,101.34**
Total of ALL cost						**$13,995.15**
Net Projected Returns						**$2,644.85**

Table 7. Strawberries, Processed Market, June-Bearing, Full Production Years.

GROSS INCOME Description			Quantity	Unit	$/Unit	Total
Strawberries, Processed			13,000	lb	$0.65	$8,450.00
Total GROSS Income						
VARIABLE CASH COSTS	Description		Labor	Machinery	Materials	Total
HARVEST						
Labor, Picking & Supervisors	$0.40	/lb	$5,200.00	$0.00	$0.00	$5,200.00
Load and Haul	$0.025	/lb	0.00	0.00	325.00	325.00
Field Sanitation	$24	/acre	0.00	0.00	24.00	24.00
Clean-up	1.0	appl.	12.50	0.00	0.00	12.50
Labor	1.0	hour				
Operating Capital Interest			0.00	0.00	7.85	7.85
Assessment	$0.0081	/lb	0.00	0.00	68.45	68.45
Processed	13,000	lbs				
Total HARVEST			$5,212.50	$0.00	$425.30	$5,637.80
Total VARIABLE cost, including Table 5						**$7,513.03**
GROSS INCOME minus VARIABLE cost						**$936.97**
Total FIXED cost from Table 5						**$3,101.34**
Total of ALL cost						**$10,614.36**
Net Projected Returns						**-$2,164.36**

RESULTS OF ESTABLISHING AND PRODUCING FOR FRESH MARKET DAY-NEUTRAL STRAWBERRIES IN A PERENNIAL HILL, PLASTICULTURE SYSTEM

Production Year 1

Table 8 shows the economic returns and costs for year one to establish day-neutral strawberry varieties using a plasticulture production system. The projected yield for this year is 16,000 pounds per acre; 80 percent of the crop is sold as fresh fruit and the remaining 20 percent as processed fruit. The price for fresh market strawberries is $1.60 per pound, whereas the processed price is $0.30 per pound. The total gross income is $21,440 per acre.

The variable per acre cash costs are $196 for land preparation, $1,715 for pre-plant, $2,926 to plant, $1,998 for post-plant, $11,367 to harvest and $699 for miscellaneous costs. Total variable cash cost are $18,900 per acre. The total labor costs in year 1 are $9,872 per acre, $261 for fuel, lube and repairs for machinery and $8,767 for materials, which includes $1,050 for plastic and drip line irrigation, $2,800 for plants (20,000 plants x $0.12 per plant plus custom planting) and $2,800 for flats during harvest. The income remaining after paying all variable costs is $2,540 per acre.

Total fixed costs are $932 per acre, $60 for fixed cash costs and $872 in fixed non-cash costs. The total variable and fixed costs in year 1 are $19,832 per acre. The net projected returns to the grower are $1,608 per acre.

Production Year 2

Table 9 shows the economic returns and costs for year two to produce day-neutral strawberry varieties using a plasticulture production system. The projected yield in this year is 25,600 pounds per acre, which 80 percent of the crop is sold as fresh fruit and the remaining 20 percent as Processed fruit. The price for fresh market strawberries is $1.60 per pound, whereas the processed price is $0.30 per pound. The total gross income is $34,304 per acre.

The variable cash costs are divided into pre-harvest, harvest and miscellaneous costs, which include the disposal of the plastic cover, drip line and labor to perform the work. The pre-harvest costs are $1,662 per acre, $16,485 to harvest and $1,192 of miscellaneous costs for a total variable cash cost of $19,338 per acre. The total labor costs in year 1 are $13,689 per acre, $121 for fuel, lube and repairs for machinery and $5,529 for materials. The income remaining after paying all variable costs is $14,966 per acre.

Total fixed costs are $932 per acre, $60 for fixed cash costs and $872 in fixed non-cash costs. The total variable and fixed costs in year 2 are $20,270 per acre. The net projected returns to the grower are $14,034 per acre.

Table 8. Strawberries, Fresh Market, Day-Neutral, Perennial Hill, Plasticulture System, Year 1.						
GROSS INCOME Description			Quantity	Unit	$/Unit	Total
Strawberries, Fresh (80%)			12,800	lb	$1.60	$20,480.00
Processed (20%)			3,200	lb	0.30	960.00
Total GROSS Income						$21,440.00
VARIABLE CASH COSTS	Description		Labor	Machinery	Materials	Total
LAND PREPARATION (Spring)						
Soil Test	1.0	appl.	$0.00	$0.00	$2.90	$2.90
Subsoil	1.0	appl.	16.53	12.60	0.00	29.13
Disc	1.0	appl.	4.49	12.54	0.00	17.04
Plow	1.0	appl.	13.48	12.55	0.00	26.03
Dixon Harrow	1.0	appl.	5.05	7.86	0.00	12.91
Lime	1.0	appl.	2.15	15.44	90.00	107.59
Dolomite & Application	$90	/acre				
Total LAND PREPARATION			$41.70	$60.99	$92.90	$195.59
PRE-PLANT						
Bed Shaping/laying	1.0	appl.	$375.00	$0.00	$1,050.00	$1,425.00
Drip, materials	$500	acre				
Plastic, materials	$550	acre				
Labor	30	hours				
Herbicide	1.0	appl.	1.96	9.99	20.00	31.96
Materials	$20	/acre				
Disc	1.0	appl.	4.49	12.54	0.00	17.04
Fertilize	1.0	appl.	2.15	15.44	200.00	217.59
Slow-Release Nitrogen	$200	/acre				
Insecticide	1.0	appl.	1.96	9.99	11.00	22.96
Material	$11	/acre				
Total PRE-PLANT			$385.57	$47.96	$1,281.00	$1,714.53
PLANT						
Plants	20,000	/acre	$0.00	$0.00	$2,800.00	$2,800.00
Strawberry Plants	$0.12	/plant				
Custom Planting	$400	/acre				
Herbicide, Band	1.0	appl.	6.14	13.64	50.00	69.78
Materials	$50	/acre				
Irrigate	2.0	sets	6.25	0.00	50.00	56.25
1 inch set	2.0	acre-inches				
Water	$12.50	/acre-inch				
Labor	0.5	hours				
Total PLANT			$12.39	$13.64	$2,900.00	$2,926.03
POST-PLANT						
Insecticide	8.0	appl.	$49.10	$109.15	$160.00	$318.25
Materials	$20	/acre				
Irrigate	100.0	sets	312.50	0.00	250.00	562.50
0.20 inch set	20.0	acre-inches				
Water	$12.50	/acre-inch				
Labor	25.0	hours				
Pulling Weeds	4.0	times	800.00	0.00	0.00	800.00
Labor	16.0	hours/time				
Herbicide, Band	1.0	appl.	6.14	13.64	15.00	34.78
Materials	$15	/acre				
Cutting Runners	4.0	times	250.00	0.00	0.00	250.00
Labor	5.0	hours/time				
Herbicide, Broadcast	1.0	appl.	2.15	15.44	15.00	32.59
Materials	$15	/acre				
Total POST-PLANT			$1,419.89	$138.23	$440.00	$1,998.12

Table 8. Strawberries, Fresh Market, Day-Neutral, Perennial Hill, Plasticulture System, Year 1 (continued).						
VARIABLE CASH COSTS	Description		Labor	Machinery	Materials	Total
HARVEST						
Labor	16.0	picks	$8,000.00	$0.00	$0.00	$8,000.00
	$0.50	/lb				
Carton & Baskets	1,600	flats	0.00	0.00	2,800.00	2,800.00
Materials: Flats	$1.75	/flat				
Load and Haul	$0.025	/lb	0.00	0.00	400.00	400.00
Field Sanitation	$24	/acre	0.00	0.00	24.00	24.00
Clean-up	1.0	appl.	12.50	0.00	0.00	12.50
Labor	1.0	hour				
Assessment	$0.00813	/lb	0.00	0.00	130.00	130.00
Yield	16,000	lbs				
Total HARVEST			8,012.50	0.00	3,354.00	11,366.50
MISCELLANEOUS						
General Overhead			0.00	0.00	150.00	150.00
Operating Capital Interest			0.00	0.00	348.64	348.64
Pickup, Truck, ATV			0.00	0.00	200.29	200.29
Total MISCELLANEOUS			$0.00	$0.00	$698.93	$698.93
Total VARIABLE COSTS			**$9,872.05**	**$260.83**	**$8,766.83**	**$18,899.71**
GROSS INCOME minus VARIABLE COST						**$2,540.29**
FIXED COSTS				Unit		Total
CASH Costs						
Property Insurance				acre		$35.00
Property Taxes				acre		25.00
Total CASH Costs						$60.00
NON-CASH Costs						
Machinery & Equipment - Depreciation &				acre		$145.78
Pickup, Truck, ATV - Depreciation & Interest				acre		103.83
Shop and Machine Shed - Depreciation &				acre		22.22
Land Ownership Charge				acre		600.00
Total NON-CASH Costs						$871.83
Total FIXED Costs						**$931.83**
Total of ALL Costs						**$19,831.54**
Net Projected Returns						**$1,608.46**

Table 9. Strawberries, Day-Neutral, Perennial Hill, Plasticulture System, Year 2.

GROSS INCOME Description			Quantity	Unit	$/Unit	Total
Strawberries, Fresh (80%)			20,480	lb	$1.60	$32,768.00
Processed (20%)			5,120	lb	0.30	1,536.00
Total GROSS Income						$34,304.00
VARIABLE CASH COSTS	Description		Labor	Machinery	Materials	Total
PRE-HARVEST						
Herbicide	1.0	appl.	$1.96	$9.99	$50.00	$61.96
Materials	$50	/acre				
Fungicide	1.0	appl.	1.96	9.99	30.00	41.96
Materials	$30	/acre				
Frost Control	1.0	appl.	12.50	0.00	25.00	37.50
2.0 inch	2.0	acre-inches				
Water	$12.50	/acre-inch				
Labor	1.0	hour				
Irrigate	100.0	sets	312.50	0.00	250.00	562.50
0.20 inch set	20.0	acre-inches				
Water	$12.50	/acre-inch				
Labor	25.0	hours				
Fertigation	14.0	appl.	29.17	0.00	250.00	279.17
Materials	$250	/acre				
Labor	2.3	hours				
Pulling Weeds	4.0	appl.	200.00	0.00	0.00	200.00
Labor	16.0	hours				
Insecticide	2.0	appl.	3.93	19.98	50.00	73.91
Materials	$25	/acre				
Fungicide	5.0	appl.	9.82	49.96	280.00	339.78
Materials	$50	/acre				
Foliar Fertilizers	$30	/acre				
Fertilize	2.0	appl.	4.30	30.87	30.00	65.17
Phosphate	$15	/acre				
Total PRE-HARVEST			$576.14	$120.80	$965.00	$1,661.93
HARVEST						
Labor	16.0	picks	$12,800.00	$0.00	$0.00	$12,800.00
	$0.50	/lb				
Carton & Baskets	1,600	flats	0.00	0.00	2,800.00	2,800.00
Materials: Flats	$1.75	/flat				
Load and Haul	$0.025	/lb	0.00	0.00	640.00	640.00
Field Sanitation	$24	/acre	0.00	0.00	24.00	24.00
Clean-up	1.0	appl.	12.50	0.00	0.00	12.50
Labor	1.0	hour				
Assessment	$0.00813	/lb	0.00	0.00	208.00	208.00
Yield	25,600	lbs				
Total HARVEST			$12,812.50	$0.00	$3,672.00	$16,484.50
MISCELLANEOUS						
Disposal	1.0	times	$300.00	$0.00	$130.00	$430.00
Plastic cover	$80	/acre				
Dripline	$50	/acre				
Labor	24.0	hours				
General Overhead			0.00	0.00	150.00	150.00
Operating capital interest			0.00	0.00	411.50	411.50
Pickup, Truck, ATV			0.00	0.00	200.29	200.29
Total MISCELLANEOUS			$300.00	$0.00	$891.79	$1,191.79
Total VARIABLE COSTS			**$13,688.64**	**$120.80**	**$5,528.79**	**$19,338.22**
GROSS INCOME minus VARIABLE COST						**$14,965.78**

Table 9. Strawberries, Day-Neutral, Perennial Hill, Plasticulture System, Year 2 (continued).		
FIXED COSTS	Unit	Total
CASH Costs		
Property Insurance	acre	$35.00
Property Taxes	acre	25.00
Total CASH Costs		$60.00
NON-CASH Costs		
Machinery & Equipment - Depreciation &	acre	$145.78
Pickup, Truck, ATV - Depreciation & Interest	acre	103.83
Shop and Machine Shed - Depreciation &	acre	22.22
Land Ownership Charge	acre	600.00
Total NON-CASH Costs		$871.83
Total FIXED Costs		**$931.83**
Total of ALL Costs		**$20,270.06**
Net Projected Returns		**$14,033.94**

CONCLUSIONS

This study compares the typical per-acre costs associated with growing perennial matted row fresh and processed market June-bearing strawberries to fresh market day-neutral strawberries using a plasticulture production system. Table 10 summaries the economic returns and costs to establish and grow strawberries using the two production systems found in Tables 4, 5, 6, 7, 8 and 9.

Yields for both perennial matted row production systems are 13,000 pounds per acre while the projected yields in the plasticulture system is 16,000 pounds in year 1 and 25,600 in year 2. The variable costs are significantly higher for the plasticulture production system due to the inclusion of higher land preparation, pre-plant, planting and post-plant costs of establishment and higher harvesting costs resulting from higher yields.

The total costs per acre to grow strawberries using the plasticulture production system are almost twice that of processed market strawberries and about 40 percent higher than the fresh market perennial matted row production system. However, the net projected returns are quite different between the conventional and plasticulture production systems. The processed market strawberries are produced at a net loss of - $2,164 per acre while the fresh market conventional strawberries generate a net return of $4,335 per acre. The first year of establishment with the plasticulture production system generates a net profit of $1,608 per acre as a result of the 16,000 pounds of fruit sold. Year 2 net projected returns are $14,034.

It is clear that growing day-neutral strawberries varieties using a plasticulture production system is the most profitable system. However, the financial risks are higher as well as a function of higher costs to establish and grow strawberries using this production system.

This study is meant to provide useful information to producers who are considering planting fresh market strawberries in Oregon. However, like any other financial budgets, putting your own yields, prices and costs in a budget will make it more meaningful.

Many tools are available to assist in budgeting such as templates from university farm management specialists and computer software programs such as *AgProfit*^{TM}. This particular program is available as a download for free at (www.agtools.org).

In addition, growers must also be cautious of the impact that a particular enterprise can have on the overall financial stability of the farm business. Industry representatives can recommend planting one cropping system over another to improve profitability, but the financial requirements to implement the investment could jeopardize cash flows, increase the debt-to-asset ratio and diminish the solvency of the farm. The computer program *AgFinance*^{TM}, in conjunction with *AgProfit*^{TM}, can generate the financial ratios and performance measures required to evaluate capital investments.

There are many economic and financial considerations to review before such decisions are made. Seeking advice from university Extension and research faculty, industry representatives, accountants, attorneys or consultants can help in those decisions to keep your farm profitable.

Table 10. Comparing the Costs and Returns of Establishing and Producing Fresh and Processed Market June-Bearing Strawberries in a Perennial Matted Row System to Day-Neutrals in a Perennial Hill, Plasticulture System.

	-- Matted Row Production --		--- Plasticulture Production ---	
	Years 2 & 3 Processed Market *(Tables 5 & 7)*	Years 2 & 3 Fresh Market *(Tables 5 & 6)*	Year 1 80% Fresh Mkt 20% Processed Mkt *(Table 8)*	Year 2 80% Fresh Mkt 20% Processed Mkt *(Table 9)*
Yields	13,000	13,000	16,000	25,600
Price, per pound[1]	$0.65	$1.41	$1.34	$1.34
Gross income	$8,450.00	$18,330.00	$21,440.00	$34,304.00
Pre-Harvest Costs[2]	$890.51	$890.51	$6,834.27	$1,661.93
Harvest Costs	$5,637.80	$9,018.59	$11,366.50	$16,484.50
Post-Harvest Costs	$984.72	$984.72	$698.93	$1,191.79
Total Variable Costs	$7,513.03	$10,893.81	$18,899.71	$19,338.22
Total Fixed Costs[3]	$3,101.34	$3,101.34	$931.83	$931.83
Total Costs	$10,614.36	$13,995.15	$19,831.54	$20,270.06
Total Net Returns	($2,164.36)	$4,334.85	$1,608.46	$14,033.94

1The price per pound for fresh market matted row and plasticulture production is an average for fresh and processed markets.

[2]Pre-Harvest Costs for plasticulture production in Year 1, includes land preparation, pre-plant, planting and post-plant costs of establishment.

[3]The costs to establish the matted row strawberry systems in year 1 are included in the Total Fixed Costs as an amortized establishment cost of $2,170 per acre for years 2 and 3.