this system provides an excellent alternative to present systems in use.

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# AN ENTERPRISE COST ANALYSIS OF PEACH PRODUCTION IN FLORIDA[1]

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*Additional index words.* variable costs, fixed costs, chilling hours, net returns.

*Abstract.* **Peaches may be commercially produced in Florida for either the fresh market or the pick-your-own consumer. North Florida has the environmental characteristics necessary to produce quality peaches acceptable in all markets. A sizable investment is required to establish and develop a peach orchard to the productive stage. Maintaining a fully productive orchard also requires a large amount of yearly operating capital. The large outlay of capital necessary for producing peaches dictates careful planning and analysis before committing the production resources. Enterprise budgets are developed to aid peach producers or potential producers in their decision making. The enterprise budgets are a systematic listing of expenses for a production period. In this paper, budgets are devolepd to show the costs applicable in Florida for establishing, developing, and producing one acre of peaches. The budget format presented may be used by peach producers utilizing individual data in specific orchards. The budgets should be useful for obtaining financing, forward production planning, and management control.**

Commercial peach production is an important enterprise for many Florida producers. An estimated 4,000 acres are planted in North and Central Florida. Peaches were introduced in Florida by the early colonists and were grown commercially in Florida during the 1800's (2). Acreage has remained fairly constant in Florida; however, increased interest in peach production is now being shown among both commercial growers and homeowners.

A sizable investment is required to establish and develop an acre of peaches to a productive stage. Extensive development costs are required that begin with the preparation of the land prior to planting. Costs continue throughout the productive life of the peach trees with a substantial annual cost required for maintaining a productive peach orchard. Commercial plantings of peaches are expensive to produce and the investment requirements suggest careful planning and analysis before committing production resources to growing peaches.

A commercial planting of peaches, although costly to establish and maintain, may reward commercial fresh fruit operations with profits when recommended production and marketing practices are followed. The budget information developed in this report can be used by peach producers and potential growers as a guide in evaluating the operating expenses and capital outlays necessary for establishing, developing, and producing quality peaches in Florida.

### Site and Variety Suitability

A proper site selection and a correct choice of variety are important factors in successfully growing peaches in Florida. The environmental characteristics of both North and Central Florida are suitable for commercial peach production. Good air and water drainage are needed for tree growth and production. A wide variety of soil types can be used for growing peaches if proper drainage is available (3).

Many varieties are suitable for Florida production and are usually characterized by chilling hours required for adaptation to the different production areas of Florida. Depending upon the variety, varying amounts of winter chilling are necessary to provide good dormancy break and heavy fruit set. Usually the chilling effectiveness is measured by hours below 45°F (3). The varieties most widely used in Florida are those that require about 350 hr chilling for Central Florida and varieties that require 650 hr chilling for the Northern Florida production areas (3).

With proper site selection and variety choice, a commercial peach tree should produce firm fruit two inches or larger in diameter with yellow flesh and attractive surface blush. The varieties suitable for commercial production should also ripen early enough to market before other areas (3).

### Budgets

The expected costs of producing peaches are developed in enterprise budget format and these budgets provide a basis for forward production planning, financing, and management control. The cost estimates presented in this paper reflect data based on a commercial enterprise with sufficient scale to justify the necessary equipment for complete and timely production practices. The costs reflected in the budgets assume that most of the recommended production prac-

[1]Florida Agricultural Experiment Stations Journal Series No. 4245.

Table 1. Estimated establishment costs per acre for peaches planted in sod.

| Item | Unit | Quantity | Price | Total cost |
|---|---|---|---|---|
| Variable costs | | | | |
| Lime (spread) | ton | 1.5 | $ 22.00 | $ 33.00 |
| Fertilizer (trees) | cwt | 3.0 | 7.10 | 21.30 |
| Fertilizer (ammonium nitrate) | cwt | 1.5 | 9.00 | 13.50 |
| Fertilizer (sod) | cwt | 5.0 | 6.10 | 30.50 |
| Fumigation material[z] | acre | 1.0 | 220.00 | 220.00 |
| Land leveling and terracing | acre | 1.0 | 35.00 | 35.00 |
| Seed (cover crop) | lb | 20.0 | .90 | 18.00 |
| Trees (15 x 20 ft) | each | 145.0 | 2.00 | 290.00 |
| Herbicides[z] | acre | 1.0 | 36.00 | 36.00 |
| Insecticides[z] | acre | 1.0 | 30.00 | 30.00 |
| Pruning | acre | 1.0 | 50.00 | 50.00 |
| Machinery costs | | | | |
| Tractor | hr | 4.5 | 4.14 | 18.63 |
| Equipment | hr | 4.5 | 3.48 | 15.66 |
| Pickup truck | mile | 100.0 | .10 | 10.00 |
| Irrigation[y] | acre | 1.0 | 35.00 | 35.00 |
| Labor | hr | 16.0 | 3.75 | 60.00 |
| Interest on variable cost[x] | $ | 916.59 | 11.25% | 103.12 |
| Management | $ | 1019.71 | 10.0% | 101.97 |
| Total variable costs | | | | $1121.68 |
| Fixed costs | | | | |
| Tractor | hr | 4.5 | 7.02 | 31.59 |
| Equipment | hr | 4.5 | 3.94 | 17.73 |
| Pickup truck | mile | 100.0 | .13 | 13.00 |
| Irrigation[y] | acre | 1.0 | 90.00 | 90.00 |
| Land charge | $ | 800.00 | 10.0% | 80.00 |
| Total fixed costs | | | | 232.32 |
| Total establishment charge | | | | $1354.00 |

[z]Chemical recommendations are found in County Agent's Handbook and Monticello ARC Research Reports.
[y]Costs based on a trickle irrigation system.
[x]Based on 15% for 9 months.

Table 2. Estimated development costs per acre for peaches, year 2.

| Item | Unit | Quantity | Price | Total cost |
|---|---|---|---|---|
| Variable costs | | | | |
| Fertilizer | cwt | 5.0 | $ 6.55 | $ 32.75 |
| Ammonium nitrate | cwt | 1.5 | 9.00 | 13.50 |
| Trees (replant) | each | 6.0 | 2.00 | 12.00 |
| Herbicides[z] | acre | 1.0 | 28.00 | 28.00 |
| Insecticides[z] | acre | 1.0 | 30.00 | 30.00 |
| Mowing | acre | 1.0 | 12.00 | 12.00 |
| Pruning and thinning | acre | 1.0 | 150.00 | 150.00 |
| Machinery costs | | | | |
| Tractor | hr | 2.5 | 4.14 | 10.35 |
| Equipment | hr | 2.5 | 2.28 | 5.70 |
| Pickup truck | mile | 100.0 | .10 | 10.00 |
| Irrigation[y] | acre | 1.0 | 35.00 | 35.00 |
| Labor | hr | 9.0 | 3.75 | 33.75 |
| Interest on variable costs[x] | $ | 373.05 | 11.25% | 41.97 |
| Management | $ | 415.02 | 10.0% | 41.50 |
| Total variable costs | | | | 456.52 |
| Fixed costs | | | | |
| Tractor | hr | 2.5 | 7.02 | 17.55 |
| Equipment | hr | 2.5 | 2.72 | 6.80 |
| Pickup truck | mile | 100.0 | .13 | 13.00 |
| Irrigation[y] | acre | 1.0 | 90.00 | 90.00 |
| Land charge | $ | 800.00 | 10.0% | 80.00 |
| Total fixed costs | | | | 207.35 |
| Total development costs | | | | $663.87 |

[z]Chemical recommendations are found in County Agent's Handbook and Monticello ARC Research Reports.
[y]Costs based on a trickle irrigation system.
[x]Based on 15% for 9 months.

Table 3. Estimated production costs per acre for peaches, year 3.

| Item | Unit | Quantity | Price | Total cost |
|---|---|---|---|---|
| Variable costs | | | | |
| Lime (spread) | ton | 1.0 | $ 22.00 | $ 22.00 |
| Fertilizer | cwt | 6.0 | 6.55 | 39.30 |
| Calcium nitrate | cwt | 2.0 | 7.50 | 15.00 |
| Trees (replant) | each | 6.0 | 2.00 | 12.00 |
| Herbicides[z] | acre | 1.0 | 24.00 | 24.00 |
| Insecticides[z] | acre | 1.0 | 88.00 | 88.00 |
| Fungicides[z] | acre | 1.0 | 52.00 | 52.00 |
| Mowing | acre | 1.0 | 12.00 | 12.00 |
| Pruning and thinning | acre | 1.0 | 400.00 | 400.00 |
| Machinery costs | | | | |
| Tractor | hr | 3.0 | 4.14 | 12.42 |
| Equipment | hr | 3.0 | 2.28 | 6.84 |
| Pickup truck | mile | 100.0 | .10 | 10.00 |
| Irrigation[y] | acre | 1.0 | 35.00 | 35.00 |
| Labor | hr | 10.0 | 3.75 | 37.50 |
| Interest on variable costs[x] | $ | 766.06 | 11.25% | 86.18 |
| Management | $ | 852.24 | 10.0% | 85.22 |
| Total variable costs[w] | | | | 937.46 |
| Fixed costs | | | | |
| Tractor | hr | 3.0 | 7.02 | 21.06 |
| Equipment | hr | 3.0 | 2.92 | 8.76 |
| Pickup truck | mile | 100.0 | .13 | 13.00 |
| Irrigation[y] | acre | 1.0 | 90.00 | 90.00 |
| Land charge | $ | 800.00 | 10.0% | 80.00 |
| Total fixed costs | | | | 212.82 |
| Total pre-harvest production costs | | | | $1150.28 |
| Harvest costs | | | | |
| Boxes | each | 140.0 | .75 | 105.00 |
| Picking baskets | each | 1.0 | 7.00 | 7.00 |
| Bins | each | 1.0 | 30.00 | 30.00 |
| Labor, picking | box | 140.0 | 1.40 | 196.00 |
| Handling and hauling | box | 140.0 | .25 | 35.00 |
| Grading and packing | box | 140.0 | 2.75 | 385.00 |
| Other labor | hr | 15.0 | 3.40 | 51.00 |
| Tractor | hr | 2.0 | 9.12 | 18.24 |
| Equipment | hr | 2.0 | 5.23 | 10.46 |
| Trucking | box | 140.0 | 1.50 | 210.00 |
| Brokerage commission[v] | $ | 1680.00 | 10.0% | 168.00 |
| Interest on packing house investment | $ | 150.00 | 12.0% | 18.00 |
| Total harvesting costs | | | | 1233.70 |
| Total production costs | | | | $2383.98 |
| Receipts | box | 140.0 | 12.00 | $1680.00 |
| Net costs, year 3 | | | | $ 703.98 |

[z]Chemical recommendations are found in County Agent's Handbook and Monticello ARC Research Reports.
[y]Costs based on a trickle irrigation system.
[x]Based on 15% for 9 months.
[w]For varieties that require girdling, add a girdling cost of $75 per acre.
[v]Based on 140 boxes at $12 per box.

tices are followed. Three distinct budgets are developed to serve as a guide to growers. These three budgets reflect the different production practices necessary to establish the peach orchard, develop the orchard during the development period, and maintain the peach operation during the productive years (1).

Both variable and fixed costs are included in the analysis and the costs assume a planting of a North Florida variety requiring about 650 hr chilling. Variable costs are the short run cash expenses that will vary with the level of output. Fixed costs are the overhead costs that may not vary with output. The fixed costs include depreciation, interest, repairs, taxes, and insurance. A land charge and overhead charge are also included as fixed costs. The land charge is based on a price of $800 per acre. Irrigation is included in these budgets and both variable and fixed cost figures are included. A 10% charge of all pre-harvest production costs is included as a management charge. Even if the owner is

the manager, this expense should be included for the recognition of the value of management in this management intensive enterprise. Harvest costs include the interest on the packing house investment needed for a large scale peach operation.

Table 4. Estimated production costs per acre for peaches, years 4 through productive life.

| Item | Unit | Quantity | Price | Total cost |
|---|---|---|---|---|
| Variable costs | | | | |
| Lime (spread) | ton | .5 | $ 22.00 | $ 11.00 |
| Fertilizer | cwt | 8.0 | 6.55 | 52.40 |
| Calcium nitrate | cwt | 3.0 | 7.50 | 22.50 |
| Herbicides[z] | acre | 1.0 | 24.00 | 24.00 |
| Insecticides[z] | acre | 1.0 | 98.00 | 98.00 |
| Fungicides[z] | acre | 1.0 | 52.00 | 52.00 |
| Mowing | acre | 1.0 | 12.00 | 12.00 |
| Pruning and thinning | acre | 1.0 | 400.00 | 400.00 |
| Machinery costs | | | | |
| Tractor | hr | 4.0 | 4.14 | 16.56 |
| Equipment | hr | 4.0 | 2.28 | 9.12 |
| Pickup truck | mile | 100.0 | .10 | 10.00 |
| Irrigation[y] | acre | 1.0 | 35.00 | 35.00 |
| Labor | hr | 12.0 | 3.75 | 45.00 |
| Interest on variable costs[x] | $ | 787.58 | 11.25% | 88.60 |
| Management | $ | 876.18 | 10.0% | 87.62 |
| Total variable costs[w] | | | | 963.80 |
| Fixed costs | | | | |
| Tractor | hr | 4.0 | 7.02 | 28.08 |
| Equipment | hr | 4.0 | 2.92 | 11.68 |
| Pickup truck | mile | 100.0 | .13 | 13.00 |
| Irrigation[y] | acre | 1.0 | 90.00 | 90.00 |
| Land charge | $ | 800.00 | 10.0% | 80.00 |
| Total fixed costs | | | | 222.76 |
| Recapture of establishment and development costs | | | | 623.00 |
| Total pre-harvest production costs | | | | $1809.56 |
| Harvest costs | | | | |
| Boxes | each | 430.0 | .75 | 322.50 |
| Picking baskets | each | 1.0 | 7.00 | 7.00 |
| Bins | each | 1.0 | 30.00 | 30.00 |
| Labor, picking | box | 430.0 | 1.40 | 602.00 |
| Handling and hauling | box | 430.0 | .25 | 107.50 |
| Grading and packing | box | 430.0 | 2.75 | 1182.50 |
| Other labor | hr | 22.0 | 3.40 | 74.80 |
| Tractor | hr | 5.0 | 9.12 | 45.60 |
| Equipment | hr | 5.0 | 5.33 | 26.65 |
| Trucking | box | 430.0 | 1.50 | 645.00 |
| Brokerage commission[v] | $ | 6450.00 | 10.0% | 645.00 |
| Interest on packing house investment | $ | 150.00 | 12.0% | 18.00 |
| Total harvesting costs | | | | 3706.55 |
| Total production costs | | | | $5516.11 |

[z]Chemical recommendations are found in County Agent's Handbook and Monticello ARC Research Reports.
[y]Costs based on a trickle irrigation system.
[x]Based on 15% for 9 months.
[w]For varieties that require girdling, add a girdling cost of $75 per acre.
[v]Based on 430 boxes at $15 per box.

*Establishment.* The establishment costs include all machinery and labor costs required for land preparation and planting the peach trees. Variable and fixed costs for a trickle irrigation system are also included since irrigation is recommended for commercial orchard production in Florida. The first year costs are estimated at approximately $1354 per acre (Table 1).

*Development.* The second and third years of growth are usually the developing years in a commercial peach orchard. With proper management and an irrigated orchard, some production is often harvested in the third season. The annual per acre development costs for years 2 and 3 are approximately $664 and $2384, respectively (Tables 2 and 3). The net development costs for year 3 are $704 which includes the sale of some peaches.

*Production.* The total annual cost of maintaining a productive orchard is estimated to be approximately $5516 per acre (Table 4) including harvest costs. Debt service for recapturing the establishment and development costs is also included. This figure is obtained by compounding each of the first 3-yr investment (Table 5) and amortizing the sum of the compounded investment for 10 yr at a rate of 12%. The resulting $623 is added to the other production costs to recover the investment for the first 3 yr.

## Returns

Potential per acre net returns at various yield and price levels are shown in Table 6. The importance of the yields

Table 5. Compounded investment for establishment and development for years 1-3, compounded at 12%.

| Years | Annual investment | | Compounding factor (12%) | | Compounded investment |
|---|---|---|---|---|---|
| 1 | $1354 | x | 1.405 | = | $1902 |
| 2 | $ 664 | x | 1.254 | = | $ 833 |
| 3 | $ 704 | x | 1.120 | = | $ 788 |
| Total compounded interest | | | | | $3523 |

Table 6. Net returns per acre at varying yield and price levels.

| Yields (boxes) | Price/box $8.00 | $10.00 | $12.00 | $14.00 | $16.00 |
|---|---|---|---|---|---|
| 350 | −2,716 | −2,016 | −1,316 | −616 | 84 |
| 375 | −2,516 | −1,766 | −1,016 | −266 | 484 |
| 400 | −2,316 | −1,516 | −716 | 84 | 884 |
| 425 | −2,116 | −1,266 | −416 | 434 | 1,284 |
| 450 | −1,916 | −1,016 | −116 | 784 | 1,684 |
| 475 | −1,716 | −766 | 184 | 1,134 | 2,084 |
| 500 | −1,516 | −516 | 484 | 1,484 | 2,484 |

Table 7. Cash flow summary for peach production.

| Item | Years 1 | 2 | 3[z] | 4[y] | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Total production costs | $1,354 | $ 664 | $2,384 | $5,516 | $5,515 | $5,516 | $5,516 |
| Gross receipts | — | — | 1,680 | 6,450 | 6,450 | 6,450 | 6,450 |
| Net annual difference | −1,354 | −664 | −704 | 934 | 934 | 934 | 934 |
| Accumulated net | −1,354 | −2,018 | −2,722 | −1,788 | −854 | 80 | 1,014 |

[z]Assumes sale of 140 boxes at $12 per box for year 3.
[y]Assumes sale of 432 boxes at $15 per box for years 4 through productive life.

and prices that producers obtain are illustrated by the figures in this table.

### Financial Analysis

If recommended management and marketing practices are followed, an investment in a peach orchard could be profitable for a producer with sufficient capital or financial backing to establish the orchard. The grower would have to forego a self-sustaining income stream for the first four years. The cash flow analysis in Table 7 indicates that a positive net annual difference between costs and receipts is realized during the fourth year. A positive accumulated net difference occurs during the sixth year. Of course, with variations in production costs, yields, and prices, the cash flow would change and the planted acreage would be the factor that would ultimately determine the returns on investment.

Although peach orchards are relatively costly to establish and maintain, profits may be realized if recommended production practices are followed. Careful economic planning is necessary by peach producers to determine the prospects for profit in their particular operation.

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# PROCESSING OF MUSCADINE GRAPES


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*Abstract.* **Two new processing devices (a continuous flow density separator and an automatic deseeder) as well as a grape size separator, were developed to use for producing preserved deseeded grapes. Preliminary results on four cultivars ('Dixie', 'Fry', 'Higgins' and 'Southland') showed they could easily be separated and up to 80% of original weight could be recovered. These devices provide the main elements for a process for canned muscadine grapes.**


Due to the growth of the muscadine grape industry alternatives to the fresh fruit market are needed. Over the past few years the market has advanced from roadside stands and you-pick operations to widespread consumer acceptance in retail stores. As grape production and acreage continue to increase market pressures are created due to the short shelf life and short harvesting season. The wine industry can provide an outlet, but another alternative would be packaged deseeded grapes for direct consumption or reprocessing.

Although wine-making uses large quantities, it does not generate as high capital return as other markets. Studies by Stover, et al. (10) showed that 25% of a crop of bunch grapes, if used for wine, would only account for 7.4% of the total returns when the rest of the crop was marketed fresh. Thus, net returns on fresh fruit were much higher than on wine. Return could possibly be increased on other processed products. Most muscadine cultivars even at optimum storage conditions of 1°C and 85% relative humidity (9) remain acceptable only about 2 wk. In recent studies, Coleman, et al. (4) showed canned deseeded 'Dixie' grapes could be stored for 6 months at 70°F or below without significant changes in flavor or texture.

Processing for deseeded muscadine grape products would require the following unit operations: 1) separation of clean grapes by maturity, 2) separation of the mature grapes by size, 3) removal of seeds, and 4) canning or drying the deseeded grapes. Recent procedures for step 1 and step 3 have been carried out on four cultivars: 'Dixie', 'Fry', 'Higgins' and 'Southland'.

### Materials and Methods

*Equipment. Automatic deseeder.* A deseeder (Fig. 1) described by Coleman, et al. (5) was used in these studies. It deseeds 4 grapes at a time, up to 160 grapes/min.

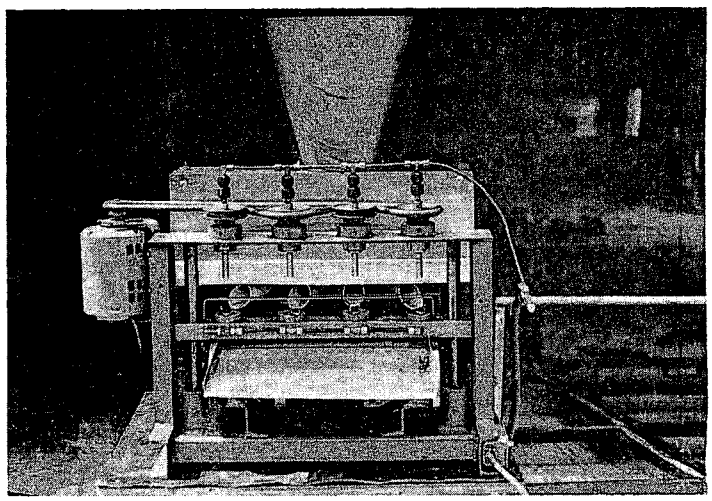

Fig. 1. Front view of deseeder showing cutter drive motor, cutters and hopper.

*Density Separators.* Two separators were tested: *Preliminary continuous separator.* A 5.3 gal (20 liter) cylindrical glass tank [11.5 inches (29.2 cm) diameter] was fitted with a 2 inch x 19 inch (5.1 cm x 48.3 cm) flat wooden paddle, driven by a stirring motor. An aluminum sleeve with small holes in it, prevented grapes from coming into

[1]Southern Region, U. S. Department of Agriculture, Agricultural Research Service.

[2]Mention of a trademark of proprietary product is for identification only and does not imply endorsement or warranty of the product by the U. S. Department of Agriculture, over other products which may also be suitable.