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Economic Considerations of Golden Shiner Production in Florida [1]

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Recreational freshwater fishing in Florida is estimated to be a one billion dollar business annually (1994--95 Florida Freshwater Sport Fishing Guide and Regulation Summary, Florida Game and Fresh-water Fish Commission); a significant portion of this revenue results from live bait sales. Live bait is preferred by many fishermen for catching several species including crappie and largemouth bass. The most popular bait for bass fishing is the golden shiner which is supplied from aquaculture pro-duction. The majority of baitfish production is located in the Mississippi Delta region. Arkansas leads the country in golden shiner production with 21,000 acres. Golden shiner production in Florida is a potential alternative crop for aquaculture farms.

The economics of golden shiner production has been reviewed for large operations, but no information on small farm production is available. Florida fish farms average under 10 acres, considerably smaller when compared to several hundred acres in the Mississippi delta regions of Arkansas and Mississippi. Most Florida foodfish operations that have recently diversified into baitfish production utilize small 0.25- to 1.0-acre ponds whereas most ponds on large farms in other states are 10--20 acres in size. Small farms are unique and experience specific economic challenges due to their size. Prospective bait producers must be aware of these challenges prior to investing in this business. This publication presents an overview of important economic considerations, including construction, equipment and operating costs of small operations in Florida.

DESCRIPTION OF OPERATIONS

Although the demand for golden shiners is high in Florida and the potential for production is attractive, existing and prospective fish producers will move slowly with small shiner production operations. This is due to the relatively high investment cost of aquaculture, the need for developing the necessary farming expertise and the recognition of the potential problem of oversupply. This is a wise business approach. To present the requirements and economic potential of golden shiner production, operations of two sizes typical of existing farms in Florida are presented.

Attention to pond design and construction specifications are important and have direct

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implications on facility cost and management. Utilizing small levee ponds offers greater management intensity with potentially higher yields, but are more expensive to construct per acre due to a greater number of aerators, water supply and drain lines and greater volume of soil moving compared to larger ponds.

Two operations are demonstrated in this report: a 5.5-acre operation consisting of five 1.0-acre ponds and two 0.25-acre broodstock ponds; and a 22-acre operation consisting of eight 2.5-acre ponds and four 0.5-acre broodstock ponds. The ratio of growout pond acreage to broodstock pond acreage is 10:1 and is consistent with the egg transfer method of golden shiner production. Broodstock are stocked and encouraged to spawn on artificial mats with the egg transfer method. The mats with eggs are transferred to growout ponds where the eggs hatch and the fish are fed until harvest.

Pond Construction and Installations

All pond construction follows Soil Conservation Service design criteria including: 16-foot top widths, 3:1 levee slopes, 6-foot levee height with 1 foot of freeboard allowing a 5-foot water depth, and an 8-inch drain. An average charge of $1.00 per cubic yard is used for earth-moving costs which reflects common charges for motor- or tractor-pulled pans (Figure 1). The use of pans is recommended to ensure necessary soil compaction. They are also more efficient in moving soil than bulldozers. A grass cover and gravel on levees to control erosion and to allow all-weather access to ponds for feeding and harvesting purposes are recommended. A detention pond for temporary holding of pond effluent is included in the 22-acre operation as required by the Florida Department of Environmental Protection(DEP), General Fish Farm Permit. The 5.5-acre operation does not require a permit since it does not exceed the 10,000 pounds per year and 10 acres criteria as stated in the 1994 Department of Environmental Protection general permit rule. Pond construction costs for the 5.5- and 22-acre operations are presented in Table 1 and Table 2 .

A water well and supply lines are required for successful golden shiner production (Figure 2). Water is required for pond flooding and replenishing

Figure 1 .

water loss from evaporation and seepage. Well water is necessary for the holding and grading tank facility. Water supply and drain lines should be constructed from PVC plastic pipe. A 6-inch well is recommended for the 5.5-acre operation to supply ponds and holding tanks. The 22-acre operation utilizes an 8-inch well.

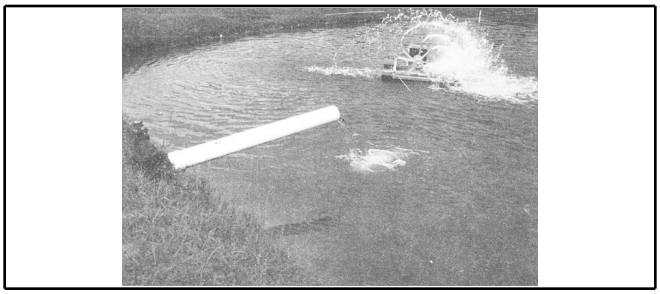

Figure 2 .

Electrical supply lines for both operations include a main distribution panel and underground electrical lines to ponds for the aerators. One main panel box with individual aerator timers is used for the 5.5-acre operation. The 22-acre operation utilizes four main panel boxes with timers and breakers.

Equipment and Operations

The necessary production equipment for the two operations is listed in Table 1 and Table 2 . A fish holding/grading tank facility is essential for any size shiner production operation. Golden shiners are delicate fish and do not respond well to handling. It is necessary for shiners to be "cured" prior to marketing. After the fish are harvested from ponds (Figure 3), they are transferred into the holding tanks. Curing, also known as hardening, refers to holding fish in cool well water for a minimum of 2--3 days which allows fish to become acclimated to lower water temperatures; this reduces fish respiration and stress levels. Salt is usually added to the water to reduce stress and promote the protective mucus layer. Purging further reduces the fishes demand for

oxygen. The end result of the curing process is a hardier and higher quality fish that can better tolerate handling. The holding tank facility (Figure 4) consists of a pole barn, concrete tanks, regenerative blower for aeration, air and water supply and drain lines and grading bars. Two 4'x15'x3' tanks are included in the 5.5-acre operation and four tanks for the 22-acre operation.

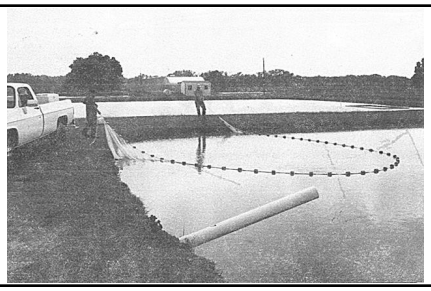

Figure 3 .

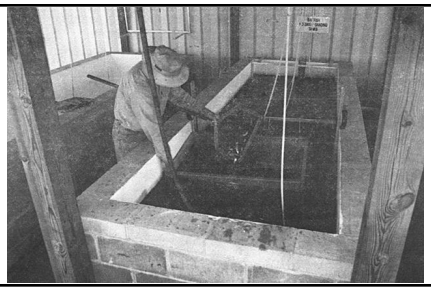

Figure 4 .

Ownership of a truck and tractor is assumed, and it is estimated half of the cost and use will be designated to the shiner production operation. A 3/4-ton truck is recommended for delivery of fish and for hauling other heavy loads. Both budgets include the necessary aeration, feeding, water quality monitoring and harvesting equipment. A small enclosure in the pole shed for feed storage and manual feeding is used in the 5.5-acre operation. The 22-acre operation utilizes a larger feed storage shed requiring air-conditioning to reduce feed quality degradation due to heat and humidity. A 500-pound capacity feed blower is included in the 22-acre operation to assist in feeding the 2.5-acre ponds. The expected life, investment, and depreciation costs of equipment are presented in Table 3 .

ECONOMIC ASSUMPTIONS

The construction and equipment cost estimates and enterprise budgets presented in this publication are based on the following assumptions:

- Land is previously owned and not included in capital investment.
- Land has a suitable clay soil and elevation for pond construction.
- Suitable quality and quantity of well water is available at normal depths.
- Electrical power lines are near farm location.
- Interest rate for construction and equipment is 8% of average investment which is calculated at one half of the cost. Interest rate for operating capital is 1% per month for 9 months on taxes and insurance and all variable costs except labor and marketing costs.
- Bagged feed at $300/ton is used.
- Adult shiners for broodstock are stocked at 500 lb/acre and cost $3.50/lb. There is a one-time charge for broodstock. In all instances other than the initial stocking, current broodstock is sold and the proceeds are used to purchase new broodstock. Because there is no net effect, the latter exchanges are not included in the budgets.
- Fertilizer costs include organic fertilizers, cotton seed and alfalfa meal, and an inorganic, liquid phosphorus (10-34-0) fertilizer.
- A 2:1 feed conversion is used to estimate feed requirements.
- Chemical costs include two pond treatments for parasite infections.
- Electricity cost is based on operating the well to fill ponds twice per year and for an average aerator use of 8 hr/day for 180 days. The kilowatt charge used is $0.07 per kilowatt hour.
- Taxes and insurance are calculated as 2.5% of half of the equipment and construction costs.
- Owner/operator labor is charged in the enterprise budgets, but excluded from the cash flow analyses. The charge in the enterprise budget is made to indicate that even though no cash is expended, unpaid labor is not completely free and that some other use could be made of the time spent on the golden shiner operation.

Part-time labor to assist owner in harvesting and feeding is included for both operations.

- Since golden shiners can be heavily preyed upon by wading birds, costs for typical bird scaring or pyrotechnic supplies are included.
- The majority of golden shiners are sold during the fall to spring months. Since fish size varies at harvest, sub-marketable-size fish can be stocked into other ponds and fed until marketable size is reached. All fish are sold to wholesalers or distributors.
- Fish income in enterprise budgets is based on a $3.25/lb FOB farm or pondbank price. 1995 pondbank prices in North Florida ranged from $3.00--3.50/lb.
- A yield of 1600 lb/acre is used for the 5.5-acre operation and 1200 lb/acre for the 22-acre operation. Average yields of 1850 lb/acre have been achieved in small ponds in north Florida. In an effort to be conservative, a slightly lower yield is used for the 5.5-acre operation. A lower yield is used for the 22-acre operation due to the larger size ponds and reduced management control. Some large ponds have achieved a yield of 1200 lb/acre.

ECONOMIC ANALYSIS

Enterprise Budgets

Enterprise or annual production budgets for both operations are presented in Table 4 and Table 5 . These budgets include a column for the reader to enter actual costs because these costs will be farm specific. Variable, fixed and total costs are included. Fixed costs are costs required and independent of the level of production and include: interest on construction and equipment, taxes, insurance and permit fees, and depreciation. Depreciation is a common business cost and involves an annual charge for the original cost of the item divided by its useful life. Breakeven price per pound, net return to owner and net return per acre are presented to allow for comparison to other fish crops.

Both operations show a positive profitability with the assumptions presented in this analysis. Net return per acre for the 22-acre operation is about 120% greater than for the 5.5-acre operation. Generally larger operations are more efficient than smaller ones because larger ones spread the capital investment costs over greater production volumes. The breakeven prices per pound are $2.93 for the 5.5-acre operation and $2.28 for the 22-acre operation. In the assumptions of this analysis, a 400 pound per acre reduction in yield for the 22-acre operation compared to the 5.5-acre operation is used to reflect observations of large pond production. Had the same yield been used, the difference of breakeven price values would have been even greater. Because the enterprise budgets presented represent only one set of assumptions, a sensitivity analysis is necessary to investigate other possible assumptions or conditions which can affect enterprise profitability.

Cash Flow Analysis

New Operations Sixteen-year cash flows for each of the start-up operations are presented in Table 6 and Table 7 . A time frame of sixteen years was selected because it encompasses the seven-year loan payment period and two major replacement/depreciation cycles after the loan is repaid. Because of the limited income caused by its size, the 5.5-acre operation does not exhibit a positive cumulative cash flow until Year 10, two years after the loan is fully repaid. It barely breaks even at that point. The annual situation is quite different. In all years but three, annual returns are positive. Returns are negative in only one year after full production is attained. In that year, Year 6, a major replacement is projected, and the operation does not generate enough cash to meet the need.

The 22-acre operation exhibits a different outcome. The 22-acre operation has a positive cumulative cash flow starting in Year 5 and a positive annual cash flow starting in Year 3. It is only in the first two years, before full production is attained, that the annual cash flows are negative. Enough cash is generated to withstand the major replacement of Year 6. In most years after the loan is repaid, about $2,000 in cash is generated per acre.

Golden shiner production is profitable for both size operations (Table 4 and Table 5). The cash flow projections (Table 6 and Table 7) reveal that there is a substantial time lag between start-up and positive cumulative cash flow, especially for the 5.5-acre operation. Many prospective producers already have made large investments to develop ponds for some other type of aquaculture enterprise.

Existing Operations

Cash flow projections of golden shiner production for producers with existing ponds are presented in Table 8 and Table 9 . It is assumed that they have on hand almost all the machinery and equipment to run a golden shiner operation. The only purchases or construction that are necessary are those for the breeding and production of baitfish. It is assumed that they already have a feed storage shed but lack the fish holding tanks.

The purchase or construction of new equipment and installations for the 5.5-acre operation totals almost $11,000; $24,000 for the 22-acre operation. It is also assumed that, in the first year, a loan payment for the existing installation and equipment will have to be made. In the case of the 5.5-acre operation the payment of the old loan amounts to $4,700. It amounts to $15,600 for the 22-acre operation. The terms of the loans are the same as those for a new operation (70% of cost for 7 years at 8%).

Cash flow projections for the operations with existing ponds are favorable. As before, annual cash flows are negative only for the first year. Cumulative cash flow for the 5.5-acre operation is projected to be negative through two years (compared to nine years for the new operation). For the 22-acre operation the projection is also negative through two years (compared to four years for the new operation).

Sensitivity Analysis

Many factors or inputs can influence business profitability. By nature, fish production can be a risky business which involves the potential of reduced yields due to poor water quality, fish disease and predation. To more completely evaluate the profitability of the 22-acre operation, three assumptions were varied. The effects of the changes on net return per acre are presented in Table 10 . In the sensitivity analysis, interest rates varied from 8 to 15%, yield varied from 800 to 1600 pound per acre and selling price varied from $2.75 to $3.75 per pound. These variations reflect occurrences that might be expected in baitfish production in Florida.

The lowest net return per acre is -$628 and the highest is $2,846. The variation in yield had the greatest effect on net return per acre. Using an 800 pound per acre yield resulted in a loss at a selling price per pound of $2.75, $3.00 or $3.25. Returns were also negative at the two higher interest rates with a price of $3.25 and yield of 800 pounds. Using the same yield, but higher selling prices of $3.50 and $3.75 showed a positive net return per acre. However, the profit margin at $3.50 might not be enough to warrant the high investment costs. Using a 1200 or 1600 pound per acre yield at all five selling prices resulted in attractive returns. This demonstrates the impact that good pond management has on fish yield and enterprise profitability. Lastly, it should be noted that variation of interest rates had the least effect on return.

CONCLUSION

The net return per acre and breakeven estimates presented in this analysis indicate that small-scale golden shiner production in Florida can be a profitable alternative for aquaculture producers. Compared to small-scale production of catfish for wholesale markets, golden shiner production offers greater potential returns. The cash flow projections for operations with pre-existing ponds and equipment indicate that producers who had difficulty earning positive returns from catfish production could generate greater returns and a positive cash flow from golden shiner production.

The cost of pond construction and equipment, $14,604 and $7,374 per acre for the 5.5- and 22-acre operations, respectively requires a large financial commitment. These costs are specific to the conditions listed in this report and serve only as a guide. It is essential that prospective bait producers investigate their specific costs prior to investing. To improve farm profits and offset the high investment costs, gearing production towards larger fish which

can sell for higher prices might be a sound strategy for Florida producers. In addition to financial considerations, baitfish production requires time and education. Prior to investment, the farmer must learn the necessary management skills. Attention to water quality, nutrition and predator management will greatly reduce risk and influence farm profits. Proper pond design, construction, and an adequate fish holding facility are critical to producing baitfish.

Identifying the local market conditions is essential to success. Prospective buyers will want to determine if new shiner producers can meet their needs of consistent quality and quantity. Understanding the many factors of the bait market including the seasonality of demand, fish size preferences and individual wholesaler requirements, will assist the farmer in developing a business plan and production operation.

Table 1.

Table 1. Pond construction and equipment cost for a 5.5-acre golden shiner production operation. Includes five 1.0-acre growout and two 0.25-acre brood ponds.

Item		Cost/Unit	Quantity	Cost	Your Cost
Pond Construction					
	Earth moving (cubic yards)	$1	27,000	$27,000	$
	Well (6 inch)		1	7,000	
	Water supply line			1,600	
	Electrical supply line			2,000	
	Drainage systems		6	2,400	
	Gravel and grass cover			960	
Construction Total				$40,960	$
Equipment					
	20' ¥ 15' pole shed		1	$700	$
	4' ¥ 16' ¥ 3' holding/grading tank		2	1,400	
	Tank facility supplies			1,200	
	3/4-ton truck (50% allocation)	$ 17,000		8,500	
	50 hp tractor (50% allocation)	16,000		8,000	
	Mower	1,500	1	1,500	
	Electric paddlewheel aerator: 1 hp	1,300	5	6,500	
	Electric pump sprayer aerator: 0.75 hp	700	2	1,400	
	Seine (200' ¥ 8' deep)	1,600	1	1,600	
	Seine reel	2,200	1	2,200	
	Feed storage enclosure	500	1	500	
	Fish hauling tank	1,200	1	1,200	
	Boat with motor	1,500	1	1,500	

Table 1.

	Oxygen meter and water quality test kit	1,150	1	1,150	
	Egg mats	5	150	750	
	Dip nets, waders and bird control supplies			785	
	Broodstock (pounds)	3.50	250	875	
Equipment Total				$39,360	$
TOTAL				$80,320	$
Total Cost/Acre				$14,604	$

Table 2.

Table 2. Pond construction and equipment costs for a 22-acre golden shiner production operation. Includes eight 2.5 acre growout and four 0.5-acre brood ponds.

Item		Cost/Unit	Quantity	Cost	Your Cost
Pond Construction					
	Earth moving (cubic yards)	$ 1	66,500	$ 66,500	$
	Well (8 inch)		1	11,000	
	Water supply line			3,600	
	Electrical supply line			3,800	
	Drainage systems (12) and detention pond			9,800	
	Gravel and grass cover			3,600	
Construction Total				$98,300	
Equipment					
	20' ¥ 25' pole shed		1	$ 1,000	$
	4' ¥ 16' ¥ 3' holding/grading tank		4	2,500	
	Tank facility supplies			1,800	

Table 2.

	3/4 ton truck (50% allocation)	$ 17,000		8,500	
	50 hp tractor (50% allocation)	16,000		8,000	
	Mower	1,500	1	1,500	
	Electric paddlewheel aerator: 2 hp	2,000	8	16,000	
	Electric pump sprayer aerator: 0.75 hp	700	4	2,800	
	Seine (300' ¥ 8' deep)	1,800	1	1,800	
	Seine reel	2,200	1	2,200	
	15' ¥ 20' feed storage shed	2,500	1	2,500	
	500-pound feed blower	3,200	1	3,200	
	Fish hauling tank	1,200	1	1,200	
	Boat with motor	1,500	1	1,500	
	Oxygen meter and water quality test kit	1,150	1	1,150	
	Egg mats	5	600	3,000	
	Dip nets, waders and bird control supplies			1,785	
	Broodstock (pounds)	3.5	1,000	3,500	
Equipment Total				$63,935	$
TOTAL				$162,235	$
Total Cost/Acre				$7,374	$

Table 3.

Table 3. Initial investment and annual depreciation costs for the 5.5 and 22-acre golden shiner production operations.

Item	Useful life (years)	Investment $	Depreciation $
Ponds	20		5% of new
well and pump			

Table 3.

	(6" - 200 gpm)	20	7,000	350
	(8" - 350 gpm)	20	11,000	550
Tank facility[1]		20		5% of new
50 hp tractor (50%)		15	8,000	535
Truck (50% allocation)		5	8,500	1700
Mower		10	1,500	150
Paddlewheel aerator				
	(1 hp)	10	1,300	130
	(2 hp)	10	2,000	200
sprayer aerator		5	700	140
Feed blower		10	3,200	320
Feed storage shed		10		10% of new
Boat with motor		10	1,500	150
Fish hauling tank		10	1,200	120
Seine		5		20% of new
Seine reel		10	2,200	220
Oxygen meter		5	900	180
Water quality kit		5	250	50
Dip net		5	25	5
waders		2	70	35
bird control supplies		5		20% of new
egg mats		2	5	2.50
broodstock		2	3.50	0

[1] Tank facility consists of pole shed and holding tanks as described in the description of operations section.

Table 4.

Table 4. Estimated annual costs and returns for a 5.5-acre golden shiner production operation.

Item and Unit	Quantity	Price (dollars)	Cost or Value (dollars)	Your Cost (dollars)
1. Gross Receipts (pounds)	8,000	3.25	26,000	
2. Variable Costs				
feed, tons	8	300	2,400	
fertilizer			250	
electricity, KwH	28,571	0.07	2,000	
fuel, gallons	250	1	250	
repairs and maintenance			750	
chemicals			750	
miscellaneous supplies			400	
family labor, hours[1]	600	5.00	3,000	
hired labor, hours	400	5.00	2,000	
interest on operating capital[2]	7796	9%	702	
Total Variable Costs			12,502	
3. Fixed Costs				
capital charges on construction, equipment and initial broodstock[3]			3,189	
taxes and insurance			997	
depreciation[4]			6,763	
Total Fixed Costs			10,949	
4. Total Costs			23,451	
5. Breakeven price/pound			2.93	
6. Net return to owner and land[5]			2,549	
7. Net return/acre			463	

Table 4.

[1]Although familiy labor is upaid, a reasonable charge for its time is included in the enterprise budget. There is no corresponding charge made in the cash flow estimates.
[2] Includes interest on all variable costs except for hired and family labor plus interest on taxes and insurance.
[3]Capital charges are calculated as 8% of average investment of construction, equipment and initial broodstock.Average investment equals to one-half the cost of each item included in these groupings.
[4]Broodshtock is excluded from depreciation calculations.
[5]Return is to owner and land because no land charge is included in the budget.

Table 5.

Table 5. Estimated annual costs and returns for a 22-acre golden shiner production operation.

Item and Unit		Quantity	Price (dollars)	Cost or Value (dollars)	Your Cost (dollars)
1. Gross Receipts (pounds)		24,000	3.25	78,000	
2. Variable Costs					
	feed, tons	24	300	7,200	
	fertilizer			700	
	electricity, KwH	50,000	0.07	3,500	
	fuel, gallons	600	1	600	
	repairs and maintenance			2,000	
	chemicals			3,000	
	miscellaneous supplies			700	
	family labor, hours[1]	1,000	5.00	5,000	
	hired labor, hours	2,000	5.00	10,000	
	interest on operating capital[2]	19,717	9%	1,775	
	Total Variable Costs			34,475	
3. Fixed Costs					

Table 5.

	capital charges on construction and equipment and broodstock[3]	6,453	
	taxes and insurance	2,017	
	depreciation[4]	11,775	
	Total Fixed Costs	20,245	
4. Total Costs		54,720	
5. Breakeven price/pound		2.28	
6. Net return to owner and land[5]		23,280	
7. Net return/acre		1,058	

[1] Although family labor is unpaid, a reasonable charge for its time is included in the enterprise budget. There is no corresponding charge made in the cash flow estimates.

[2] Includes interest on all variable costs except for hired and family labor plus interest on taxes and insurance.

[3] Capital charges are calculated as 8% of average investment of construction, equipment, and initial broodstock. Average investment equals one-half the cost of each item included in the groupings.

[4] Broodstock is excluded from depreciation calculations.

[5] Return is to owner and land because no land charge is included in the budget.

Table 6.

Table 6. Sixteen-year annual and cumulative csh flow for 5.5-acre golden shiner operation, producing 8,000 pounds sold at $3.25 per pound.

Year	Income and Expenses (in dollars)					Cash Flow	
	Income	Initial Investment	Operating Costs[3]	Loan Payment[4]	Replace-ment[5]	Annual	Cumu- lative
1	56,224[1]	80,320	0	0	0	-24,096	-24,096
2	15,600[2]		10,597	10,799	0	-5,796	-29,892
3	26,000		10,597	10,799	820	3,874	-26,108
4	26,000		10,597	10,799	0	4,604	-21,503
5	26,000		10,597	10,799	820	3,874	-17,719
6	26,000		10,597	10,799	13,135	-8,531	-26,250
7	26,000		10,597	10,799	820	3,874	-22,466
8	26,000		10,597	10,799	0	4,604	-17,861
9	26,000		10,597		820	14,583	- 3,278
10	26,000		10,597		0	15,403	12,125
11	26,000		10,597		13,955	1,448	13,574
12	26,000		10,597		11,700	3,703	17,277
13	26,000		10,597		820	14,583	31,860
14	26,000		10,597		0	15,403	47,264

Table 6.

15	26,000		10,597		820	14,583	61,847
16	26,000		10,597		13,135	2,268	64,115

[1] This sum is the amount of the loan (70% of $79,720).

[2] This sum is 60% of income from full production.

[3] This value includes all operating costs from Table 4 minus family labor and adding cost of insurance.

[4] Loan payment is based on the amount of the loan financed at 8% for seven years.

[5] The values in this column are consistent with the years of economic life displayed in Table 3.

Table 7.

Table 7. Sixteen-year annual and cumulative cash flow for 22-acre operation, producing 24,000 pounds soldat $3.25 per pound.

Year	Income and Expenses (in dollars)					Cash Flow	
	Income	Initial Investment	Operating Costs[3]	Loan Payment[4]	Replace-ment[5]	Annual	Cumu-lative
1	113,565[1]	162,235	0	0	0	-48,671	-48,671
2	46,800[2]		31,686	21,813	0	-6,699	-55,369
3	78,000		31,686	21,813	2,210	22,291	-33,078

Table 7.

4	78,000		31,686	21,813	0	24,501	-8,576
5	78,000		31,686	21,813	2,210	22,291	13,715
6	78,000		31,686	21,813	13,675	10,826	24,542
7	78,000		31,686	21,813	2,210	22,291	46,833
8	78,000		31,686	21,813	0	24,501	71,334
9	78,000		31,686		2,210	44,104	115,439
10	78,000		31,686		0	46,314	161,753
11	78,000		31,686		14,710	31,604	193,357
12	78,000		31,686		13,675	32,639	225,996
13	78,000		31,686		0	46,314	272,310
14	78,000		31,686		2,210	44,104	316,414
15	78,000		31,686		0	46,314	362,728
16	78,000		31,686		13,675	32,639	395,367

[1] This sum is the amount of the loan (70% of $161,335).

[2] This sum is 60% of income from full production.

[3] This value includes all operating costs from Table 5minus family labor and adding cost of insurance.

[4] Loan payment is based on the loan amount financed at 8% for seven years.

Table 7.

[5] The values in this column are consistent with the years of economic life displayed in Table 3.

Table 8.

Table 8. Sixteen-year annual and cumulative cash flow for 5.5-acre operation, with existing ponds and equipment producing 8,000 pounds sold at $3.25 per pound.

Year	Income and Expenses (in dollars)					Cash Flow	
	Income	Initial Investment	Operating Costs[3]	Loan Payment	Replace-ment[5]	Annual	Cumu-lative
1	7,602[1]	10,860	0	4,700[4]	0	-7,958	-7,958
2	15,600[2]		10,597	1,561	0	3,442	-4,516
3	26,000		10,597	1,561	820	13,022	8,507
4	26,000		10,597	1,561	0	13,842	22,349
5	26,000		10,597	1,561	820	13,022	35,371
6	26,000		10,597	1,561	13,135	707	36,079
7	26,000		10,597	1,561	820	13,022	49,101
8	26,000		10,597	1,561	0	13,842	62,943
9	26,000		10,597		820	14,583	77,527
10	26,000		10,597		0	15,403	92,930
11	26,000		10,597		12,250	3,153	96,083

Table 8.

12	26,000		10,597		13,135	2,268	98,351
13	26,000		10,597		820	14,583	112,935
14	26,000		10,597		0	15,403	128,338
15	26,000		10,597		820	14,583	142,921
16	26,000		10,597		13,135	2,268	145,190

[1] This sum is the amount of the loan (70% of $10,860).

[2] This sum is 60% of income from full production.

[3] This value includes all operating costs from Table 4 minus family labor and adding cost of insurance.

[4] The first year's loan payment is to cover the final year payment for the previous loan to construct ponds and purchase machinery and equipment. Loan payments for years 2-8 are based on financing a loan of $10,860 for seven years at 8%.

[5] The values in this column are consistent with the years of economic life in Table 3.

Table 9.

Table 9. Sixteen-year annual and cumulative cash flow for 22-acre operation with existing ponds and equipment producing 24,000 pounds sold at $3.25 per pound.

Table 9.

Year	Income and Expenses (in dollars)					Cash Flow (dollars)	
	Income	InitialInvestment	Operating Costs[3]	LoanPayment	Replace-ment[5]	Annual	Cumu-lative
1	16,475[1]	23,535	0	15,600[4]	0	-22,660	-22,660
2	46,800[2]		31,686	3,164	0	11,950	-10,710
3	78,000		31,686	3,164	2,210	40,940	30,229
4	78,000		31,686	3,164	0	43,150	73,379
5	78,000		31,686	3,164	2,210	40,940	114,319
6	78,000		31,686	3,164	13,675	29,475	143,794
7	78,000		31,686	3,164	2,210	40,940	184,733
8	78,000		31,686	3,164	0	43,150	227,883
9	78,000		31,686		2,210	44,104	271,987
10	78,000		31,686		0	46,314	318,301
11	78,000		31,686		14,710	31,604	349,905
12	78,000		31,686		13,675	32,639	382,544
13	78,000		31,686		0	46,314	428,858
14	78,000		31,686		2,210	44,104	472,962
15	78,000		31,686		0	46,314	519,276

Table 9.

16	78,000		31,686		13,675	32,639	551,915

[1] This sum is the amount of the loan (70% of $23,535).

[2] This sum is 60% of income from full production.

[3] This value includes all operating costs from Table 5minus family labor and adding cost of insurance.

[4] The first year's loan payment is to cover the final year payment for the previous loan to construct the ponds and purchase machinery and equipment. Loan payments for years 2-8 are based on a loan of $23,535 financed for seven years at 8%.

[5] The values in this column are consistent with the years of economic life displayed in Table 3.

Table 10.

Table 10. Net return per acre for various selling prices, yields and interest rates.

Selling price per pound (dollars)	Yield (lbs/acre)	Net return per acre in dollars based on three long term interest rates		
		8%	12%	15%
	800	-370	-518	-628
2.75	1200	511	363	253
	1600	1,392	1,244	1,134
	800	-185	-336	-446
3.00	1200	783	636	526
	1600	1,755	1,608	1,504
	800	-7	-154	-264
3.25	1200	1,056	909	799
	1600	2,119	1,971	1,861
	800	175	27	-83
3.50	1200	1,329	1,181	1,068
	1600	2,483	2,335	2,225
	800	357	209	99
3.75	1200	1,602	1,454	1,344
	1600	2,846	2,799	2,589