

Budgets for Small Scale Catfish Production to Supply a Fee Fishing Operation

Forrest Wynne

In temperate climates, catfish production and fee fishing occur during the spring and summer. Fee fishing facilities can provide a reliable market outlet to small-scale catfish producers. These operations require large catfish (1 lb., or greater) which are stocked into small fishing ponds. During a 200-day season, a small-scale fee fishing operation may sell 30,000 lbs. of fish, or more. Small quantities of fish, 500-1,000 lbs. are usually delivered on a weekly basis.

Fee fishing facilities receive a retail price for the catfish they sell. These operations may buy fish at prices which range from \$0.70 to \$1.35 per lb. and then sell them to customers for \$1.00 to \$2.00 per lb. Fee fishing establishments may be willing to pay higher prices than catfish processing plants which often wholesale processed fish in large volumes. In contrast to processing plants, fee fishing operations will accept fish which are less uniform in size.

Much of the southern U.S. lacks the flat land required for levee-style, catfish production ponds or the groundwater resources needed to fill them. In these regions, catfish are grown in watershed ponds. These ponds may be deep and irregular in shape because they are typically constructed in the valleys of hilly terrain. With some watershed ponds, partial draining may be required before catfish can be harvested.

Traditionally, catfish harvests have occurred during the fall. Runoff from winter and spring rains refill the ponds for the next production season. The lack of a reliable year-round water source does not allow frequent pond draining to harvest

fish to supply fee fishing operations.

If a pond's water volume is reduced early in the season to remove larger catfish, the remaining fish may suffer later from poor water quality. Alternatively, holding large numbers of market-size fish until the next fishing season can increase operating cost and the risk of crop loss.

Some fee fishing operators have expressed interest in producing their own fish. In some instances, better quality fish and substantial savings may be realized by businesses which are able to supply some or all of their own fish. Catfish production in watershed ponds is outlined in the form of enterprise budgets, which have been adapted from those of Crews and Jensen.⁽²⁾ These budgets are to serve as guidelines for prospective growers and to assist in the decision making process (Tables 1-8).

Budgets have been developed for two hypothetical catfish operations which consist of five and ten, 2-acre ponds. Each production facility would supply a small-scale fee fishing facility with approximately 33,000 lbs. of fish annually. The effects of different fish prices on net returns are discussed for each operation. Additionally, some management techniques for catfish production in watershed ponds are suggested. These suggestions may assist producers when marketing fish to fee fishing operations.

Limitations

The budgets provided contain limitations based on their inherent

assumptions. Budget assumptions include the following:

- * all catfish fingerlings are stocked in the spring;
- * a complete or single batch harvest occurs in November; and
- * all fish produced are sold.

Land, pond construction, and utility installation costs vary greatly between sites and regions and were not included in this budget. Costs for the construction of freshwater shrimp ponds on hilly land in Mississippi are provided in Table 10.⁽³⁾ Freshwater shrimp ponds are similar to those used for small-scale catfish production. A discussion and an example of loan pay-back potential for additional investment items were provided by Crews and colleagues.⁽¹⁾ The expense of a farm manager was not included in the operational expenses, but should be if one must be hired.

These catfish operations provide supplemental farm income through direct sales, or by marketing fish through a vertically integrated, small-scale fee fishing facility. Proportional equipment and facility expenses are shared among other farm-produced commodities.

Modified production practices may be necessary to supply fish to fee fishing operations. Considerable changes in time of stocking and harvest, and different harvest techniques may be needed. Individuals must evaluate production resources and local market conditions to develop cost estimates for their own enterprise budget. Blank spaces are provided for the potential producer to estimate costs and returns based on their specific situation. These scenarios have been

established to provide basic operational guidelines, only.

TABLE 1. Estimated costs and returns budget using the following catfish production practices (adapted from Crews and Jensen)⁽²⁾

- * Stocking in spring
- * 3,500 fish stocked per acre
- * 2 lbs. of feed/lb. of gain
- * 1 lb. end weight
- * Custom harvest in autumn
- * 91 lbs./1000 beginning weight
- * 200 days in growing season
- * 6% mortality/unharvested fish

ENTERPRISE CONSISTING OF FIVE PONDS OF 2 ACRES EACH

<i>ITEM</i>	<i>WEIGHT EACH</i>	<i>UNIT</i>	<i>QUANTITY</i>	<i>PRICE OR COST/UNIT</i>	<i>VALUE OR COST</i>	<i>YOUR FARM</i>
1. GROSS RECEIPTS						
Catfish 1	pound		32,900	\$0.70	23030.00	
2. VARIABLE COST						
Fingerlings			35000	\$0.10	\$3500.00	
Floating feed (32%)			31.87(s)T	\$305.00	\$9720.35	
Chemicals		APL/acre	1.00	\$70.00	\$700.00	
Harvest labor		hour	30.00	\$5.00	\$150.00	
Tractor (fuel, oil)		hour	58.00	\$5.00	\$290.00	
Electricity		KWh	12960	\$0.075	\$972.00	
Machinery & Equipment (repair)					\$651.50	
Interest on operating Capital			\$5855.00	\$0.12	\$702.60	
TOTAL VARIABLE COST					\$16686.45	
3. INCOME ABOVE VARIABLE COST						\$6343.55
4. FIXED COST ON BUILDING AND EQUIPMENT						
Interest			\$16306.50	.12	\$1956.78	
Depreciation			\$2939.04	.12	\$352.69	
TOTAL FIXED COSTS					\$2309.47	
5. TOTAL OF ALL SPECIFIED EXPENSES						\$18995.92
6. NET RETURNS ABOVE ALL SPECIFIED EXPENSES						\$4034.08
<hr/>						
NET RETURNS PER ACRE						
ABOVE SPECIFIED VARIABLE EXPENSES						\$634.36
ABOVE SPECIFIED TOTAL EXPENSES						\$403.41
BREAK-EVEN PRICE (PER 100 POUNDS)						
TO COVER SPECIFIED VARIABLE EXPENSES						\$50.72
TO COVER SPECIFIED TOTAL EXPENSES						\$57.74

NET RETURNS TO LAND, EXISTING POND, OPERATOR'S LABOR AND MANAGEMENT ESTIMATES SHOULD BE USED AS GUIDELINES FOR PLANNING PURPOSES ONLY

TABLE 2. Estimated costs and returns budget using the following catfish production practices (adapted from Crews and Jensen)⁽²⁾

- * Stocking in spring
- * 3,500 fish stocked per acre
- * 2 lbs. of feed/lb. of gain
- * 1 lb. end weight
- * Custom harvest in autumn
- * 91 lbs./1000 beginning weight
- * 200 days in growing season
- * 6% mortality/unharvested fish

ENTERPRISE CONSISTING OF FIVE PONDS OF 2 ACRES EACH

ITEM	WEIGHT EACH	UNIT	QUANTITY	PRICE OR COST/UNIT	VALUE OR COST	YOUR FARM
1. GROSS RECEIPTS						
Catfish 1	pound		32,900	\$1.00	32900.00	
2. VARIABLE COST						
Fingerlings			35000	\$0.10	\$3500.00	
Floating feed (32%)			31.87(s)T	\$305.09	\$9720.35	
Chemicals		APL/acre	1.00	\$70.00	\$700.00	
Harvest labor		hour	30.00	\$5.00	\$150.00	
Tractor (fuel, oil)		hour	58.00	\$5.00	\$290.00	
Electricity		KWh	12960	\$0.075	\$972.00	
Machinery & Equipment (repair)					\$651.50	
Interest on operating Capital			\$5855.00	\$0.12	\$702.60	
TOTAL VARIABLE COST					\$16686.45	
3. INCOME ABOVE VARIABLE COST						\$16213.55
4. FIXED COST ON BUILDING AND EQUIPMENT						
Interest			\$16306.50	.12	\$1956.78	
Depreciation			\$2939.04	.12	\$352.69	
TOTAL FIXED COSTS					\$2309.47	
5. TOTAL OF ALL SPECIFIED EXPENSES						\$18995.92
6. NET RETURNS ABOVE ALL SPECIFIED EXPENSES						\$13904.08
<hr/>						
NET RETURNS PER ACRE						
ABOVE SPECIFIED VARIABLE EXPENSES						\$1621.36
ABOVE SPECIFIED TOTAL EXPENSES						\$1390.41
BREAK-EVEN PRICE (PER 100 POUNDS)						
TO COVER SPECIFIED VARIABLE EXPENSES						\$50.72
TO COVER SPECIFIED TOTAL EXPENSES						\$57.74

NET RETURNS TO LAND, EXISTING POND, OPERATOR'S LABOR AND MANAGEMENT ESTIMATES SHOULD BE USED AS GUIDELINES FOR PLANNING PURPOSES ONLY

TABLE 3. Estimated costs and returns budget using the following catfish production practices (adapted from Crews and Jensen)⁽²⁾

- * Stocking in spring
- * 3,500 fish stocked per acre
- * 2 lbs. of feed/lb. of gain
- * 1 lb. end weight
- * Custom harvest in autumn
- * 91 lbs./1,000 beginning weight
- * 200 days in growing season
- * 6% mortality/unharvested fish

ENTERPRISE CONSISTING OF FIVE PONDS OF 2 ACRES EACH

ITEM	WEIGHT EACH	UNIT	QUANTITY	PRICE OR COST/UNIT	VALUE OR COST	YOUR FARM
1. GROSS RECEIPTS						
Catfish 1	pound		32,900	\$1.25	41125.00	
2. VARIABLE COST						
Fingerlings			35000	\$0.10	\$3500.00	
Floating feed (32%)			31.87(s)T	\$305.00	\$9720.35	
Chemicals		APL/acre	1.00	\$70.00	\$700.00	
Harvest labor		hour	30.00	\$5.00	\$150.00	
Tractor (fuel, oil)		hour	58.00	\$5.00	\$290.00	
Electricity		KWh	12960	\$0.075	\$972.00	
Machinery & Equipment (repair)					\$651.50	
Interest on operating Capital			\$5855.00	\$0.12	\$702.60	
TOTAL VARIABLE COST					\$16686.45	
3. INCOME ABOVE VARIABLE COST					\$24438.55	
4. FIXED COST ON BUILDING AND EQUIPMENT						
Interest			\$16306.50	.12	\$1956.78	
Depreciation			\$2939.04	.12	\$352.69	
TOTAL FIXED COSTS					\$2309.47	
5. TOTAL OF ALL SPECIFIED EXPENSES					\$18995.92	
6. NET RETURNS ABOVE ALL SPECIFIED EXPENSES					\$22129.08	
<hr/>						
NET RETURNS PER ACRE						
ABOVE SPECIFIED VARIABLE EXPENSES					\$2443.86	
ABOVE SPECIFIED TOTAL EXPENSES					\$2212.91	
BREAK-EVEN PRICE (PER 100 POUNDS)						
TO COVER SPECIFIED VARIABLE EXPENSES					\$50.72	
TO COVER SPECIFIED TOTAL EXPENSES					\$57.74	

NET RETURNS TO LAND, EXISTING POND, OPERATOR'S LABOR AND MANAGEMENT ESTIMATES SHOULD BE USED AS GUIDELINES FOR PLANNING PURPOSES ONLY

Table 4. Investment in facilities and new equipment required for five catfish ponds of 2 acres each, stocked at 3,500 fingerlings (7 inches in length) per acre (adapted from Crews and Jensen)⁽²⁾

ITEM	PRICE PER UNIT (\$)	NUMBER OF UNITS	PROPORTION CHARGED	TOTAL CHARGED	SALVAGE VALUE %	YEARS OF LIFE
Feed shed	3200	1	0.65	2080	0	15
Bush hog	8000	1	0.25	2000	0	10
3/4 ton truck (4x4)	25000	1	0.10	2500	10	10
D.O. meter	900	1	1.0	900	10	5
Water quality test kit	200	1	1.0	200	10	5
Tractor (40 hp)	24000	1	0.30	8000	10	10
PTO aerator	3400	1	1.0	3400	0	10
Electric aerators (2 hp)1700		5	1.0	8500	5	10
Feeder	2000	1	1.0	2000	0	10
Boat	1000	1	1.0	1000	0	15
Electric fishing motor	300	1	1.0	300	0	10
Deep cycle battery	80	1	1.0	80	10	10
Battery charger	80	1	1.0	60	0	10
Well	0	0	0	0	100	20
Well pump	0	0	0	0	10	20
Pond & drainage structure	0	0	0	0	100	20
Other	0	0	0	0	100	20
TOTAL				31020		

ASSUMPTIONS

Enterprise budgets were developed for two hypothetical catfish grow-out facilities which consisted of five- and ten-pond operations, each consisting of 2-acre ponds. A production season of 200 days was assumed. Net costs and returns (above variable and total specified expenses) per acre were calculated for fish sold at US \$0.70, \$1.00, and \$1.25 per pound and were compared for both farm sizes (Tables 1-8). The associated fee fishing facility required approximately 33,000 lbs. of catfish for a 200-day fishing season.

On the 10-acre farm (five ponds), channel catfish fingerlings were stocked at 3,500 fish/acre and electric aeration was used. Aeration consisted of five, 2-hp (1.5 kw), electric paddle wheel aerators. Aerators were operated for 6 hours per night for 180 nights. The 20-acre operation (ten ponds) was stocked with 2,000 catfish fingerlings/acre and no electric aeration was used. When

needed, both facilities provided

emergency aeration with a tractor-powered paddle wheel.

Large fingerlings, 7 inches long (91 lbs./1,000), were stocked to help assure the production of 1 lb. fish in one season. The stocking densities chosen for each farm would provide the 33,000 lbs. of fish needed to supply a fee fishing operation for one season. Net returns (above specified total expenses) per acre were ranked from highest to lowest, on both farms, for catfish sold at \$0.70, \$1.00 and \$1.25 per pound (Table 9). Budget assumptions and explanations⁽²⁾ are outlined in Section 1 and 2, respectively.

SECTION 1 CATFISH ASSUMPTIONS

1. Existing ponds are utilized and no land acquisition or pond construction costs are included in the budget. If these items are not available, such fixed costs must be estimated and entered into the budget. Examples of

some selected costs are provided by Montanez and colleagues⁽³⁾ and are

included in Table 10.

2. There is a market for the fish.
3. Fingerlings (7 inches) are stocked in April.
4. Fish loss for each pond is 6%.
5. Electric aeration is used for 180 nights beginning in May for a period of six hours each night. Emergency aeration is provided to all ponds. Ponds are stocked with 3,500 fish/acre.
6. All ponds are monitored with an electric dissolved oxygen meter and a water quality test kit.
7. Bagged feed is used.
8. A PTO-driven feed blower is used.
9. Catfish production is one of several enterprises generating income on the farm. Equipment is charged to the catfish operation on a percentage-use basis.
10. Complete harvest occurs in November. The budget does not include labor or other costs associated with initial harvest or fish transport. Additional labor is hired to remove the remaining fish which

BUDGET

were missed during the initial harvest.

TABLE 5. Estimated costs and returns budget using the following catfish production practices (adapted from Crews and Jensen)⁽²⁾

- * Stocking in spring
- * 2,000 fish stocked per acre
- * 2.0 lbs. of feed/lb. of gain
- * 1 lb. end weight
- * Custom harvest in autumn
- * 91 lbs./1000 beginning weight
- * 200 days in growing season
- * 6% mortality/unharvested fish

ENTERPRISE CONSISTING OF TEN PONDS OF 2 ACRES EACH

ITEM	WEIGHT EACH	UNIT	QUANTITY	PRICE OR COST/UNIT	VALUE OR COST	YOUR FARM
1. GROSS RECEIPTS						
Catfish 1	pound		37,600.20	\$0.70	26320.14	
2. VARIABLE COST						
Fingerlings			40000	\$0.10	\$4000.00	
Floating feed (32%)			36.43(s)T	\$305.00	\$11111.15	
Chemicals		APL/acre	1.00	\$70.00	\$1400.00	
Harvest labor		hour	34.00	\$5.00	\$170.00	
Tractor (fuel, oil)		hour	58.00	\$5.00	\$290.00	
Machinery & Equipment (repair)					\$651.50	
Interest on operating Capital			\$6509.00	\$0.12	\$781.08	
TOTAL VARIABLE COST					\$18403.73	
3. INCOME ABOVE VARIABLE COST					\$7916.41	
4. FIXED COST ON BUILDING AND EQUIPMENT						
Interest			\$12844.00	.12	\$1541.28	
Depreciation			\$2131.54	.12	\$255.79	
TOTAL FIXED COSTS					\$1797.07	
5. TOTAL OF ALL SPECIFIED EXPENSES					\$20200.80	
6. NET RETURNS ABOVE ALL SPECIFIED EXPENSES					\$6119.34	
NET RETURNS PER ACRE						
ABOVE SPECIFIED VARIABLE EXPENSES					\$395.82	
ABOVE SPECIFIED TOTAL EXPENSES					\$305.97	
BREAK-EVEN PRICE (PER 100 POUNDS)						
TO COVER SPECIFIED VARIABLE EXPENSES					\$48.95	
TO COVER SPECIFIED TOTAL EXPENSES					\$53.73	

NET RETURNS TO LAND, EXISTING POND, OPERATOR'S LABOR AND MANAGEMENT ESTIMATES SHOULD BE USED AS GUIDELINES FOR PLANNING PURPOSES ONLY

TABLE 6. Estimated costs and returns budget using the following catfish production practices (adapted from Crews and Jensen)⁽²⁾

- * Stocking in spring
- * 2,000 fish stocked per acre
- * 2.0 lbs. of feed/lb. of gain
- * 1 lb. end weight
- * Custom harvest in autumn
- * 91 lbs./1000 beginning weight
- * 200 days in growing season
- * 6% mortality/unharvested fish

ENTERPRISE CONSISTING OF TEN PONDS OF 2 ACRES EACH

<i>ITEM</i>	<i>WEIGHT EACH</i>	<i>UNIT</i>	<i>QUANTITY</i>	<i>PRICE OR COST/UNIT</i>	<i>VALUE OR COST</i>	<i>YOUR FARM</i>
1. GROSS RECEIPTS						
Catfish 1	pound		37600.20	\$1.00	37600.20	
2. VARIABLE COST						
Fingerlings			40000	\$0.10	\$4000.00	
Floating feed (32%)			36.43(s)T	\$336.21	\$11111.15	
Chemicals		APL/acre	1.00	\$70.00	\$1400.00	
Harvest labor		hour	34.00	\$5.00	\$170.00	
Tractor (fuel, oil)		hour	58.00	\$5.00	\$290.00	
Machinery & Equipment (repair)					\$651.50	
Interest on operating Capital			\$6509.00	\$0.12	\$781.08	
TOTAL VARIABLE COST					\$18403.73	
3. INCOME ABOVE VARIABLE COST						\$19196.47
4. FIXED COST ON BUILDING AND EQUIPMENT						
Interest			\$12844.00	.12	\$1541.28	
Depreciation			\$2131.54	.12	\$255.79	
TOTAL FIXED COSTS					\$1797.07	
5. TOTAL OF ALL SPECIFIED EXPENSES						\$20200.80
6. NET RETURNS ABOVE ALL SPECIFIED EXPENSES						\$17399.40
<hr/>						
NET RETURNS PER ACRE						
ABOVE SPECIFIED VARIABLE EXPENSES						\$959.82
ABOVE SPECIFIED TOTAL EXPENSES						\$869.97
BREAK-EVEN PRICE (PER 100 POUNDS)						
TO COVER SPECIFIED VARIABLE EXPENSES						\$48.95
TO COVER SPECIFIED TOTAL EXPENSES						\$53.73

NET RETURNS TO LAND, EXISTING POND, OPERATOR'S LABOR AND MANAGEMENT ESTIMATES SHOULD BE USED AS GUIDELINES FOR PLANNING PURPOSES ONLY

TABLE 7. Estimated costs and returns budget using the following catfish production practices (adapted from Crews and Jensen)⁽²⁾

- * Stocking in spring
- * 2,000 fish stocked per acre
- * 2.0 lbs. of feed/lbs. of gain
- * 1 lb. end weight
- * Custom harvest in autumn
- * 91 lbs./1000 beginning weight
- * 200 days in growing season
- * 6% mortality/unharvested fish

ENTERPRISE CONSISTING OF TEN PONDS OF 2 ACRES EACH

ITEM	WEIGHT EACH	UNIT	QUANTITY	PRICE OR COST/UNIT	VALUE OR COST	YOUR FARM
1. GROSS RECEIPTS						
Catfish 1	lb.		37600.20	\$1.25	47000.25	_____
2. VARIABLE COST						
Fingerlings			40000	\$0.10	\$4000.00	
Floating feed (32%)			36.43(s)T	\$336.21	\$11111.15	
Chemicals		APL/acre	1.00	\$70.00	\$1400.00	
Harvest labor		hour	34.00	\$5.00	\$170.00	
Tractor (fuel, oil)		hour	58.00	\$5.00	\$290.00	
Machinery & Equipment (repair)					\$651.50	
Interest on operating Capital			\$6509.00	\$0.12	\$781.08	
TOTAL VARIABLE COST					\$18403.73	
3. INCOME ABOVE VARIABLE COST						\$28596.52
4. FIXED COST ON BUILDING AND EQUIPMENT						
Interest			\$12844.00	.12	\$1541.28	
Depreciation			\$2131.54	.12	\$255.79	
TOTAL FIXED COSTS					\$1797.07	
5. TOTAL OF ALL SPECIFIED EXPENSES						\$20200.80
6. NET RETURNS ABOVE ALL SPECIFIED EXPENSES						\$26799.45
<hr/>						
NET RETURNS PER ACRE						
ABOVE SPECIFIED VARIABLE EXPENSES						\$1429.83
ABOVE SPECIFIED TOTAL EXPENSES						\$1339.97
BREAK-EVEN PRICE (PER 100 POUNDS)						
TO COVER SPECIFIED VARIABLE EXPENSES						\$48.95
TO COVER SPECIFIED TOTAL EXPENSES						\$53.73

NET RETURNS TO LAND, EXISTING POND, OPERATOR'S LABOR AND MANAGEMENT ESTIMATES SHOULD BE USED AS GUIDELINES FOR PLANNING PURPOSES ONLY

Table 8. Investment in facilities and new equipment required for ten catfish ponds of 2 acres each, stocked at 2,000 fingerlings (7 inches in length) per acre (adapted from Crews and Jensen)⁽²⁾

ITEM	PRICE PER UNIT (\$)	NUMBER OF UNITS	PROPORTION CHARGED	TOTAL CHARGED	SALVAGE VALUE %	YEARS OF LIFE
Feed shed	3200	1	0.65	2080	0	15
Bush hog	8000	1	0.50	4000	0	10
3/4 ton truck (4x4)	25000	1	0.10	2500	10	10
D.O. meter	900	1	1.0	900	10	5
Water quality test kit	200	1	1.0	200	10	5
Tractor (40 hp) aerator	24000	1	0.30	8000	10	PTO
	3400	1	1.0	3400	0	10
Feeder	2000	1	1.0	2000	0	10
Boat	1000	1	1.0	1000	0	15
Electric fishing motor	300	1	1.0	300	0	10
Deep cycle battery	80	1	1.0	80	10	10
Battery charger	80	1	1.0	60	0	10
Well	0	0	0	0	100	20
Well pump	0	0	0	0	10	20
Pond & drainage structure	0	0	0	0	100	20
Other	0	0	0	0	100	20
TOTAL				24250		

11. The owner/operator supplies all routine management and labor. Total labor costs are estimated for a 10-month period for a 2.5-acre pond stocked with 10,000 fingerlings (Table 11).⁽¹⁾

SECTION 2

EXPLANATION OF CATFISH BUDGET

ITEM 1. GROSS RECEIPTS. Total value of catfish sold minus a 6% fish loss.

ITEM 2. VARIABLE COST. Cost which is directly associated with production.

* **Fingerlings.** Channel catfish, 7 inches long (91 lbs./1,000 fish), are stocked at the beginning of April.

* **Feed.** A floating, 32% crude protein feed is fed. No more than a 6-week supply is purchased in bags. Food conversion ratio is assumed to be 2:1. Unharvested fish were estimated to average 1 lb./fish and each would have consumed 2 lbs. of feed. A 10-

day treatment with medicated feed is included in the budget.

* **Chemicals.** A 3 mg/L, potassium permanganate treatment is included in the budget to control fish disease. The ponds have an average depth of 6.5 feet and will require 49 lbs. of chemical per surface acre.

* **Labor.** The owner/operator will provide the labor associated with feeding, pond maintenance, chemical applications and aeration. Additional labor was hired to remove fish which remained in the ponds after initial harvest. Labor was set at a rate of 2 hours per 1,000 lbs. of remaining fish. Labor estimates for growing 10,000 fingerlings in a 2.5-acre catfish pond are provided from the literature⁽¹⁾ for a 9-month season (Table 11).

* **Electricity.** Electricity consumption was estimated for the 10-acre operation which stocked 3,500 fish/acre. Five, 2-hp (1.5 kw) aerators were operated 6 hours each night for

180 nights, starting in May. Cost of electricity was calculated at a rate of \$0.075/kw-hour. *Cost to install electricity at the pond sites has not been included in the budget.* The 20-acre facility did not use electric aeration because fingerlings were stocked at a low density (2,000/acre).

* **Tractor** (fuel, oil, lubrication). A 40-hp tractor is used for travel to the pond, feeding, mowing and emergency aeration. Fuel consumption per hour was averaged between light loads (feeding) and heavy loads (paddle wheel aeration). Oil and lubrication were charged as a constant proportion of fuel usage.

* **Equipment Repair.** Estimates were derived from the average annual equipment cost which was based on original cost. Calculations were made on the basis of the useful life of an item.

* **Interest on Operating Capital.** This is the formal interest charge on borrowed money, or the potential

investment interest lost in order to purchase operating inputs. Interest was charged from the date the item was purchased until the loan was paid in full.

ITEM 3. INCOME ABOVE VARIABLE COST. This indicates the income above cash cost, but does not take the cost of investment items into consideration. Full cost accounting

must include ownership cost to allow for replacement.

Table 9. Net return (above specified total expenses) per acre for catfish produced on two hypothetical farms with five and ten, 2-acre ponds stocked at two different densities and marketed at three prices. Net returns are ranked from highest to lowest.

RANK	NUMBER OF PONDS	STOCKING DENSITY PER ACRE	PRICE OF CATFISH PER POUND	NET RETURN PER ACRE
1	5	3500	\$1.25	\$2212.91
2	5	3500	\$1.00	\$1390.41
3	10	2000	\$1.25	\$1339.97
4	10	2000	\$1.00	\$869.97
5	5	2000	\$0.70	\$403.41
6	10	3500	\$0.70	\$305.97

Table 10. Prices of selected inputs used in producing freshwater shrimp in the hill area of Mississippi in 1991 (adapted from Montanez et al.⁽³⁾)

ITEM	UNIT	DOLLARS
Land cost	acre	\$600.00
Earth moving	yd ³	\$0.80
Piping and fixtures	pond	\$2685.00
Gravel	yd ³	\$9.72
Vegetative cover with maintenance	acre	\$190.78

ITEM 4. FIXED COSTS. Fixed costs are present on any production facility regardless of whether catfish are produced or sold. For the budgets in Tables 1-8, only equipment and machinery costs are included. Expenditures for land, pond construction, utility installation, etc. must be included under fixed costs also. Fixed costs for the two hypothetical farms are presented in Tables 4 and 8. If capital was borrowed, these costs should be added to the budget in the form of interest charges and an annual loan payment. Where appropriate, equipment costs were shared on a proportional use basis with other farm enterprises.

* *Interest on Buildings and Equipment.* This is the interest charged, based on the average

investment (new cost value divided by two) allocated to the catfish operation for machinery, buildings and equipment.

* *Depreciation on Buildings and Equipment.* Depreciation takes into account the wearing out or obsolescence of equipment and is calculated as the sum of the annual depreciation (new cost minus salvage value, divided by the number of years of life). Depreciation reflects the average annual cost of capital items, not actual cost which includes finance charges.

ITEM 5. TOTAL COST. Total cost is the sum of the Variable and Fixed Costs.

ITEM 6. NET RETURN ABOVE ALL SPECIFIED EXPENSES. The difference between Gross Receipts and Total Cost represents the Net

Return.

ECONOMIC COMPARISONS

Net returns per acre increased for each operation as the price of fish increased. Increases were 41%, 42%, and 48% greater for the 10.0-acre farm (five, 2-acre ponds with 3,500

fish/acre), when compared to the 20-acre operation when fish were sold at \$0.70, \$1.00 and \$1.25 per lb., respectively. The 10-acre operation had 9% less variable cost than the 20-acre farm (ten, 2-acre ponds with 2,000 fish/acre) but had 22% greater fixed costs. Break-even price per 100 lbs. of fish (to cover specified variable expenses) was \$0.02 higher for the 10-acre farm. However, break-even price per 100 lbs. of fish (to

cover specified total expenses) for the 10-acre farm was \$0.04 less than that for the 20-acre farm operation. With twice the area of production ponds, the 20-acre farm produced 4,700 lbs. more fish without electric Table 11. Estimation of nine month labor requirements (hours) for a 2.5-acre pond stocked with 10,000 catfish fingerlings.⁽¹⁾

aeration.

Net returns per acre (above specified total expenses) were compared for the 10- and 20-acre catfish operations when fish were sold at prices of \$0.70, \$1.00 and

\$1.25/lbs. (Tables 1-8). Net returns were ranked from highest to lowest in Table 9. The 10-acre farm which sold fish at the highest price had at least a

MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	TOTAL
9	15	21	37	37	37	28	21	28	235

27% greater net return per acre than all others. The 10-acre facility which sold fish at \$1.00/lb. had a 3.6% greater return per acre than the 20-acre operation which sold fish at 1.25/lb. If fish from the 20-acre farm were sold for \$1.00/lb., as opposed to \$0.70/lb. net returns increased by nearly 65%.

Overall, profits were higher if catfish were sold for \$1.00/lb. or higher. At a price of \$0.70/lb., net returns per acre were low at \$403.41 and \$305.97 for the 10-and 20-acre operations, respectively. If catfish prices drop below \$1.00/lb., net returns to small-scale catfish producers may be minimal.

HARVESTING

The cost of seines and other harvest equipment has not been included in the budget. A live hauling tank and related equipment will be required if catfish are to be transported for any significant distance.

Without draining, attracting fish into an open seine with feed (trap seining) may be the only practical method for harvesting large, deep ponds. Trap seining may also be used to periodically remove small quantities of fish - although, success is not always assured. It may be necessary to maintain fish in tanks until a marketable quantity has been harvested. If fish must be held for several days to a week, flow-through tanks will be needed. However, holding ponds would be required to retain a large biomass of fish for

more extended periods.

Multiple batch harvests may be the most effective strategy when marketing fish to fee fishing operations. Such harvests would occur throughout the growing season. Partial harvests might eliminate much of the risk and expense of overwintering market-size fish. However, multiple batch production has been associated with higher food conversion ratios, which increases operating cost. Presumably, some large catfish escape harvest and continue to consume food - larger fish are reported to convert food less efficiently than smaller fish.

With partial harvests, fewer fingerlings must be stocked more frequently to replace fish that have been removed. Catfish fingerlings typically cost less per fish when bought in large numbers. Constructing ponds to hold large numbers of fingerlings to re-stock production ponds would add to business costs. However, purchasing small quantities of more expensive replacement fish will also increase costs. Maintaining accurate records of fish inventories and production costs becomes more complex for ponds which contain mixed stocks of fish.

CONSIDERATIONS

* Fee fishing operations could be used more effectively as a market outlet for small-scale catfish producers.

* Stocking catfish fingerlings in

autumn and using a water-temperature based feeding schedule may allow additional fish growth during cool weather.⁽⁴⁾ These practices may provide higher yields and more market-size fish for the subsequent fee fishing season.

* In some instances, the benefits of improved water quality and reduced management associated with extensive catfish culture may offset the larger net returns of more intensive production.

* The economics of small-scale, multiple-batch catfish production should be examined more closely.

NOTES & REFERENCES

1. Crews, J.R., Howell, K., Jensen, J.W., Masser, M.P. Enterprise budgets for Alabama catfish production. Mimeograph. Alabama Cooperative Extension Service, Auburn University, Auburn, Alabama, USA.

2. Crews, J.R., Jensen, J.W., 1991. Budget and sensitivity analyses for Alabama catfish production. Mimeograph. Alabama Cooperative Extension Service, Auburn University. Auburn, Alabama, USA.

3. Montanez, J.L., Dillard, J.G., Fuller, M.J. 1992. Economic analysis of production of freshwater shrimp, *Macrobrachium rosenbergii*. Bulletin 985, Mississippi Agricultural & Forestry Experiment Station, Mississippi State University, Mississippi State, Mississippi, USA.

4. Wurts, W.A., Wynne, F.S. 1994. Winter growth of channel catfish *Ictalurus punctatus*, fingerlings stocked at low density in early autumn. World Aquaculture Book of
e-mail: fwynne@ca.uky.edu

Abstracts, New Orleans, Louisiana, USA, January 14-18, 1994.

FORREST WYNNE, Area Extension Specialist for Aquaculture, 2292 South Highway 27, Suite 200 Somerset, KY 42501 (606)677-6180, FAX (606)677-6188
