



*COSTS and RETURNS of  
Commercial Catfish Production  
in ALABAMA*



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# *Costs and Returns of Commercial Catfish Production in Alabama*<sup>1</sup>

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## INTRODUCTION

COMMERCIAL CATFISH FARMING was an infant industry in 1960. Substantial production was lacking until the middle 1960's when investors recognized the potential of catfish farming. In 1963, about 2,370 acres of water were devoted to intensive production of catfish in the United States. By 1969, production had expanded to an estimated 39,300 acres.<sup>3</sup>

Alabama's production level followed a similar explosive pattern. Intensive culture of catfish accounted for an estimated \$233,120 gross returns from an estimated 496 acres in 1968.<sup>4</sup> Production increased to approximately 5,000 acres by 1970 with net returns to land, labor, and management estimated at \$700,000.<sup>5</sup> Pond acreage was divided among three primary types of production: 1) commercial; 2) recreational; and 3) private.

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<sup>2</sup> Research Associate and Assistant Professor, Department of Agricultural Economics and Rural Sociology.

<sup>3</sup> U.S. DEPARTMENT OF THE INTERIOR, BUREAU OF SPORTS FISHERIES AND WILDLIFE. 1970. Report to the Fish Farmers. Resource Publication 83. Government Printing Office, Washington, D.C.

<sup>4</sup> ANONYMOUS. 1970. Table of Estimated Gross Returns from Intensive Culture of Warmwater Fishes. Fish Farming Experimental Station, Stuttgart, Arkansas.

<sup>5</sup> The estimate of catfish production acreage in Alabama was based on information provided by county Agricultural Extension and Soil Conservation Service personnel. Total acreage was adjusted downward to compensate for the acreage being used for private purposes. Adjusted acreage was multiplied by an estimate of average net returns per acre. Thus, the \$700,000 represents an estimate of total net returns to catfish farmers in Alabama.

Commercial production, the subject of this study, involves the stocking of fingerlings and application of other production inputs until the fish reach marketable size. The producer sells the fish to either processors, retail outlets, or individuals.

Total catfish acreage was spread randomly through the State with highest concentrations in the southern half in 1970, Figure 1. Variations in acreage devoted to catfish production among counties and areas were primarily influenced by 1) location of processors, 2) availability of water, 3) quality of land for pond construction, 4) the degree of help received from public agencies, and 5) the level of adaptability of catfish production to farm situations.

## **PROBLEM AND OBJECTIVES**

Many people considered commercial catfish production as a profit-making enterprise in 1970. Numerous potential producers desired information concerning costs and returns of catfish production so this enterprise could be analyzed as an alternative in the reorganization of their farms. Accurate budgets were necessary for this evaluation. Since catfish production is a relatively new enterprise, few comprehensive budgets were available. For this reason, research was needed to determine the economic position and profitability of the catfish industry.

To determine resource efficiency, many producers desired information concerning optimum size for a catfish unit. Since little information was available concerning the relationship between size and cost, research was needed to ascertain an optimum size catfish operation.

The primary objectives of the study were to determine the dollar value of inputs, costs, and returns for commercial production of catfish in Alabama and to determine the optimum size for commercial catfish operations in Alabama.

## **METHOD OF STUDY**

### **Selection of Sample**

Preliminary information concerning the number, type, and acreage of catfish producers in Alabama was provided by county Extension offices. A purposive sampling procedure was used. Primary consideration was given to the number of ponds in a

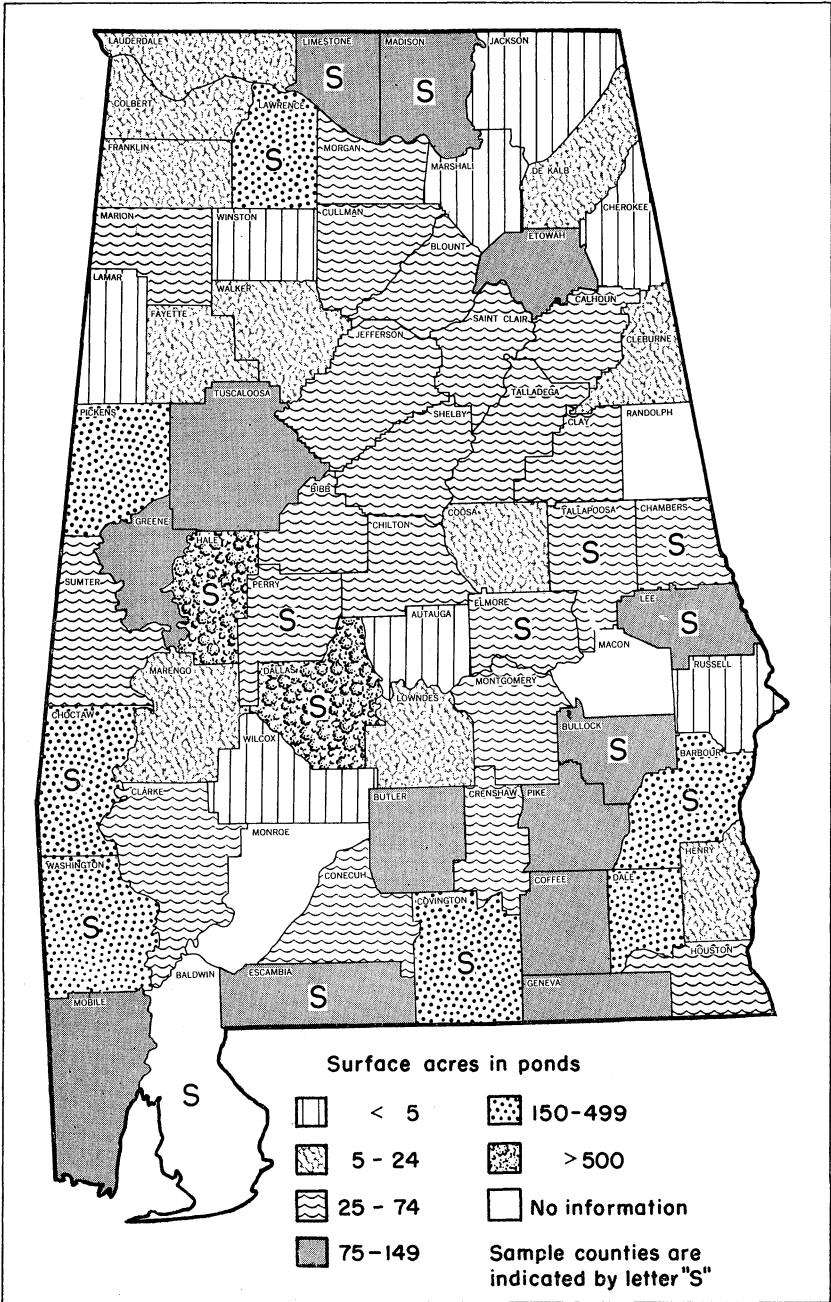


FIG. 1. Concentration of catfish operations and sample counties.

county or an area. Also, an effort was made to interview producers who had completed at least 1 year of production because representative cost and return data were desired. Since production areas were fairly diverse, costs of collecting information influenced the sample size and location. Although these standards possibly permitted sample bias in favor of the more developed areas, the bias was accepted because other sampling methods might have proved more limiting from a cost standpoint.

When entering each county sampled, a representative from the county Extension office or the Soil Conservation Service was interviewed concerning the scope and nature of catfish production in the county. Representatives of these agencies were questioned concerning trends in pond construction, occurrence of disease problems, and types of marketing channels used by county catfish producers. This information was compiled to help provide a more detailed picture of Alabama's catfish industry.

Then, local commercial catfish producers were contacted and personally interviewed regarding producer characteristics, farm characteristics, general data related to the catfish operation, cost data for the catfish operation, return data for the catfish operation, and the producer's opinion of the catfish business.

Data were collected in 17 counties in the State. Fifty-eight commercial catfish producers were interviewed to obtain comprehensive production information concerning their 1969-70 crop of catfish. Fifty-three of these were asked comprehensive questions on both costs and returns. The other five producers had no returns since they were relatively new in the catfish business. Data from all 58 were used in calculating cost data, but data from only 53 were used for calculating information concerning returns.

Alabama commercial catfish operators were divided into three size groups on the basis of total acreage. The small-producer group was composed of 27 producers who had less than 5 acres devoted to catfish production. The middle-sized and large-producer groups consisted of 14 and 12 producers with acreage between 5 and 15 and greater than 15, respectively.

### **Cost Procedures**

Feed, fingerlings, fertilizer, chemicals, utilities, property tax, insurance, and interest on borrowed capital were charged as

indicated by the respondent. General maintenance expenditures were charged at the price reported by the respondent, but long-term maintenance outlays, such as dam or pond renovations, were depreciated by the straight-line method with no salvage value. The straight-line method was used because most farmers were familiar with the calculations. An estimated life of 20 years was used for maintenance depreciation — long-term maintenance expenditures — as well as for pond depreciation. Ponds were also depreciated by the straight-line method with no salvage value at prices indicated by the respondents.

Gas expense for truck use was based on individual cost responses or on yearly catfish share figures as reported by the producers. When the latter response was given, gas charges were computed by dividing total catfish-use mileage by 15 miles per gallon and multiplying the resulting figure by \$.25 per gallon for gas.

All labor expenditures except operator's labor were charged at the rate indicated by the respondent. Labor requirements were based on actual catfish labor requirements reported.

Equipment and facilities were depreciated by the straight-line method with no salvage value. Total costs for equipment and facilities were adjusted for percentage use in the catfish operation. Expected life of these items varied as follows:

<i>Item</i>	<i>Expected life (years)</i>
Tractor and mower.....	12
Agitator.....	3
Well.....	20
Barn or shed.....	10
Motor and pump.....	6
Truck.....	10
Fish hauling tank.....	5
Boat and motor.....	5

Interest on operating capital was charged at 6 per cent per annum based on a 9-month production period.

Costs were not standard among all producers since some producers utilized different practices or performed only part of those practices common to other producers. Average costs were reported which were common to many producers. These cost data were used to calculate average total costs for producers in the sample.

## ANALYSIS OF COSTS AND RETURNS

### Catfish Production in Alabama

In analyzing the feasibility of any business venture, careful consideration should be given to initial and short-term investment requirements, labor requirements, and potential profitability levels. The same careful guidelines must be followed in the allocation of resources to commercial catfish production.

All returns, costs, investment, and labor requirements for the analysis were based on per acre in catfish production and per pound of catfish produced. Tables were included with both bases, but explanations were primarily offered on the per acre basis. Although costs items were not standard among all producers, entries were included for those items which were encountered frequently.

Average total cost per acre was \$377.00, Table 1. On a per pound basis, this represented an average total cost of \$.306. Average total costs per pound ranged from \$.11 to \$.65, including a charge for land and labor.

Major operating cost items were feed, fingerlings, electricity, maintenance, transportation costs, harvest labor, fertilizer, and chemicals. Pond depreciation, equipment and facility depreciation, and interest and taxes were major fixed cost items. Feed and fingerling outlays represented 81 per cent of total variable costs. Individually, feed comprised the largest portion of total of variable costs with 45 per cent. These two items represented 63 per cent of total costs. In addition to representing a major portion of total cost, feed and fingerling investment represented the two primary factors that determined quantity and quality of fish produced.

The average feed conversion rate for fish produced commercially in Alabama was 1.92 to 1 which indicated that the fish gained 1 pound of body weight for each 1.92 pounds of feed. Experiments have shown that with proper feeding a more favorable conversion rate of between 1.25 and 1.75 can be reached.<sup>6</sup> The unfavorable feed conversion rate among catfish operations indicated that greater feed efficiency could be obtained.

Electricity was used for lights, pumps, and miscellaneous

<sup>6</sup> SWINGLE, H. S. 1958. Experiments on Growing Fingerling Channel Catfish to Marketable Size in Ponds. Proc. Annual Conf. S.E. Assoc. Game and Fish Comm. 12:63-72.



TABLE 1. AVERAGE COSTS PER ACRE IN CATFISH PRODUCTION AND PER POUND OF CATFISH PRODUCED, 58 COMMERCIAL CATFISH PRODUCERS, ALABAMA, 1970

Item	Per acre	Per pound
	<i>Dollars</i>	<i>Dollars</i>
<b>Variable costs</b>		
Feed <sup>1</sup> .....	132.81	.108
Fingerlings.....	104.64	.085
Electricity.....	10.47	.009
Maintenance.....	8.56	.007
Transportation costs.....	4.87	.004
Harvest labor.....	8.95	.007
Fertilizer.....	6.11	.005
Chemicals.....	2.62	.002
Miscellaneous.....	2.35	.002
Interest on operating capital.....	12.66	.010
Total.....	294.04	.239
<b>Fixed costs</b>		
Pond depreciation.....	24.60	.020
Equipment and facilities depreciation.....	17.30	.014
Interest and taxes.....	5.06	.004
Total.....	46.96	.038
<b>Other costs</b>		
Land <sup>2</sup> .....	6.00	.005
Labor <sup>3</sup> .....	30.00	.024
Total.....	36.00	.029
<b>Total cost</b> .....	<b>377.00</b>	<b>.306</b>

<sup>1</sup> Feed conversion: 1.92:1.

<sup>2</sup> Land was valued at \$100 per acre. Land investment was charged at 6 per cent.

<sup>3</sup> Labor was charged at a rate of \$1.50 per hour. Average labor requirement per acre for Alabama producers was approximately 20 hours.

power requirements. Electricity cost per acre ranged from \$.54 to \$31.50 with an average of \$10.47. The largest segment of the electrical requirement was for pumping water. Water was either pumped from a well or recirculated from the pond to prevent oxygen depletion in the pond water. Although pumping cost represented only 3 per cent of the total costs, without it some producers would have lost their crop of fish. Many producers who were not utilizing pumps with their operations experienced oxygen depletion problems.

Major maintenance costs were for such items as drain repair, mowing, clearing brush, dam repair, clearing pond bottom, and cutting off banks. Mowing and brush clearing were considered as annual costs while the other items were prorated at the same rate as pond construction. Maintenance costs averaged \$8.56 per acre.

Transportation costs represented total expenditures for gas, oil, and miscellaneous items required in the operation of the

business. For the cases where feed was not delivered to the producer, the producer had to transport it himself. Also, many producers used their trucks to haul feed to the pond for distribution. These requirements resulted in an average transportation cost of \$4.87 per acre. The transportation cost entry represented a minor part of total cost for the catfish producers.

The cost of harvest labor varied with the amount of fish harvested and condition of the pond being harvested. Pond obstructions such as stumps necessitated higher expenditures for pond harvest labor and usually resulted in lower poundage of fish harvested. The contour of the pond bottom also influenced the harvest labor requirement. Efficient harvests were more frequent among the producers who constructed ponds with smooth bottoms and catch basins.

To harvest fish, ponds were drained until water remained only in the catch basin area. Since the fish were concentrated in a rather confined area, harvesting was a minor function. After the fish were netted in seines, they were placed in aerated tank trucks for the trip to the processing unit. In many cases processors furnished all or part of the labor required for harvesting.

Timing was an important factor in harvesting commercially-produced fish. First, the producer contacted a processor and established a harvest time. Then, the producer gauged pond drainage time so that it coincided with harvest time; otherwise, the producer jeopardized his entire crop of fish. If the fish were not harvested or moved from the confined area quickly, they probably would die from insufficient oxygen, especially during the warm months.

All of these factors influenced cost and effectiveness of the harvest. Harvest labor represented an average cost of \$8.95 per acre. The cost was based on hourly requirements and wage rates as indicated by producers. The producers who sold to processors generally did not incur this cost or at least not all of it, but producers who sold fish through other market channels paid the harvest cost.

Ponds were fertilized to enhance the growth of natural fish food and to retard growth of undesirable plants by shading the bottom. Fertilizer cost per acre ranged from \$.28 to \$17.50 with an average cost of \$6.11. On a pound of fish produced basis, this requirement represented only \$.005.

Chemical costs comprised a relatively small part of total cost

for commercial catfish producers. Average cost for chemicals was only \$2.62 per acre. Chemicals were utilized by only 13 of the interviewees. The low chemical use rate was primarily the result of two situations: 1) the lack of producer knowledge of problems which use of certain chemicals could alleviate; and 2) few tested and approved chemicals were available for use with catfish operations in 1970.

Chemicals were used to eliminate insects and unwanted fish from ponds before stocking since these pests consumed feed intended for catfish. Some producers used chemicals to control vegetative growth in ponds. Chemical costs per acre ranged from \$.12 to \$6.67.

Interest on operating capital per acre of catfish produced averaged \$12.66. The figure was computed at 6 per cent of total variable costs for a 9-month period.

Pond depreciation represented 52 per cent of total fixed cost. Equipment and facilities depreciation comprised 37 per cent of total fixed costs. The remaining segment was composed of interest and tax charges. Property tax was based on estimates given by the producers.

Land and labor were also charged as a part of total cost. Land was valued at \$100 per acre and was charged at a rate of 6 per cent. Land quality varied significantly among producers; thus, land requirements must be based on specific land values of the area under consideration for pond location. The \$100 was used only as an estimate.

Labor was generally provided by the operator of the catfish farm. Labor requirements were for chemical and fertilizer treatments, stocking of ponds, feeding operations, maintenance, and harvesting. These operations varied widely among producers. The average labor requirement excluding harvest labor was 20 hours per acre.

The average gross receipts per acre were \$508.39, Table 2. This represented an average price of \$.414 per pound. Average volume of catfish produced per acre was 1,228 pounds. This figure included an average of 16 pounds of catfish consumed by the producer.

Average net return to land, labor, and management was \$167.39 per acre or \$.137 per pound of fish produced. After charging land at 6 per cent of its established value, net returns to labor and management were \$161.39 per acre and \$.132 per pound of

TABLE 2. AVERAGE COSTS AND RETURNS PER ACRE IN CATFISH PRODUCTION AND PER POUND OF CATFISH PRODUCED, 53 COMMERCIAL CATFISH PRODUCERS, ALABAMA, 1970

Item	Per acre	Per pound
	<i>Dollars</i>	<i>Dollars</i>
Gross receipts <sup>1</sup> .....	508.39	.414
<b>Costs</b>		
Variable cost.....	294.04	.239
Fixed cost.....	46.96	.038
Total.....	341.00	.277
<b>Returns</b>		
Returns to land, labor, and management .....	167.39	.137
Cost of land .....	6.00	.005
Return to labor and management .....	161.39	.132
Cost of labor.....	30.00	.024
Return to management.....	131.39	.108
Average investment.....	771.65	.629
Return to investment, pct.....	18.00	18.000

<sup>1</sup> Average catfish production was 1,228 pounds per acre. The figure included 16 pounds of catfish which was consumed by the producer.

catfish produced. Operator's labor was charged at a rate of \$1.50 per hour for the average labor requirement, Table 3. The cost of operator's labor was subtracted from returns to labor and management. The residual, average return to management was \$131.39 per acre and \$.108 per pound of catfish produced.

Producers had an average production period of 9 months with a range from 6 to 19 months. The production period was the time between the stocking of fingerlings and harvest of the fish crop. Commercial catfish production could be an annual crop depending on the time of stocking and the feeding rate.

Average total investment was \$771.65 per acre and \$.629 per pound of catfish produced. Return to investment was 18 per cent. Capital investment requirements were for pond construction, land, water supply, storage facilities, and equipment. Equipment and facility requirements were primarily for a boat and motor, truck, tractor and mower, fish hauling tank, storage shelter, motor and pump, and well. These items represented approximately 36 per cent of the total investment requirement. Investment and depreciation were based on a percentage catfish-use figure which was supplied by producers. Items unique to catfish production were charged at 100 per cent of their value.

The major investment requirement was for pond construction. Pond investment represented 64 per cent of total investment. Average total investment in ponds was \$492 per acre and \$.401 per pound of fish produced.

TABLE 3. AVERAGE INVESTMENT IN CAPITAL ASSETS AND AVERAGE LABOR REQUIREMENTS PER ACRE IN CATFISH PRODUCTION AND PER POUND OF CATFISH PRODUCED, 58 COMMERCIAL CATFISH PRODUCERS, ALABAMA, 1970

Item	Per acre	Per pound
	<i>Dollars</i>	<i>Dollars</i>
<b>Equipment and facilities</b>		
Boat and motor.....	11.16	.009
Truck.....	51.88	.042
Tractor and mower.....	15.38	.013
Fish hauling tanks.....	36.83	.030
Storage shelter.....	53.72	.044
Motor and pump.....	34.66	.028
Well.....	72.29	.059
Miscellaneous.....	3.73	.003
Total.....	279.65	.228
<b>Other investment</b>		
Pond.....	492.00	.401
<b>Total investment</b> .....	<b>771.65</b>	<b>.629</b>
<b>Labor requirements</b>		
	<i>Hours</i>	<i>Hours</i>
Operator.....	20.0	.016
Harvest labor.....	6.0	.005
Total.....	26.0	.021

Careful consideration of pond location was important to catfish producers. Topography where pond construction was contemplated had a major influence on pond construction cost. If square or rectangular ponds were built, total cost was lower because common levees serviced the ponds. When substantial earth movement was required, a higher construction cost was indicated.

### Catfish Production by Size of Enterprise

Producers were divided into groups on the basis of total acreage of the operation. Groupings included producers with less than 5 acres, between 5 and 15 acres, and greater than 15 acres. The producer group with small ponds consisted of 27 commercial catfish producers who had an average acreage of 2.67. The middle segment was comprised of 14 producers who had an average of 10.05 acres in water. Twelve producers, classified as large producers, had an average of 46.12 acres devoted to intensive catfish production. Analysis of relationships indicated that economies of size were present, Table 4.

As the size of enterprise increased, average total cost per acre decreased. Average total cost per acre for the small-acreage producers was \$56.64 greater than average total cost per acre for the middle-sized group and \$139.09 greater than the average

TABLE 4. AVERAGE COSTS PER ACRE IN CATFISH PRODUCTION, 53 COMMERCIAL CATFISH PRODUCERS, BY SIZE OF ENTERPRISE, ALABAMA, 1970

Item	Size of enterprise		
	Small	Middle-sized	Large
Number of producers.....	27	14	12
Average acreage.....	2.67	10.45	46.12
	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>
<b>Variable costs</b>			
Feed.....	152.79 <sup>1</sup>	131.86 <sup>2</sup>	88.96 <sup>3</sup>
Fingerlings.....	111.27	104.30	87.92
Electricity.....	11.26	9.58	8.78
Maintenance.....	5.79	11.91	10.82
Transportation costs.....	5.68	3.98	4.12
Harvest labor.....	11.06	6.87	6.61
Fertilizer.....	4.22	3.49	0.21
Chemicals.....	0.98	3.48	4.26
Miscellaneous.....	2.25	3.29	1.48
Interest on operating capital.....	13.74	12.55	9.57
Total.....	319.04	291.31	222.73
<b>Fixed costs</b>			
Pond depreciation.....	26.63	24.52	19.13
Equipment and facilities depreciation.....	19.67	12.35	15.69
Interest and taxes.....	6.87	2.39	1.07
Total.....	53.17	39.26	35.89
<b>Other costs</b>			
Land <sup>4</sup> .....	6.00	6.00	6.00
Labor <sup>5</sup> .....	39.00	24.00	13.50
Total.....	45.00	30.00	19.50
<b>Total cost</b> .....	<b>417.21</b>	<b>360.57</b>	<b>278.12</b>

<sup>1</sup> Feed conversion: 2.04:1.

<sup>2</sup> Feed conversion: 1.87:1.

<sup>3</sup> Feed conversion: 1.72:1.

<sup>4</sup> Land was valued at \$100 per acre. Land investment was charged at 6 per cent.

<sup>5</sup> Labor was charged at a rate of \$1.50 per hour. Average labor requirements were 26 hours for firms with less than 5 acres, 16 hours for firms with between 5 and 15 acres, and 9 hours for firms with more than 15 acres.

total cost per acre for the large-producer group. On a per pound of catfish produced basis, average total cost was \$.347, \$.296, and \$.214 for the small, middle-sized, and large catfish units, respectively, Appendix Table 1.

Total variable cost per acre was \$319.04 for the small-producer group, \$291.31 for the middle-sized group, and \$222.73 for the large-producer group. Within the variable cost grouping, feed expenditures varied widely. Average feed expenditure was \$152.79 for the small operations, \$131.86 for the middle-sized operations, and \$88.96 for the large operations. Lower feed cost resulted primarily because the large producers were able to secure quantity discounts.

Producers with large operations had a more efficient feed conversion rate than the producers with middle-sized or small operations. The feed conversion rate for the large-acreage producers was 1.72 to 1, while it was 1.87 to 1 and 2.04 to 1 for the middle-sized and small producer groups, respectively.

Fingerling costs varied among the enterprise size groupings. The producers with small operations paid an average of \$6.97 and \$23.35 more per acre for fingerlings than did the middle-sized and large operations, respectively. A lower cost entry for fingerlings was attributed to the fact that large production units purchased more fingerlings and the catfish fingerling producers offered them a lower price.

Chemical and maintenance costs increased as the producing units became larger. The major portion of the variation was noted between the small unit grouping and the middle-sized producer grouping. Little fluctuation was evident between the middle-sized and large groups.

An analysis of harvest costs indicated that producers with small operations experienced higher per acre harvest cost than did producers with middle-sized and large operations. Producers in the small category paid \$4.19 and \$4.45 more per acre for harvest labor than the middle-sized or large producers, respectively. A certain amount of time was required to prepare for harvest by the people harvesting. The hours were spread over a few acres so the harvest cost was higher for the smaller units. After the production unit became greater than 5 acres, harvest cost remained fairly constant with less noticeable declines.

Pond depreciation declined over the range of size groupings. Average pond depreciation per acre was \$7.50 lower for the producers with large ponds.

Equipment and facility depreciation decreased from the producers with small operations to the producers with middle-sized operations, but depreciation increased from the middle-sized to the large operations. Large producers used more equipment and facilities than the small producers to maintain the catfish operation.

Average gross receipts per acre decreased from the small catfish enterprises to the middle-sized operations, but increased between the middle-sized and large units, Table 5. The major reason for the former situation was that small-acreage producers received a higher per pound price, \$.433, for their fish than did

TABLE 5. AVERAGE COSTS AND RETURNS PER ACRE IN CATFISH PRODUCTION, 53 COMMERCIAL CATFISH PRODUCERS, BY SIZE OF ENTERPRISE, ALABAMA, 1970

Item	Size of enterprise		
	Small	Middle-sized	Large
Number of producers.....	27	14	12
Average acreage.....	2.67	10.05	46.12
	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>
Gross receipts <sup>1</sup> .....	520.90	486.36	493.54
<b>Costs</b>			
Variable costs.....	319.04	291.31	222.73
Fixed costs.....	53.17	39.26	35.89
Total.....	372.21	330.57	258.62
<b>Returns</b>			
Returns to land, labor, and management	148.69	155.79	234.92
Cost of land.....	6.00	6.00	6.00
Returns to labor and management.....	142.69	149.79	228.92
Cost of labor.....	39.00	24.00	13.50
Return to management.....	103.69	125.79	215.42
Average investment.....	961.70	606.57	520.67
Return to investment, pct.....	11.40	21.7	42.50

<sup>1</sup> Average catfish production was 1,203 pounds per acre for the small firms, 1,222 pounds for the middle-sized firms, and 1,292 pounds for the large firms.

the producers with middle-sized operations, \$.398, Appendix Table 2. Producers with large operations received an average per pound price of \$.382. The \$.051 decrease in price received between the small producers and the large producers was not enough to overcome the 90 pounds difference in harvest quantities per acre between the two size units. Producers with small operations received a more favorable price primarily because they sold more fish to individuals at a higher price while the large-acreage producers sold more fish to processors at a lower price.

The average returns to land, labor, and management per acre increased as the size of the enterprise increased. Net return to land, labor, and management was \$148.69, \$155.79, and \$234.92 for the small, middle-sized, and large operations, respectively. After land and labor costs were deducted, return to management per pound of catfish produced was \$.086 for the small units, \$.102 for the middle-sized units, and \$.168 for the large operations. Return to investment was 11.4, 21.7, and 42.5 per cent for the small, middle-sized, and large producers, respectively.

Average total investment per acre decreased significantly as size of operation increased, Table 6. All items in the equipment and facility section evidenced a per acre investment decrease



TABLE 6. AVERAGE INVESTMENT IN CAPITAL ASSETS AND AVERAGE LABOR REQUIREMENTS PER ACRE IN CATFISH PRODUCTION, 58 COMMERCIAL CATFISH PRODUCERS, BY SIZE OF ENTERPRISE, ALABAMA, 1970

Item	Size of enterprise		
	Small	Middle-sized	Large
Number of producers.....	27	14	12
Average acreage.....	2.67	10.05	46.12
	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>
<b>Equipment and facilities</b>			
Boat and motor.....	19.95	5.67	1.32
Truck.....	80.17	35.63	18.98
Tractor and mower.....	7.72	2.60	4.59
Fish hauling tanks.....	58.04	9.23	52.09
Storage shelter.....	96.19	4.09	29.75
Motor and pump.....	51.92	9.57	12.90
Well.....	110.78	45.63	15.03
Miscellaneous.....	4.33	3.75	3.41
Total.....	429.10	116.17	138.07
<b>Other investment</b>			
Pond.....	532.60	490.40	382.60
<b>Total investment</b> .....	961.70	606.57	520.67
	<i>Hours</i>	<i>Hours</i>	<i>Hours</i>
<b>Labor requirements</b>			
Operator.....	26.0	16.0	9.0
Harvest labor.....	7.4	4.6	4.4
Total.....	33.4	20.6	13.4

except for some random variations between the middle-sized and large groupings. These were mainly because of the inclusion of more expensive items, a fish hauling tank and storage shelter, or the inclusion of more units of the same item, motor and pump, by the large units to meet the requirements of large-scale production.

Pond investment per acre decreased markedly as pond size increased. Average investment per acre in ponds was \$42.20 less for the middle-sized units and \$150.00 less for the large operations than for the small operations. On a per pound of catfish produced basis, average total investment was \$.800 for the small units, \$.496 for the middle-sized units, and \$.408 for the large units, Appendix Table 3.

Average labor requirements per acre declined as size of the enterprise increased. Small units required 10 and 17 hours more for labor than the middle-sized and large operations, respectively. Since the major labor requirement for catfish producers was for feeding, it was assumed that feeding time did not increase significantly with acreage increases.

Per acre harvest labor requirements were significantly higher

for the producers with small ponds. Small units required 7.4 hours for harvesting while the middle-sized and large units required only 4.6 and 4.4 hours, respectively. Little variation was noted in the larger two size groupings, primarily because initial preparation for harvest was spread over additional acreage. When processors furnished harvest labor, this entry was not included.

The relationship between total cost and size was made with a linear regression model. The relationship indicated a downward trend of total cost with increases in size, Figure 2. The trend equation was:

$$Y = 361.473 - 2.94X$$

Standard error of B = (1.02)

Significant at the .01 level

where Y = total cost per acre of catfish produced

X = size of enterprise

Acreage values were substituted into the trend equation to determine the relationship between size and costs. Over the range of acreage from 1 to 25, total cost declined significantly

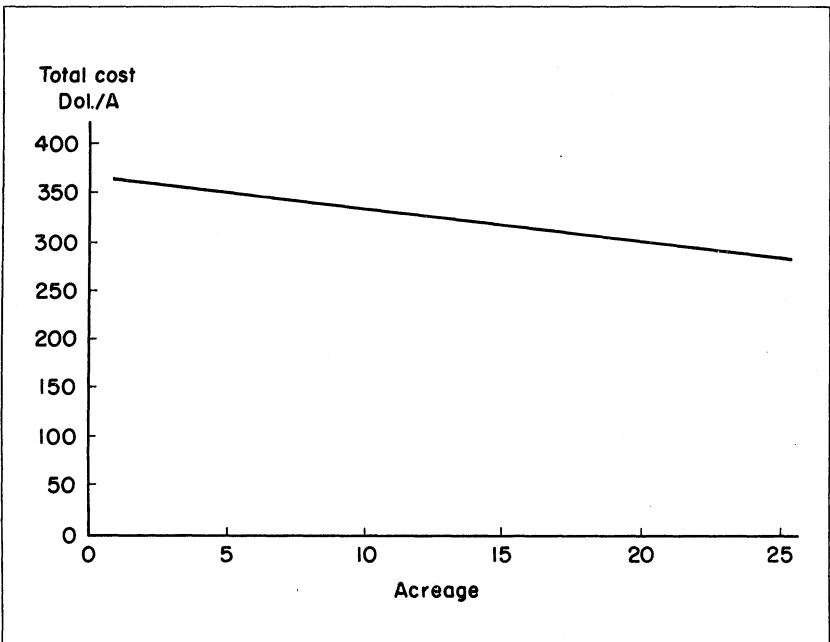


FIG. 2. Relationship between total cost of producing catfish and size of enterprise.

from \$361 to \$288. The actual and computed costs exhibited a similar slope over the range of observed acreage.

An optimum size operation could not be ascertained from the information available. The largest operation in the sample had 71 acres devoted to catfish production, but a significant number of such operations was not available for study. Total cost per acre decreased over the range for operations studied, and a significant upward-turning total cost curve was not noted.

### SUMMARY

Commercial catfish production warranted consideration as an alternative enterprise for reorganization of farms by rural Alabamians. Since commercial catfish production was a relatively new enterprise, adequate information describing costs, returns, investment, and labor requirements were not available in 1970. Research was needed to ascertain these requirements and to determine the overall situation of Alabama's commercial catfish industry.

Initial information concerning the number, type, and acreage of catfish operations in Alabama was secured from county Extension offices. Data were obtained from 58 commercial catfish producers. Data from 53 producers were used for analysis of returns, and all were used for the analysis of costs.

The total labor requirement for commercial catfish operations was relatively low. Yearly labor requirements averaged 20 hours per acre, not including a 6 hour per acre harvest labor requirement.

Average total cost per acre of catfish produced was \$377.00. Seventy-eight per cent of total cost was comprised of variable costs. Feed and fingerling outlays represented 81 per cent of total variable costs.

Average gross receipts were \$508.39 per acre and \$.414 per pound of catfish produced. Average pounds of catfish produced per acre was 1,228. Average net return to land, labor, and management was \$167.39 per acre and \$.137 per pound of catfish produced. Average return to management was \$131.39 per acre.

Average total investment was \$771.65 per acre and \$.629 per pound of catfish produced. Return to investment was 18 per cent.

Data from producers were divided into three groups on the

basis of total acreage to determine if size of operation affected costs, returns, investments, and labor requirements. The small group had less than 5 acres, the middle-sized producers had between 5 and 15 acres, and the large grouping had more than 15 acres of water for catfish operations.

As size of the operation increased, average total costs per acre decreased from \$417 to \$361 to \$278.

Average feed expenditure per acre was \$152.79, \$131.86, and \$88.96 for the small, middle-sized, and large catfish operations, respectively. The small-acreage producer group had an average feed conversion rate of 2.04 to 1, while the middle-sized units had a rate of 1.87 to 1, and the large operations had a feed conversion rate of 1.72 to 1.

Total fixed cost per acre was much greater for the small operations than for the middle-sized or large operations.

Gross receipts per acre were \$520.90 for the small operations, \$486.36 for the middle-sized units, and \$493.54 for the large operations.

Return to management on a per acre basis was \$103.69, \$125.79, and \$215.42 for the small, middle-sized, and large enterprises, respectively. Average investment per acre evidenced a significant decline with increases in acreage. Return to investment was 11.4 per cent for the small operations, 21.7 per cent for the middle-sized operations, and 42.5 per cent for the large operations.

An optimum size operation was not found because data were not available in sufficient volume at the upper acreage levels. Average total costs per acre decreased over the range of production studied.

## CONCLUSIONS

Analysis of cost data from the 58 operations interviewed indicated catfish were produced by operations which were not large enough to secure optimum economies of size in Alabama in 1970. Although data were not available to isolate the optimum size unit, total cost per acre evidenced a sharp decline among size divisions while return to land, labor, and management increased as size increased.

Potential commercial catfish producers should evaluate the resources available to them as well as the local market, present

and future, before allocating their resources to catfish production. Although large scale production was most efficient, a market was available for exploitation by the small producers. Small producers should gauge their production for the individual retail market. Net profit per acre may not be maximum with small units, but analysis indicated net profit was favorable when compared with the resources required for production.

Since pond construction requires a large initial investment, producers should carefully plan their operation prior to pond construction. Pond sites should be selected on such criteria as availability of water, accessibility, ability of the soil to hold water, and possible run-off of chemicals such as herbicides and pesticides. Ponds should be constructed with smooth bottoms which are free of stumps and conducive to efficient harvest. Also, ponds should be constructed with a drain in the catch basin so the pond could be drained completely. To correct the problem of vegetative growth in shallow water, ponds should be constructed with cutoff banks with a slight incline to approximately 1½ feet deep. Before constructing a pond, the potential catfish producer should contact the Soil Conservation Service for pond construction information.

Commercial catfish production was an alternative for farm reorganization. The labor requirement for commercial catfish production indicated catfish production was a beneficial alternative for enterprises requiring more intensive labor. The land requirement seldom limited crop production since low quality land, in terms of crop production, could often be utilized for catfish production. The investment requirement was sizeable, but return to investment was favorable.

Commercial catfish production has evidenced rapid growth in recent years and the future seems to offer potential for further growth. To smooth the transition from an infant to a stable industry, much research will be needed.

As more catfish are produced for sale, adequate markets may not be readily available to move the volume of fish produced without price declines. Indications are that vertical integration may influence the future of a catfish enterprise.

## APPENDIX

APPENDIX TABLE 1. AVERAGE COSTS PER POUND OF CATFISH PRODUCED, 53 COMMERCIAL CATFISH PRODUCERS, BY SIZE OF ENTERPRISE, ALABAMA, 1970

Item	Size of enterprise		
	Small	Middle-sized	Large
Number of producers.....	27	14	12
Average production, pounds <sup>1</sup> .....	3,212	12,281	59,587
	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>
<b>Variable costs</b>			
Feed.....	.127	.108	.069
Fingerlings.....	.092	.085	.068
Electricity.....	.009	.008	.007
Maintenance.....	.005	.010	.008
Transportation costs.....	.005	.003	.003
Harvest labor.....	.009	.006	.005
Fertilizer.....	.004	.003	.000
Chemicals.....	.001	.003	.003
Miscellaneous.....	.002	.003	.001
Interest on operating capital.....	.012	.010	.007
Total.....	.266	.239	.171
<b>Fixed costs</b>			
Pond depreciation.....	.022	.020	.015
Equipment and facilities depreciation.....	.016	.010	.012
Interest and taxes.....	.006	.002	.001
Total.....	.044	.032	.028
<b>Other costs</b>			
Land <sup>2</sup> .....	.005	.005	.005
Labor <sup>3</sup> .....	.032	.020	.010
Total.....	.037	.025	.015
<b>Total cost</b> .....	.347	.296	.214

<sup>1</sup> Average pounds of catfish produced per acre was 1,203 for the small firms, 1,222 for the middle-sized firms, and 1,292 for the large firms.

<sup>2</sup> Land was valued at \$100 per acre. Land investment was charged at 6 per cent.

<sup>3</sup> Labor was charged at a rate of \$1.50 per hour. Average labor requirement for the small, middle-sized, and large firms was 26 hours, 16 hours, and 9 hours, respectively.

APPENDIX TABLE 2. AVERAGE COSTS AND RETURNS PER POUND OF CATFISH PRODUCED, 53 COMMERCIAL CATFISH PRODUCERS, BY SIZE OF ENTERPRISE, ALABAMA, 1970

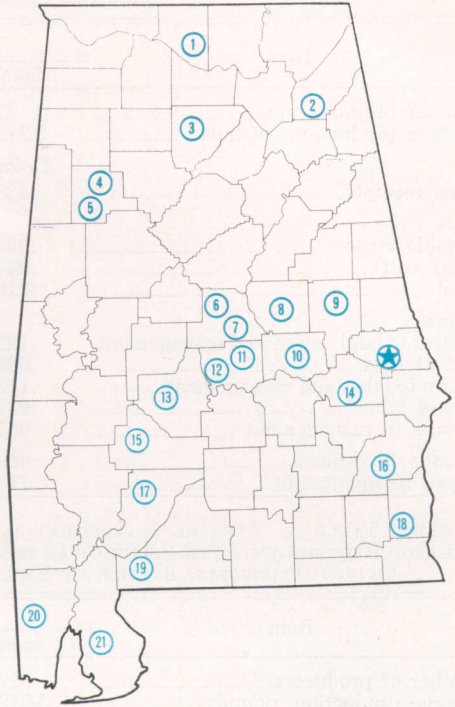
Item	Size of enterprise		
	Small	Middle-sized	Large
Number of producers .....	27	14	12
Average production, pounds .....	3,212	12,281	59,587
	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>
<b>Gross receipts</b> .....	.433	.398	.382
<b>Costs</b>			
Variable costs .....	.266	.239	.171
Fixed costs .....	.044	.032	.028
Total .....	.310	.271	.199
<b>Returns</b>			
Returns to land, labor, and management ..	.123	.127	.183
Cost of land .....	.005	.005	.005
Return to labor and management .....	.118	.122	.178
Cost of labor .....	.032	.020	.010
Returns to management .....	.086	.102	.168
Average investment .....	.800	.496	.408
Return to investment .....	.114	.217	.425

APPENDIX TABLE 3. AVERAGE INVESTMENT IN CAPITAL ASSETS AND AVERAGE LABOR REQUIREMENTS PER POUND OF CATFISH PRODUCED, 58 COMMERCIAL CATFISH PRODUCERS, BY SIZE OF ENTERPRISE, ALABAMA, 1970

Item	Size of enterprise		
	Small	Middle-sized	Large
Number of producers .....	27	14	12
Average production, pounds .....	3,212	12,281	59,587
	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>
<b>Equipment and facilities</b>			
Boat and motor .....	.017	.005	.001
Truck .....	.067	.029	.015
Tractor and mower .....	.006	.002	.004
Fish hauling tanks .....	.048	.008	.040
Storage shelter .....	.080	.003	.023
Motor and pump .....	.043	.008	.010
Well .....	.092	.037	.012
Miscellaneous .....	.004	.003	.003
Total .....	.357	.095	.108
<b>Other investment</b>			
Pond .....	.443	.401	.300
<b>Total investment</b> .....	.800	.496	.408
	<i>Hours</i>	<i>Hours</i>	<i>Hours</i>
<b>Labor requirements</b>			
Operator .....	.022	.013	.007
Harvest labor .....	.006	.004	.003
Total .....	.028	.017	.010

# AGRICULTURAL EXPERIMENT STATION SYSTEM OF ALABAMA'S LAND-GRANT UNIVERSITY

With an agricultural research unit in every major soil area, Auburn University serves the needs of field crop, live-stock, forestry, and horticultural producers in each region in Alabama. Every citizen of the State has a stake in this research program, since any advantage from new and more economical ways of producing and handling farm products directly benefits the consuming public.



## Research Unit Identification

### ★ Main Agricultural Experiment Station, Auburn

1. Tennessee Valley Substation, Belle Mina.
2. Sand Mountain Substation, Crossville.
3. North Alabama Horticulture Substation, Cullman.
4. Upper Coastal Plain Substation, Winfield.
5. Forestry Unit, Fayette County.
6. Thorsby Foundation Seed Stocks Farm, Thorsby.
7. Chilton Area Horticulture Substation, Clanton.
8. Forestry Unit, Coosa County.
9. Piedmont Substation, Camp Hill.
10. Plant Breeding Unit, Tallassee.
11. Forestry Unit, Autauga County.
12. Prattville Experiment Field, Prattville.
13. Black Belt Substation, Marion Junction.
14. Tuskegee Experiment Field, Tuskegee.
15. Lower Coastal Plain Substation, Camden.
16. Forestry Unit, Barbour County.
17. Monroeville Experiment Field, Monroeville.
18. Wiregrass Substation, Headland.
19. Brewton Experiment Field, Brewton.
20. Ornamental Horticulture Field Station, Spring Hill.
21. Gulf Coast Substation, Fairhope.