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ECONOMIC ANALYSIS of the CATFISH PROCESSING INDUSTRY

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CONTENTS

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Economic Analysis of the Catfish Processing Industry[1]

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CATFISH PROCESSING is a young and expanding industry. Development of processing has paralleled or exceeded growth in production in the Southeast. In 1964 there was only one major catfish processing plant in operation. Most catfish sold were river fish and processing was performed either by fishermen or wholesalers. With the increase in pond culture of catfish, the need for better processing facilities became apparent. Additionally, a survey of catfish farmers uncovered many complaints and questions regarding the processing industry.

A list of catfish processing firms was compiled from information provided by the National Marine Fisheries Service, Little Rock, Arkansas. The list included 21 major firms within the Southeastern United States, Figure 1. Managers of 19 of these firms were interviewed. A firm in Texas and one in Florida were not included in the survey.

Growth of the catfish processing industry has occurred essentially since 1967, Table 1. During 1968 seven new firms began operation. The growth of the industry coupled with extreme seasonality of production, led to operation at less than full capacity for most plants. As an aggregate, the 19 plants surveyed operated at only 36 per cent capacity during 1970. Much of the time when the plants were in operation they were processing less than 8 hours per day.

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[1] This study was conducted under research project Hatch 630 R (S-83) "Processing and Marketing Technology of Commercially Cultured Catfish" and supported by State and Federal funds. Appreciation is expressed to John Adrian, former Research Associate for assistance in early phases of the study.

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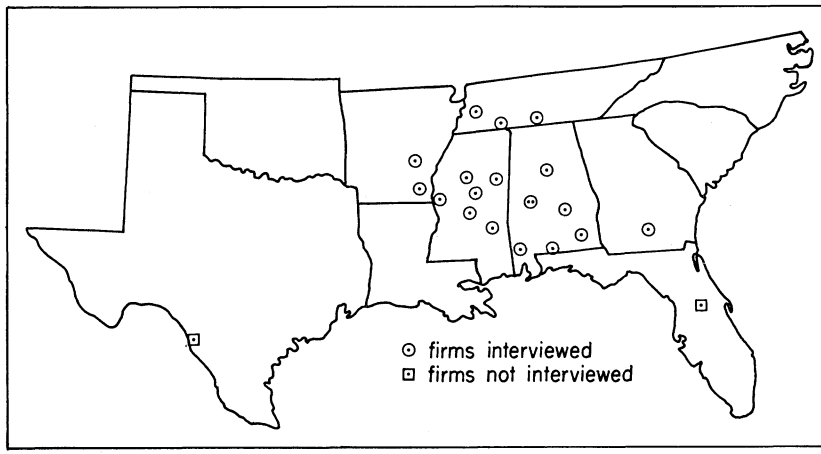

FIG. 1. Location of major catfish processing plants, southern United States, 1971.

Because knowledge was lacking regarding the processing industry, several objectives were undertaken in the research project.

1. To complete a descriptive analysis of major catfish processing plants in the Southeast,
2. To discover variable and fixed costs for catfish processing plants, and
3. To find problems inherent in the catfish processing industry.

CATFISH PROCESSING PLANTS IN THE SOUTHEASTERN UNITED STATES—DESCRIPTIVE ANALYSIS

Ownership and Level of Operation

The ownership of plants was related to the level of operation. Six of the plants visited were corporations, five were cooperatives,

TABLE 1. BEGINNING YEAR OF OPERATION OF EXISTING CATFISH PROCESSING PLANTS AND NUMBER IN OPERATION IN EACH STATE, 1971

State	1964	1965	1966	1967	1968	1969	1970	1971	Plants in operation in 1971
	No. of plants beginning operation								
Alabama					1	3	1	2	6[1]
Mississippi	1					3		3	6
Arkansas				1	1				2
Tennessee			1		1	1			3
Georgia						1			1
Total	1	0	1	1	3	7	1	5	18

[1] One plant in operation in 1970 was not in operation in 1971.

five were privately owned, and three were partnerships. The cooperatively owned plants were instituted by producers to ensure a stable market for fish. One plant operated at 5 per cent of capacity, however, the remaining five operated from 45 to 75 per cent capacity.[3] The non-cooperatively owned plants averaged operating at 37 per cent capacity and six of the nine plants operated at less than 25 per cent capacity. Thus, plants which were producer owned were generally able to receive a more stable supply of fish, however, they still operated far from capacity level.

Mississippi plants operated at full capacity during 1970 while Alabama and Tennessee plants operated at less than 30 per cent of capacity, Table 2. The majority of commercial catfish production occurred in the Mississippi Delta. All catfish plants received some fish from the Delta region, and during the summer of 1971, when many plants were closed due to lack of supply, all plants in operation were hauling fish from the Delta.

Plant managers generally expected to process more fish in 1971 than in 1970, however, several more processing plants were also expected to be in operation. In 1971, processing plants in Mississippi were equipped to process 513 per cent more fish than in 1970, yet, planned processing was expected to increase by only 75 per cent, Table 3. Alabama processors expected to increase capacity by 4 million pounds, and to increase production by 5 million pounds. All plants were expected to produce about 59 per cent of capacity for the year.

TABLE 2. TOTAL ANNUAL CAPACITY, LIVE WEIGHT PROCESSED, AND PERCENTAGE OF CAPACITY UTILIZED IN PROCESSING PLANTS BY STATE, 1970

State	Processed 1970	Total capacity 1970	Percentage of capacity used
	Live weight pounds		*Pct.*
Mississippi	1,698,000	1,701,700	99.8
Arkansas	2,080,000	5,083,000	40.9
Alabama	1,985,000	7,072,000	28.1
Tennessee	193,120	2,541,500	7.6
Georgia	3,000,000[1]		
Total	8,956,120	16,398,200	36.3[2]

[1] Approximate figure used with permission of processing plant manager.

[2] Capacity and production of the Georgia plant were not included in this percentage.

[3] Although several plants maintained more than one 8-hour shift per day, total production capacity was based upon 221 8-hour shifts or 44 weeks per year.

TABLE 3. TOTAL ANNUAL CAPACITY, PLANNED PROCESSING AND PROJECTED PERCENTAGE OF CAPACITY UTILIZED IN PROCESSING PLANTS BY STATE, 1971

State	Planned processing 1971	Total capacity 1971	Predicted percentage of capacity used
	Live weight pounds		*Pct.*
Mississippi	3,968,000	8,110,700[1]	48.9
Arkansas	4,200,000	5,083,000	82.6
Alabama	6,995,000	11,514,100	60.8
Tennessee	210,680	1,547,000[1]	13.6
Total	15,373,680	26,254,800	58.6

[1] Actual capacity was greater, but one plant was built to process only the owner's fish.

Purchase and Sale of Catfish

Processors generally indicated that markets were available for various sizes of fish. One processor would accept fish as small as a dressed weight of 3 ounces, while another preferred fish as large as he could find. A third manager would accept all sizes up to 40 pounds. Fish which dressed out at ½ to ¾ pound were preferred by 42 per cent of the processors. The average size for all fish purchased was 1.3 pounds.

The method of determining payment weight varied among processors. Some processors paid pond weight while others paid processed weight. In either case, extremely small fish, usually less than 0.5 lb. live weight, were not processed.

Managers of catfish processing plants purchased 8,956,120 pounds of catfish in 1970 at an average price of 33.23 cents per pound. Farmers in five states grossed more than $2,929,000 from catfish sales in 1970. Processors sold approximately 5,385,200 pounds of processed catfish at an average of 83.19 cents per pound. Processor sales for 1970 totaled approximately $4,479,000.

Buyers of live catfish were hopeful of purchasing more than twice as many fish in 1971 as in 1970. Managers anticipated purchases of $6,570,000 which would lead to sales of approximately $9,792,000. However, most managers recontacted during 1972 reported 1971 processing far short of previously planned purchases. In some cases, production was only 30 per cent of what was anticipated.

Approximately 165,000 pounds (live weight) of catfish were filleted by five catfish processing plants in 1970. Two plants which filleted fish upon customer request were not included in

the total. Two plants not in operation in 1970 expected fillets to be a small part of their operation (1 per cent for one, 10 per cent for another). The average wholesale price charged for fillet in 1970 was $1.06 per pound with a range from $.79 to $1.25 per pound.

Machine Skinning Versus Hand Skinning

While catfish were processed into many product forms, a majority of the fish were deheaded, definned, eviscerated, skinned, washed, and iced or frozen. The major difference between processing plants was the method of removing the skin. Ten plants used hand skinning methods while nine used some mechanical means for skinning. The method of skinning influenced the number of employees required in similar size plants.

The industry employed 351 persons in the processing operation, Table 4. Firms utilizing hand skinning methods averaged eight fewer employees per plant of similar size than those using machine skinning methods. Wide variations in employment were obvious as plants employing both the largest and smallest number of people used the hand skinning method. The hand skinning plants also displayed the highest and the lowest productivity per worker. The machine skinning plant averaged 492 pounds per employee while hand skinning plants averaged 450 pounds per 8-hour day.

One hand skinning operation was very small and production could not have been maintained year-round without additional employees. Omission of data on production from this plant resulted in productivity in hand skinning operations averaging 371 pounds per employee per day.

Factors other than productivity of workers were considered in determining whether to use machine or hand skinning. One fac-

TABLE 4. NUMBER OF PEOPLE EMPLOYED IN CATFISH PROCESSING PLANTS BY STATE, 1971

State	People employed		
	Management	Production	Total
	No.	*No.*	*No.*
Mississippi	15	108	123
Alabama	14	100	114
Arkansas	6	84	90
Tennessee	4	20	24
Total	39	312	351

tor considered was marketability of the product. Catfish have a thin membrane under the skin which imparts a sheen to the skinned fish. Machine skinning with equipment available in 1970 destroyed the membrane and detracted from the appearance of fish. Many managers felt the product commanded a higher price after hand skinning.

Machine skinners represented a higher capital investment for the processor. The average investment for all plants with machine skinners was $130,126 – $69,769 in building, $42,857 in processing equipment, and $17,500 in harvesting equipment. Plants with hand skinners were capitalized for $99,400 – $51,400 in building, $33,00 in processing equipment, and $15,000 in harvesting equipment.[4] Because plants were not being utilized to the highest potential and because hand skinning plants represented a lower investment cost, most machine skinning operations appeared to be less profitable in 1970.

PROCESSING COSTS

The differential between processor purchase price and sale price is known as the marketing margin. This margin must be sufficient to cover all costs involved in processing fish and placing it in the hands of a subsequent buyer. The average margins for all processors was about 50 cents per pound, i.e. a processed pound of catfish was sold for approximately 50 cents more than the processor paid for a pound of live catfish.

The greatest cost to the processor was the raw product – the catfish. The second major cost was the loss in weight from transforming the product from the live to the dressed stage.

Almost half of the processor's average margin of 50 cents per pound was used in dressing the fish. Most processors incurred a 40 to 42 per cent weight loss in processing fish, but one manager reported wastes as high as 52 per cent.

When a manager paid 33 cents per pound for catfish and lost 40 per cent of each pound in processing, each processed pound of fish cost the manager 55 cents before labor, management, utilities, and other costs were considered.

Labor costs per processed pound of fish averaged 5.6 cents using machine skinners and 7.3 cents using hand skinners. Hand

[4] Calculations did not include one operation of each type—both of which represented investments of over $500,000.

TABLE 5. APPROXIMATE COST PER POUND OF CATFISH PROCESSED IN A PLANT OPERATING AT FULL CAPACITY, SOUTHEASTERN U.S., 1971

Item	Cost per pound[1]
	Cents
Price paid for catfish (live wt.)	33.23
Weight loss of 40%—cost to processor	22.15
Labor cost	6.00
Supervision	1.12
Packaging	1.50
Utilities	.37
Delivery	1.00
Depreciation	.56
Total	66.13

[1] All costs other than cost of the fish and weight loss cost were based upon yield or processed weight.

skinning costs were distorted somewhat by costs of one firm in which labor costs averaged 17.1 cents per processed pound. Otherwise, hand skinning costs averaged 6.2 cents per processed pound – six-tenths of a cent more than machine skinning costs.

Because most plant managers were unable to pinpoint all costs precisely, (processing) costs were estimated through the composite costs of several firms. All calculations were first made for a processing plant which operated at full capacity and paid minimum wages of $1.60 per hour, Table 5.

The total cost to processors for a pound of fish delivered to a subsequent buyer was 66 cents if the plants were operating at full capacity. For processors with labor costs in the range of 8 to 10 cents per pound the costs would approach 70 cents per pound.

The average production level for processing plants was 36.3 per cent of capacity in 1970. At this level the fixed costs were not spread over as many units of production. Labor costs exhibited a dramatic rise as plants moved from full production, Table 6. Because startup and cleanup time were essentially the

TABLE 6. APPROXIMATE COST PER POUND OF CATFISH PROCESSED IN A PLANT OPERATING AT 36.3 PER CENT CAPACITY, SOUTHEASTERN U.S., 1971

Item	Cost per pound
	Cents
Price paid for catfish (live wt.)	33.23
Weight loss of 40%—cost to processor	22.15
Labor cost	16.53
Supervision	3.09
Packaging	1.50
Utilities	1.02
Delivery	1.00
Depreciation	1.54
Total	80.06

same to process a full or partial batch of fish, overhead costs did not decline as production declined. For the same reason, part-time labor was not appreciably less costly than full-time labor.

Total costs at the 36.3 per cent capacity level were 80 cents or 14 cents per pound higher than the cost at full capacity. Considering normal markups at wholesale and at retail levels, a 66-cent fish would retail for 95 cents per pound while the 80-cent fish would cost $1.15 per pound. Most of the processors felt sales were severely depressed when the price at retail exceeded $1.00.

APPRAISAL OF ALABAMA'S CATFISH PROCESSING INDUSTRY

Alabama catfish processing plants were in production less than 3 of every 10 working days in 1970. Although managers would have preferred to buy fish within 50 miles of their plant, some catfish were purchased and hauled 250 miles from the Mississippi Delta. Some doubt was raised whether Alabama producers could support seven processing plants.

Districts with a 50-mile radius were drawn around each plant location. Any county included in more than one zone was added to the district which encompassed the greatest part of the county. Counties more than 50 miles from a processing plant were included in the district of the nearest plant.

The production in each district was compared with the processing capacity of each plant. Calculations were first made with the assumption that average yield was 1,500 pounds of catfish per acre. Although a 1,500-pound yield was not unreasonable for producers with good management practices, one study revealed Alabama farmers had an average yield of 1,228 pounds per acre.[5] Further studies indicate even this average yield estimate may be too high.[6] Calculations were made to determine what percentage of capacity could be fulfilled by producers in a particular district, Table 7.

Alabama's commercial producers are not using their total water acreage for commercial catfish production. However, even if

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[5] Cost and Returns of Commercial Catfish Production in Alabama, J. L. Adrian and E. W. McCoy, Alabama Agricultural Experiment Station, Auburn University, September 1971, Bulletin 421.

[6] In an unpublished study by Auburn University in 1971, all Alabama catfish producers with more than 1,000 catfish were interviewed (total of 756 producers).

TABLE 7. PERCENTAGE OF PLANT CAPACITY FILLED BY COMMERCIAL PRODUCERS IN DISTRICT AT TWO PRODUCTION LEVELS

District[1]	1,500 lb./acre	1,228 lb./acre
	Pct.	*Pct.*
1	17.63	12.64
2	16.34	11.72
3	27.10	19.44
4	9.50	6.81
5	96.14	68.95
6	43.31	31.06

[1] Plants and districts were not identified to keep from revealing specific information about individual plants.

total commercial acreage were utilized, at current average yields, the State's four smallest processing operations could easily handle total production. Consideration of combination and commercial acreage does not brighten the outlook. Three plants (the two largest plants and the smallest plant) could process total production while utilizing 94 per cent of capacity. In short, poor knowledge of the industry as a whole has caused irregular growth and over expansion of the processing industry.

ALTERNATIVES FOR INDUSTRY IMPROVEMENT

In addition to the apparent solution of fewer processing plants and a greater supply of catfish, several alternative courses of action are available. Although these suggestions would require major changes in catfish processing, each alternative has merits and should be given proper consideration.

CATFISH RAISED UNDER CONTRACT. Several processors are now experimenting with contracts for production. A plant manager who is able to ensure a stable supply of fish for processing should be able to reduce costs considerably. If the plant could operate close to capacity on a year-round basis, costs might be reduced by 20 per cent or more.

To ensure a stable supply, greater cohesion of catfish producers and processors would be necessary. The catfish producers would need to voluntarily agree to harvest fish during the summer season even though summer is the main growth period for catfish.

SEASONAL OPERATION. In spite of the fact that catfish grow only in certain seasons, not all catfish producers operate on the same seasonal basis. Most ponds are stocked in early spring, but harvest dates vary from 7 or 8 months to as much as 2 years after stocking.

Part of the problem is caused by processors trying to operate on a year-round basis. Processing schedules have forced some producers to harvest in the summer while other carry fish through the winter.

According to research at Auburn, with improved management practices, 5-inch fingerlings may be stocked in March and catfish averaging approximately 9/10 pound each can be harvested in September. With the advent of cooler weather, the fish stop growing and only a maintenance diet must be fed.

Although catfish almost stop eating during cold weather, a maintenance diet must be fed to prevent loss of weight during the winter months. Holding fish over the winter increases costs without commensurate increase in the weight of fish. In addition a pond cannot be prepared for restocking the following spring.

With adequate processing capacity the entire production could be processed between the earliest harvest date in September and the latest stocking date in March. A seasonal labor force released from other farm related work would be available for the processing plants during the winter months. Producers have indicated in surveys and by their actions that a seasonal harvesting pattern would be acceptable.

Processors have generally reacted negatively to the possibility of seasonable harvest. General alternatives for use of processing plants during the off season are not available. However, the plants are presently operating on a seasonal basis and closure during the summer would only acknowledge recognition of the existing situation.

One of the major problems associated with seasonable harvest is the form of the market product. Fresh or ice pack catfish would only be available from September to March while the remaining fish sales would be a frozen product. Research has demonstrated that frozen catfish has greater storability in terms of product deterioration than fresh ice packed catfish.[7] Consumers in major northern and eastern markets are accustomed to frozen fish products and frozen fish could be marketed at a lower cost than ice pack fish.

A graph of 1971 monthly production of the catfish processing industry indicated a sharp drop in processing output during the the period of April through July, Figure 2. Only 23.6 per cent

[7] See Appendix for discussion of storability of catfish.

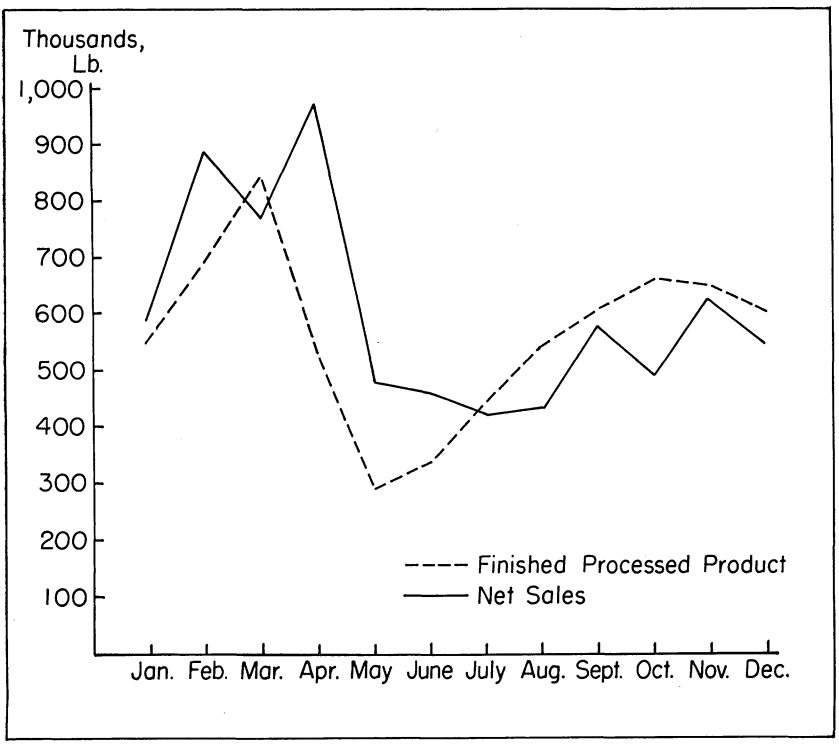

FIG. 2. Production and sales of catfish by processing plants, United States, 1971. (Figures from News Leader, Volume 2, Number 5. Little Rock, Arkansas: Catfish Farmers of America, January, 1972.)

of total output was processed in the 4-month period. An evaluation of the possibility of seasonal processing was made by assuming the 4-month output was evenly distributed throughout the remainder of the year, Table 8. At the time of the study the 4-month period represented the highest unit cost of processing for most firms. Fish were hauled great distances. Aeration or ice was necessary in transporting. Death losses were increased both in harvesting since aeration of ponds was low, and in transporting the fish. Many plants were operating on piecemeal basis processing only when fish were available.

Redistribution of the summer processing to the winter months did not greatly increase output in any month. Output was increased, however, during most of the months when demand was highest. The high demand period of May reduced inventory sig-

TABLE 8. PERCENTAGE OF TOTAL PROCESSING COMPLETED PER MONTH BY CATFISH INDUSTRY AND BY SEASONAL OPERATION, 1971

Month	Part of processing completed	
	Catfish industry[1]	Seasonal operation
	Pct.	*Pct.*
Jan.	8.2	11.2
Feb.	10.3	13.3
March	12.3	15.3
April	8.0	-----
May	4.3	-----
June	4.9	-----
July	6.4	-----
Aug.	8.2	11.2
Sept.	9.2	12.0
Oct.	9.8	12.8
Nov.	9.6	12.7
Dec.	8.8	11.5
	100.0	100.0

[1] Computed from figures published in News Leader, Volume 2, Number 5 (Little Rock, Arkansas: Catfish Farmers of America, January, 1972).

nificantly soon after termination of the processing season. With seasonal processing, 32 per cent of the yearly processing weight of fish was in inventory at the end of March, Table 9. At this point processing was completed and all sales were made from inventory. After 2 months the inventory was reduced to approximately 6 per cent of total processed weight or less than one-sixth

TABLE 9. MONTHLY INDUSTRY SALES AS A PERCENTAGE OF TOTAL SALES AND MONTHLY INVENTORY AS A PERCENTAGE OF TOTAL PROCESSED WEIGHT FOR SEASONAL OPERATION BY MONTH AND SEASON

Month	Pct. of total processing completed	Industry sales as pct. of total sales	Monthly inventory as pct. of total processed weight	Cumulative inventory as pct. of total processed weight
	Pct.	*Pct.*	*Pct.*	*Pct.*
Aug.	11.2	6.1	5.1	5.1
Sept.	12.0	7.9	4.1	9.2
Oct.	12.8	6.9	5.9	15.1
Nov.	12.7	8.7	4.0	19.1
Dec.	11.5	7.5	4.0	23.1
Jan.	11.2	8.2	3.0	26.1
Feb.	13.3	12.3	1.0	27.1
March	15.3	10.4	4.9	32.0
April	-----	13.3	—13.3	18.7
May	-----	6.5	—6.5	12.2
June	-----	6.3	—6.3	5.9
July	-----	5.9	—5.9	-----
	100.0	100.0		

of the original amount in inventory. The inventory amount would not be reduced to zero as shown in the example, however, the amount remaining in inventory could form a part of processing decisions the following year.

Confronted with the problem of building an inventory, a plant manager has three alternatives: Contract with another firm to freeze and store the product; freeze and store the product at the processing plant; or freeze the product at the plant and then transport it for storage at a commercial freezer.

Although most cold storage plants are equipped with blast freezers, a problem arises when fresh fish must be transported from plant to freezer. In most instances, fish would have to be iced for shipment. For long distances, even this may be ineffective.

The most desirable and probably the most economical alternative would be to freeze and store the product at the processing plant with additional inventory maintained in storage at major marketing areas. Handling and transportation costs would be held to a minimum while flexibility of movement would be maintained. Some shipping and inventory problems might also be eliminated. Because of the wide variety of freezer types and technicalities of choosing freezer types, further investigation of the alternative was beyond the scope of this study.

Thus, the alternatives of freezing the catfish at the plant and shipping the product to a cold storage warehouse were assumed for the example. Although most plants included in the 1971 study were equipped with blast freezing facilities and some cold storage space, most managers used commercial warehouses for storage or as distribution centers. Thus, the only assumption suggested by seasonal processing was that processors continue marketing at existing rates while building an inventory to supply markets when the processing plant was closed.

Storage Costs

Managers of six cold storage plants within the State were interviewed to determine storage costs. Storage and handling costs varied, but firms with higher handling charges had lower storage rates. Handling charges were made only once for incoming shipments, Appendix Table 1. Storage rates were on a monthly basis with a volume discount, Appendix Table 2.

As a hypothetical example, a large-scale operation processing 2,000,000 pounds of catfish with a yield of 1,250,000 pounds of dressed fish was assumed. Company sales were assumed to follow the industry sales pattern of 1971, as shown in Table 9. All unsold product was assumed to be added to an inventory which continued to accumulate until April when the plant closed for 4 months. The hypothetical firm would be typical of one of the larger existing firms in the industry.

At the end of the processing season an inventory of 400,000 pounds or a little less than ⅓ of total processing amount had been amassed, Table 10. Handling and storage costs totaled 2.37 cents per pound for the year. The storage cost represented an addition to processor costs since storage costs were assumed to be borne by the purchaser in determining processing costs. While storage represents an increased cost the reduction in cost are somewhat more difficult to determine. A firm operating at 36 per cent capacity realistically only operates during the winter months. Capacity operation on an 8-month basis would increase the level of operation from 36 to 66 per cent with commensurate decreases in fixed or per unit costs, Table 11. Total costs are reduced by 10 cents per pound or a net reduction of about 7½ cents per pound. With the reduction in processing cost a 72-cent per pound fish at the processor level would be marketed at less than $1.00 per pound.

It would be advantageous to processors to operate at capacity year-round since costs could be minimized in this fashion; however, it benefits many producers to use seasonal harvest. Processors would have to bid up the price of fish during the summer to compensate producers for the maintenance diet fed during the winter as well as the loss of a growing season due to summer harvest.

As with many young growing industries catfish production, processing, and marketing needed solutions to problems before researchers were aware that the problems existed. Much faulty information was and is available to all segments of the industry. Lacking basic information regarding supply and demand, the price at the producer level has been subject to violent swings not only from year to year but within a harvest season. Publications stressing profits from catfish production failed to delve into production problems and ignored the associated problems of marketing.

The three areas; production, processing, and marketing all re-

TABLE 10. PROCESSING, SALES, INVENTORY, AND STORAGE COSTS BY MONTH FOR A SEASONAL PROCESSING OPERATION

Month	Processed weight	Sales	Month's inventory	Handling charge	Cumulative inventory	Storage cost
	Lb.	*Lb.*	*Lb.*	*Dol.*	*Lb.*	*Dol.*
Aug.	140,000	76,250	63,750	$159.38	63,750	$ 223.13
Sept.	150,000	98,750	51,250	128.13	115,000	402.50
Oct.	160,000	86,250	73,750	184.38	188,750	660.63
Nov.	158,750	108,750	50,000	125.00	238,750	835.63
Dec.	143,750	93,750	50,000	125.00	288,750	1,010.63
Jan.	140,000	102,500	37,500	93.75	326,250	1,141.88
Feb.	166,250	153,750	12,500	31.25	338,750	1,185.63
March	191,250	130,000	61,250	153.13	400,000	1,400.00
April	------	166,250	------	----	233,750	818.13
May	------	81,250	------	----	152,500	533.75
June	------	78,750	------	----	73,750	258.13
July	------	73,750	------	----	------	
Total	1,250,000	1,250,000		1,000.02		8,470.04

TABLE 11. APPROXIMATE COST PER POUND OF CATFISH PROCESSED IN A PLANT SEASONALLY OPERATING 8 MONTHS PER YEAR (67 PER CENT OF CAPACITY)

Item	Cost per pound
	Cents
Price paid for catfish (live wt.)	33.23
Weight loss of 40%—cost to processor	22.15
Labor cost	9.01
Supervision	1.68
Packaging	1.50
Utilities	.56
Delivery	1.00
Depreciation	.84
Total	69.97

quire additional research efforts before the catfish industry can obtain its full potential. Each area has unique problems, however, the three must be considered in conjunction if the industry expects to attain viable growth.

Production

In areas where pond construction is dependent on natural terrain features economies of size may be difficult to obtain. Given a fixed size of operation only through experience and good management practices can the catfish producer lower costs. Good management practices include keeping abreast of new developments in research as well as staying abreast of the marketing aspects of the business. Producers located some distance from processing facilities might consider a cooperatively owned holding facility. The facility would enable the producer with 2,000 fish a pooling arrangement whereby his and other fish go to a single buyer. Processors cannot profitably harvest small ponds for limited numbers of fish.

Processing

Processors cannot establish retail prices. They must pay enough to maintain producers in business yet sell low enough to move their supply of fish. Under existing conditions the margin between the two prices is not sufficient to maintain the processors in business. To maintain price stability processors must establish a steady supply of fish in order to get efficient labor utilization.

Marketing

Although a promotional campaign has been carried on publicizing catfish, little concentrated effort has been devoted to establishing consumer demand curves. Knowledge is unavailable

regarding the preferences for fresh and frozen catfish. In addition very little is known about consumer subjective impressions of catfish as a food fish. Much marketing research is necessary before the optimum industry size can be established. In the interim period, additional processing plants have been constructed even though existing plants are operating far below capacity and some are sustaining losses.

SUMMARY

A survey of 19 catfish processing plants in the Southeast was completed during 1971. In the aggregate the plants operated at 36 per cent of capacity during 1970. The major problem of processors was obtaining an adequate supply of fish to continue operating during the summer months. Even though existing plants were experiencing difficulties with supply of fish, new plants were under construction adding to the processing capacity of the industry.

With the cost structure existing in 1970, plants operating at 36 per cent capacity could deliver a pound of processed catfish to the next level of marketing for approximately 80 cents. With normal markups at wholesale and retail, the consumer price for the fish would be about $1.15 per pound. During the 1970-71 market period the retail price of fresh and frozen catfish was between $1.15 and $1.20 per pound. If supply could be stabilized to allow year round processing the processing costs would be reduced to around $0.66 per pound and a consumer price below $1.00 per pound.

An alternative to year-round harvest and processing is seasonal processing to match the seasonal nature of production. Catfish growth is greatly reduced when the water temperature drops below 70 degrees. During the winter months the fish require a maintenance diet but may decline in weight as they absorb accumulated body fat. Costs of harvesting fish are higher during the summer months due to increased death loss and requirements for greater oxygenation during hauling. Seasonal processing of catfish would allow marketing of processed catfish at about 70 cents per pound with a retail price under $1.00 per pound.

APPENDIX

SUMMARY OF RESEARCH ON KEEPING QUALITY OF FROZEN, PROCESSED CHANNEL CATFISH STORED AT 0°F

Location	*Packaging method*	*Sensory quality*
Auburn University[1]	Frozen whole, heat-sealed bag	Very good at 12 mo.
Mississippi State[2] University	Frozen whole, heat-sealed bag	Very good at 12 mo.
	Frozen whole, non-sealed bag	Very good at 12 mo.
Georgia Agricultural Experiment[3] Station	Frozen whole, heat-sealed bag	Good at 9 mo.
U.S. Department of Commerce National Marine Fisheries Service[4]	Frozen whole, heat-sealed bag	Very good at 16 mo.

[1] Lovell, R. T. 1972. Keeping quality of frozen catfish fed diets containing various sources and amounts of fat. 1972 Annual Report, Department of Fisheries and Allied Aquacultures, Auburn University Agricultural Experiment Station, Auburn, Alabama.

[2] Drake, S. R., G. R. Ammerman and R. W. Rogers. 1971. Catfish quality. *The Catfish Farmer* 3(5):23.

[3] Boggess, Jr. E. K. Heaton and A. L. Shewfelt. 1971. Storage stability and commercially prepared and frozen pond-raised channel catfish (*Ictalurus punctatus*, Rof.). J. Food Sci. 36:969.

[4] Greig, R. A. and J. R. Donahue. 1967. Frozen storage capabilities of channel catfish. Amer. Fish. and U.S. Trout News, Sept.-Oct., 1967.

APPENDIX TABLE 1. HANDLING CHARGES BY COLD STORAGE PLANTS IN ALABAMA, 1972

Plant	Less than 5,000 pounds	5,000-14,999 pounds	15,000 pounds and over
	Charge per 100 pounds (in cents)		
1	25	25	25
2	25	25	25
3	28	25	23
4	31	28	25

APPENDIX TABLE 2. MONTHLY STORAGE CHARGES BY COLD STORAGE PLANTS IN ALABAMA, 1972

Plant	Less than 5,000 pounds	5,000-14,999 pounds	15,000 pounds and over
	Charge per 100 pounds per month (in cents)		
1	60	46	35
2	60	46	35
3	35	28	23
4	48	38	32