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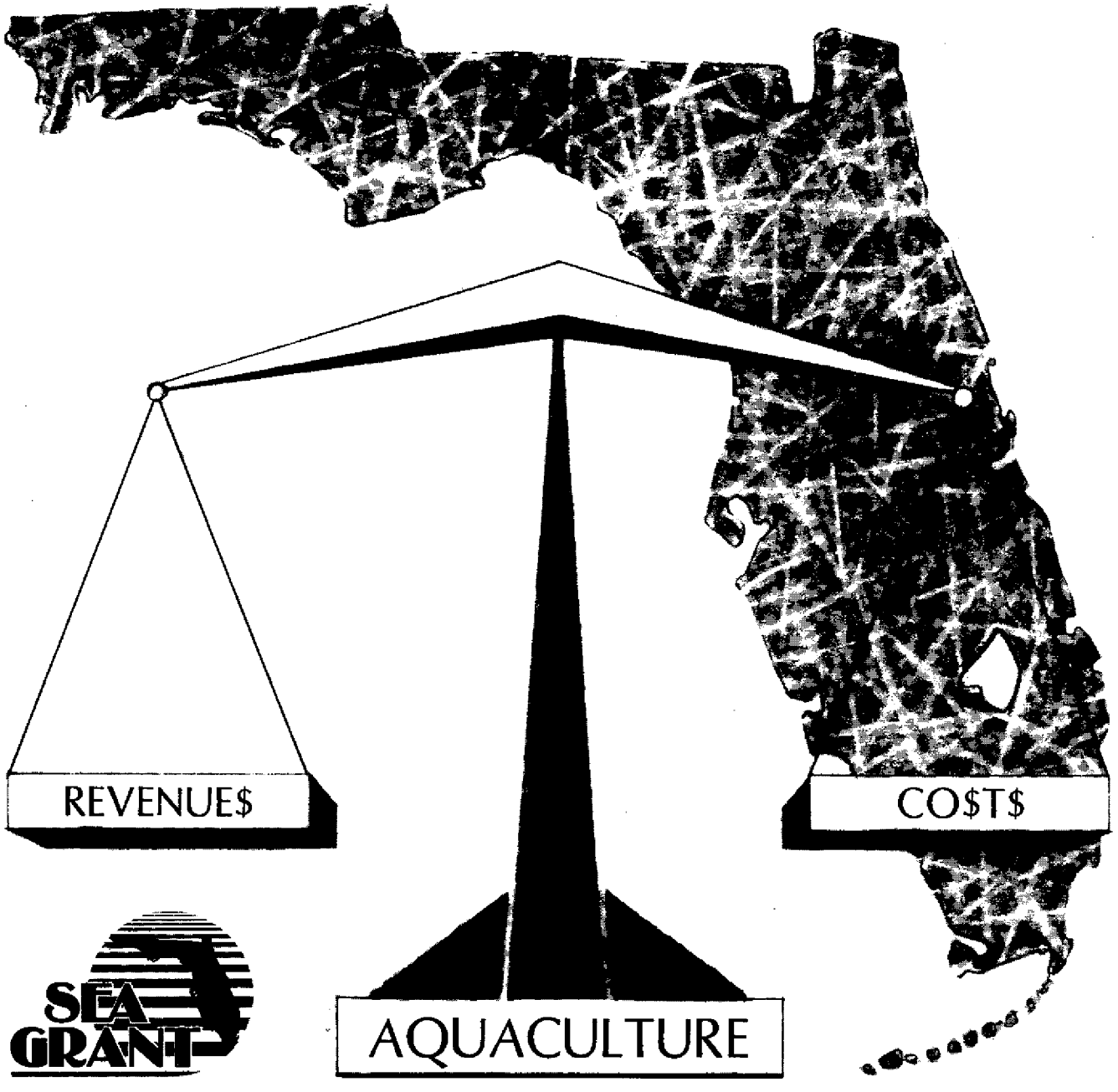
Aquaculture in Florida:

General Economic Considerations



by: Charles M. Adams

AQUACULTURE IN FLORIDA: GENERAL ECONOMIC CONSIDERATIONS

By
Charles M. Adams

Assistant Professor, Food and Resource Economics Dept.
Marine Economics Specialist,
Florida Sea Grant Extension Program,
Cooperative Extension Service, University of Florida
Gainesville, Florida 32611

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INTRODUCTION

Aquaculture has lived up to its potential in some regions of the United States. Within the past two decades, the production of catfish, salmonid trout, oysters, and, most recently, freshwater crawfish have each emerged as growing and profitable industries in selected areas of the country. Though domestic aquaculture will most likely not be the ultimate answer to chronic problems of protein deficient diets, supplies of certain species (such as those mentioned above) may be significantly enhanced on a local, regional, and, in some cases, national basis.

For the few species mentioned already, successful commercial production has meant that the pieces of the aquacultural "jigsaw puzzle" have fallen into place - and the pieces are many. Only when the biological, environmental, institutional, legal, economic, and social components fit together to form a sufficiently cohesive and compatible framework, can an aquacultural enterprise hope to be successful in achieving its goals. Catfish producers in certain areas of Mississippi and crawfish producers in Louisiana, for example, have solved the puzzle.

Aquaculture in Florida appears to hold some potential. And this potential will continue to attract individuals with an appetite for developing a successful aquacultural enterprise. The following discussion will focus primarily on entry-level questions of an economic nature. This, of course, does not attempt to diminish the importance of the other pieces of the aquacultural jigsaw puzzle, but rather attempts to generate thought regarding a particular piece of the puzzle which has been identified to be especially perplexing in Florida. Hopefully, the potential investor in a start-up aquaculture operation will be made aware of economic issues that will serve as an aid in either expediting success or forewarning of unwise investment.

THE STATUS OF FLORIDA AQUACULTURE

But what about Florida? Can aquaculture in Florida be expected to enjoy the same level of success as has been witnessed in other states? Florida's seemingly abundant water resources, semi-tropical climate, and more than 1,350 miles of coastline would appear to make the state an excellent prospect for culturing many species. In reality, aquaculture has met with limited success in Florida. Although attempts have been made to commercially culture a number of marine and freshwater species, these have, in general, been unsuccessful.

This undistinguished record is particularly noteworthy for "foodfish" species. At present, there is only limited commercial catfish production in Florida (87.5 acres in production reported for 1981). Some alligator production exists, as well as limited production of other species such as penaeid shrimp juveniles, American eels, softshell blue crab, crawfish, and Tilapia. Bait and sport fish production exists in some areas of the state, but also on a limited scale (Florida Aquaculture Plan, 1985). Production in a research capacity also exists for a number of other marine and freshwater finfish and shellfish. The culture of tropical (ornamental) fish and aquatic plants, on the other hand, is a flourishing industry in the South Central

regions of the state. Florida currently produces over 95 percent of the tropical fish grown in the U.S. This production involves 300 fulltime and part-time producers who utilize 20,000 ponds which cover approximately 6 to 8 thousand acres. The estimated annual value at retail and farm level is reported to be as high as $75 million and $15 million, respectively (Florida Aquaculture Plan, 1985). However, this notable success story for Florida aquaculture is the exception, rather than the rule.

THE ISSUE OF ECONOMICS

To what can the absence of a flourishing food fish aquaculture industry in Florida be attributed? Do potential aquaculturists in Florida simply make bad investment and management decisions, or is one or more of the pieces of the jigsaw puzzle not easily found? A paper prepared at the Institute of Food and Agricultural Sciences (IFAS) at the University of Florida identifies numerous constraints and research needs which have hindered the development of a commercial aquaculture industry in Florida (IFAS, 1983). Among the problem areas listed were those of a technical nature, such as genetics, feed improvement, spawning and larval rearing technology, and disease and parasite control. However, the major constraints to the development of Florida aquaculture are identified to be non-technical, such as social, legal, and economic issues. Prime examples of such non-technical problems include competition from supplies generated through the commercial fishing of natural stocks, environmental regulation and permitting, marketing, and the basic economic viability of attempting to commercialize energy and labor intensive production systems in high-cost aquatic environments.

The importance of non-technical considerations, and particularly those of an economic nature, is in large part due to Florida being characterized by a rapidly growing population, especially in coastal regions. Florida also possesses a large traditional agriculture sector. The resulting increased competition between agricultural, residential, and industrial users for the use of abundant (but not unlimited) water resources has placed a high premium on the regulatory awareness and economic value associated with Florida's water resources and waterfront properties. In addition, production problems which manifest themselves in a more general economic nature were most frequently identified by the same IFAS study when constraints were allocated to species of a particular interest to Florida aquaculture (Table 1). The potential Florida aquaculturist, therefore, must be keenly aware of this economic environment in which commercial feasibility may be a goal (Prochaska and Adams, 1985).

WHAT IS YOUR GOAL?

One of the first decisions which must be made by the potential aquaculturist regards the goal of the investment. This decision may even precede deciding on species or location. Most likely the aquaculturist has had a firm grasp of this objective from the outset. However, early planning should recognize the implications of the selected goal and the relevance and necessity of asking certain economic questions.

In establishing goals, one must be aware of the level of feasibility for a planned aquacultural system. Technical feasibility indicates that,

Table 1-- Summary of the status of aquaculture in Florida

Species or product	Use	Problems
A. Established large-scale (>$10 m) commercial operations		
1) Freshwater tropical and aquatic plants	ornamental industry	competition from abroad lack of modern technology
B. Promising small-scale (<$1 m) commercial operations		
1) Alligators	food, hides	legal constraints marketing (new industry)
2) Channel catfish	food, fingerlings for sale to out-of-state growers	competition from commercial unsuitable climate and/or soil type, economics of production
3) Tilapia	export of hatchery technology	competition from commercial fishery, low value, economics of production
4) Watercress	food	unknown
C. Commercial operations in start-up or R and D Phase		
1) Marine tropical fish	ornamental industry	lack of technology
2) Marine (penaeid shrimp)	export of maturation/ hatchery technology and/or juveniles	growing lack of need
3) Eels	food (export)	economics, marketing
4) Dolphin (fish)	food or technology export	unknown (new effort)
5) Freshwater centrarchids	juveniles for sports fishery introduction or rehabilitation	marketing, economics
6) Little-neck clams	food	lack of capital, security, economics, legal constraints
D. Unsuccessful commercial operations		
1) Penaeid shrimp	food	economics, competition from commercial fishery
2) Freshwater shrimp (Macrobrachium)	food	economics, unsuitable climate
3) Pompano	food	economics, lack of technology
4) Striped bass	food	economics, lack of technology
5) Spiny lobster	food	lack of technology
6) Oyster	food	economics, competiton from commercial fishery
7) Freshwater bait fish	sports fishing	lack of technology, marketing

Source: Florida Agriculture in the 80's: Marine Resources. University of Florida, IFAS, Gainesville, 1983.

regardless of cost, the technical knowledge exists to culture the target species in the desired quantities and size. Economic feasibility suggests that annual revenues from market sales will cover annual costs, given certain assumptions regarding costs of operation, market conditions, and production performance. Economic feasibility is an appropriate measure for justifying start-up or pilot plant operations. Commercial feasibility involves demonstrating that economic feasibility can be achieved and maintained over a period of time on a larger scale. Commercial feasibility is usually associated with consistent production, effective reaction to inconsistent market conditions, and the alert business management of a full-scale commercial operation. Commercial feasibility requires the existence of the other two feasibility levels.

Consider the following three distinct aquacultural goal alternatives:

(1) hobby
(2) "backyard" operation
(3) commercial system.

The commercial system is of primary interest in Florida and will be the focus of this paper, but the backyard operation has enjoyed a growing interest. Each of these alternatives suggests a given set of objectives and a specific level of interest in the technical, economic, or commercial feasibility of the culture process for the chosen species.

For example, the **hobbyist** may decide that the goal of growing an exotic species for fun requires only an appreciation for the technical feasibility of the culture process, such as growing sport fish for "put and take" fishing in private farm ponds. Within certain bounds the economics of the hobby is of lesser importance than the recreational "value".

On the other hand, the **backyard** operation (analogous to the home garden) is oriented toward the goal of offsetting a portion of home-food consumption expense. In this case, the successful small-scale backyard aquaculturist may make the statement "I can grow it cheaper than I can buy it". Thus, the backyard operation must, given the prevailing price structure, be at least technically and economically feasible, although labor costs are frequently not considered.

Finally, the **commercial** operation must be concerned with the goal of not only achieving, but maintaining profitability from one year to the next (note that the backyard operator considers retail market price while the commercial operator is concerned with producer level prices). The successful commercial operation must, therefore, be able to achieve not only technical and economic feasibility, but commercial feasibility as well.

After the goals and objectives have been established for an aquacultural system, the technical, economic and/or commercial feasibility can be considered. The possibility exists that neither of these levels of feasibility have been demonstrated for the species and location selected. Just because you have heard that catfish can be grown in Florida does not necessarily imply that catfish can be grown profitably in your specific area. Given the non-uniform nature of Florida's natural resource base, utmost concern must be given to matching the culture requirements of a given species to

the existing environmental conditions and constraints of the selected location. Search technical journals, trade magazines, university extension publications, and examine this question closely.

WHAT IS YOUR MARKET?

A critical component of an investment decision for a commercial aquacultural system is to clearly define and understand the targeted market. The aquaculturist must have a firm grasp of the marketing objectives, in terms of timing, location and form. In addition, detailed knowledge of market stability and potential for growth in the chosen market is necessary. These considerations must play a role in the process of species and location selection.

Timing

An understanding of how the market behaves throughout the year should play a major role in the development of the overall marketing plan. Seasonality in prices can play a key role in the decision-making processes of the firms. Expected price levels can dictate the timing of stocking and harvesting. Prices received for aquatic products can change substantially during the year (Figures 1 and 2). The prudent aquacultural businessman will not assume prices to be constant or follow simple trends. Price changes at the retail (consumer) level may be a result of seasonal shifts in consumer demand, changes in the price of close substitutes, or changes in overall supplies (including foreign imports). Price changes at the producer (farm) level may be primarily due to changes in available supplies. In an overall sense, changes in consumer demand and producer supplies will probably both play a role in determining prices at all marketing levels. The aquaculturist should attempt to obtain a feel for how these factors affect price.

One of the major constraints to aquacultural development of a given species in Florida has been shown to be the competition from supplies of the same species (or a close substitute) which are produced by local commercial fisheries. Knowledge of when these supplies (and possibly supplies from aquacultural production in other regions) arrive on the market, and the resulting effect on price is of utmost importance to a potential Florida aquaculturist. Therefore, monitoring dockside or wholesale price through local dealers and buyers, as well as state and federal market information sources, would be an extremely important everyday business activity. Deciding which price is relevant depends on which market level (i.e. wholesale or retail) is being targeted.

A foothold in the market, even for an already accepted product, can be difficult to establish. This problem can be compounded for the aquacultural producer who is often producing a "cultured" product possibly unfamiliar to consumers. The first step, of course, is locating buyers. However, unless the aquaculture product can be delivered to the market when buyers request, market development will be restricted. Buyers, such as processors, distributors, and wholesalers, usually contract on a strict schedule basis. The production process must consistently meet these timing requirements. A processor may be reluctant to commit to a contract unless a strict schedule of product delivery can be demonstrated consistently. If product must be

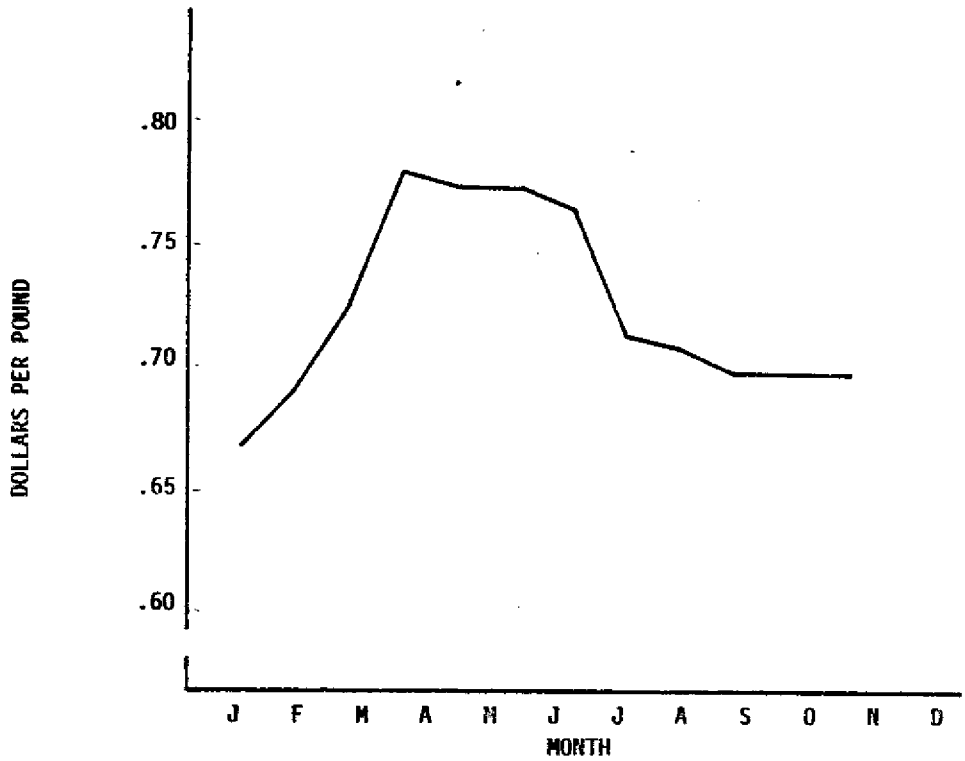

Figure 1: Producer price (weighted average) for farm raised catfish during 1985.

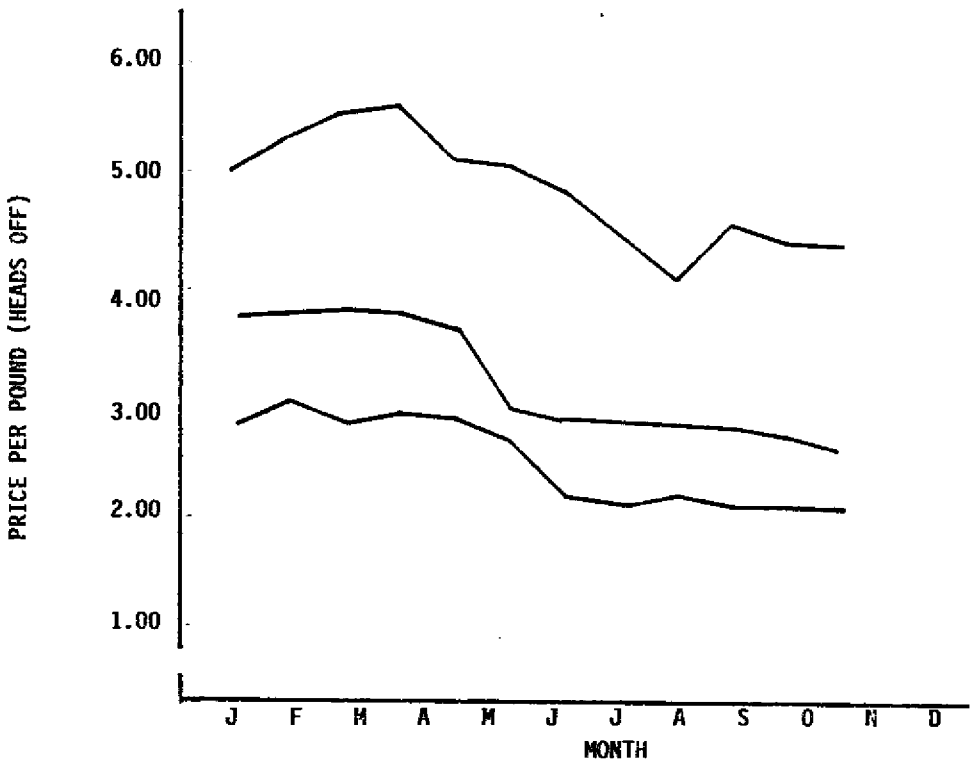

Figure 2: Exvessel price for three size classes of Penaeid shrimp, Gulf region, 1984.

available on a year round basis, some means for holding supplies to meet buyer demand must be given consideration. This aspect of timing might be of critical importance in northern Florida where local environmental conditions may place seasonal restrictions on production.

The commercial feasibility of an aquacultural system might be enhanced because a comparative advantage occurs on a seasonal basis. For example, Florida's semi-tropical climate may allow for the culturing of certain species earlier and/or later in the year than the producers in other regions of the country. This may be particularly true for juvenile or fingerling production of certain species (e.g. catfish). In this case, being able to produce a greater quantity, a larger size, or at a time when price may be be higher would certainly be an advantage over producers in other areas. When possible, timing should be used to the aquaculturist's advantage.

Do potential timing advantages and seasonal opportunities exist in the market? Is the production process flexible enough to allow production to take advantage of weekly, monthly, or seasonal changes in the market? Does the targeted market require year-round or seasonal production? Are there commercial fisheries supplies targeted for the market you seek? If so, when? These are some of the basic questions regarding the time element of marketing that any potential aquacultural producer should consider.

Location

Aquacultural producers often face the problem of supply being in one location while demand is in another. This obviously means their product will have to be transported. The producer may have to bear this transportation cost, depending on contractural obligations. Will the product price you receive absorb this cost? Is the targeted market local, regional, or national? These can be important considerations for a remotely located aquaculture facility.

The question of market location and transportation cost depends on who receives the product. In other words, who are your buyers? The potential aquacultural investor must thoroughly investigate who the possible buyers are and how the initial change in possession will occur. Will the product be turned over to a local processor who can transport the product for you? Or can a better price be obtained by contracting with a distant processor or wholesaler, with the cost of transportation incurred by the producer? Will the first handler of your product take possession at the aquacultural facility or must the producer transport the product at least as far as the first handler's warehouse? Local distributors may be available who can handle shipping, but for a fee. A producer may bypass distributors, processors, or wholesalers, but this may eventually increase costs and risk. This latter point may be particularly true for new aquaculture firms who do not have complete knowledge of the market. Therefore, the problems associated with transporting product may be best solved initially by contracting through an established marketing network. The availability of these transportation services and facilities may have an impact on the choice of production location.

The remoteness of the aquaculture facility may have a significant impact on the cost of operation. How distant are your feed and other supply sources?

Will the cost of transporting these supplies to the facility add substantially to overall cost? Do these and other added costs of transportation put you at a competitive disadvantage with producers in other regions? Can the product price that the market will bear cover these costs? These are some of the questions related to location in the market that the potential aquaculturist should consider.

Form

A decision on market outlet requires a decision on product form. What is the product you plan on delivering? Depending on your chosen species and location, you may have many market outlet alternatives from which to select, such as restaurants, retail seafood markets, bait dealers, recreational fish ponds, and others. Each market will demand the product be delivered in a specific "form". Product form may range from a live animal to a highly processed portion. The beginning aquaculturist may wish to concentrate initially on providing an unprocessed product. However, future capital investment to allow the delivery of a processed product may be a successful strategy.

Though the producer may not be involved in heading, gutting, and/or filleting, there may still exist some less noticeable "processing" activities involved in getting the product in the desired form and ready for transport. These may simply be harvesting and packaging for live shipment or grading and icing whole animals for fresh delivery to a processor. Each of these activities, however, has its costs. Be aware of the costs of the processing activities which are included within your production system.

Included among considerations of product form are those regarding product quality. A high quality product is one which is consistently delivered with a high degree of freshness, minimum spoilage, and homogenous in appearance (i.e. size, color, etc.). High standards of quality will facilitate buyer acceptance and satisfaction. If you provide a product of inconsistent quality, the task of developing market outlets will be difficult. Improper handling and processing can result in reduced future sales. The costs associated with ensuring consistent product quality can be more than offset through the consistent availabity of satisfied market outlets. Can you provide maximum product quality in the product form required by the targeted market outlet? This vital question should be considered closely.

When deciding on product form, consider the competition. Are there additional producers of this specific product? Will these producers provide competition? Given the presence of these competitors, how difficult will the task of establishing market outlets be? Must you compete only on the basis of price or can your product be distinguished in other ways (i.e. quality, availability, appearance, etc.)? Do hybrid species exist which may have a more appealing appearance and higher meat yield (such as the Red Hybrid Tilapia recently developed in Florida)? Utilizing a developed hybrid which possesses characteristics more appealing to the consumer than those possessed by the wild caught version may provide a valuable competitive edge, particularly in the fresh market. The fact that processed, packaged, and frozen channel catfish shipped from South America have been shown to cost less at the New Orleans port of entry than the break-even price at the farm for pond-raised channel catfish in Louisiana should bring the importance of competition into sharp focus.

A decision regarding product form requires knowledge of the market and what buyers want. For example, research has shown the economically optimal size for channel catfish produced in grow-out ponds is in the one to two pound range. However, consumers of fresh wild caught catfish in Florida have been shown to prefer a two to five ounce dressed catfish (Florida Aquaculture Plan, 1985). Should the Florida producer create a new market for a larger, more economically feasible catfish by changing consumer preferences through marketing or should the producer attempt to produce a smaller, less economically feasible catfish which has an established market? Alternatively, should the producer attempt to market a larger pond grown catfish out-of-state? These very real questions are not easy to answer, but are no less important. Therefore, the potential aquaculturist must be aware of prevailing or potential demand for the species-specific product forms to be produced in order to make decisions such as whether to market locally or in other regions. In addition, should existing seafood market channels be targeted or should the unique attributes of a cultured product (i.e. grown in a controlled environment, less chance of "off-flavor", less seasonality in availability, more homogenous in size and appearance, etc.) be capitalized on such that existing market opportunities are enhanced or new market channels created?

WHAT ARE THE COSTS OF FACILITY CONSTRUCTION AND OPERATION?

The facility and operating procedures employed in aquacultural production can be described as either extensive or intensive. Extensive culture systems are usually characterized by large areas of land, relatively small amounts of labor, large economies of size, and low yield per unit of production area. In addition, extensive culture systems typically utilize relatively lower stocking densities, allow the producer less control over the environment, and provide management with less manipulative control of the standing crop. Leveed ponds, tidal impoundments, and coastal embayments are examples of this type of production system. Alternatively, intensive culture systems, which employ high stocking densities, intensive supplemental feeding, and strict environmental control procedures, are found to utilize, on a per-unit-of-production-area basis, less land, have higher capital operating costs, and exhibit higher yields than extensive systems. Raceways, enclosed hatchery and maturation systems, cage culture, and circular tanks/carboys are examples of intensive culture methods. However, certain types of pond systems and management schemes are also referred to as intensive (i.e. Taiwanese-style grow-out ponds).

The decision to use either extensive or intensive methods in Florida will depend on the selected species and the environmental constraints of the chosen location. Local regulations and permitting may further restrict the feasibility of certain systems (i.e. bottom leasing in certain areas of Florida). Detailed knowledge must be obtained regarding local and statewide laws which regulate acquisitions of land and water for aquacultural purposes.

Having selected a suitable system, the potential aquaculturist should be fully aware of the variety and magnitude of costs involved in constructing and operating the chosen system. Simply identifying that certain types of costs exist in the generic sense is not sufficient. This will be particularly true if venture capital or a lending institution is involved. Rather, the potential investor must be able to demonstrate what fixed and variable costs

are anticipated, how much they will be, and when they will be incurred in the short and long run planning horizon.

Fixed Costs

Fixed costs are those which do not vary with the level of production. Examples of fixed costs are interest on borrowed capital, depreciation, certain taxes, overhead, licenses, permits, legal and consulting fees, and insurance (unlike more traditional agricultural production, insurance for crop production is only available to a very limited extent for aquacultural producers). Expenses incurred by acquiring land, drilling wells, constructing buildings, raceways, and levees, and purchasing depreciable equipment are examples of costs incurred during the "startup" phase of an operation, which often leads to high levels of fixed costs for an aquaculture business. The high cost of land in Florida, for example, has made these "startup" costs of critical importance to aquacultural investors. The economic feasibility of culturing certain species in Florida, such as catfish and alligators, is particularly constrained by this initial cost of investment in dug-pond systems. Only certain regions of Florida have soil types and topographical features that are well suited for leveed pond construction. Thus, building ponds that hold water sufficiently and are free from possible brackish water intrusion or flooding can be a costly undertaking.

An established row crop or livestock producer, who wishes to invest in aquaculture, may spread some fixed costs across other existing enterprises, especially if machinery and equipment needed for aquaculture is already being used elsewhere on other enterprises and has excess capacity. The single enterprise aquacultural producer attempting to establish a new business or backyard operation, however, may not have this option of spreading fixed costs.

One strategy for determining whether or not the culture of a certain species in a specific location is commercially feasible is to utilize a pilot phase of production. If economic feasibility can be demonstrated on a small scale then full-scale commercial investment may follow. Of course, this assumes that a number of production, cost, and market relationships will remain constant as the scale of the operation is increased. This method can minimize the level of indebtedness, thereby reducing fixed costs and vulnerability, in the event of commercial failure. Given the limited success of past commercial aquacultural production of food-fish in Florida, the use of a pilot phase as an investment strategy may warrant consideration.

Variable Costs

Variable costs are those which vary directly with the level of production. Examples of variable costs are feed costs, fuel or energy costs required for water exchange, labor costs, payroll taxes, purchasing fingerlings/juveniles, harvesting costs, and processing costs. Potential Florida aquaculturists may currently be at a competitive disadvantage by being far removed from commercial sources of feed and fingerlings/juveniles. This may add to the cost of these and other inputs. This may change in time, however, with the possible development of major regions of aquacultural production within the state. Some supplies may be purchased in volume through local

general agricultural cooperatives, thereby reducing the cost of certain inputs. The absence of custom services, such as processing, harvesting, and transportation, will require the Florida producer to perform certain activities that could otherwise be contracted, as is the case in states such as Alabama and Mississippi which possess well-developed aquacultural support industries.

Given the very warm climate in the south central portions of the state, excessive pumping costs may be necessary to maintain acceptable water quality in outdoor ponds for certain species. This may be particularly true for extreme southern portions of the state where freshwater aquifer sources are non-artesian. Thus, considerable care must be given to assessing the impact of local environmental and market conditions on the variable costs incurred in the day-to-day operation of the facility.

PRICES, REVENUE, AND PROFIT: HOW MUCH AND WHEN?

Aquaculture and agriculture have many similarities. One of the most important is the nature of the cashflow. Many other types of businesses have a somewhat evenly distributed cashflow, while aquaculture and agriculture are characterized with a cashflow that has revenue being generated only a very few times (possibly only once) during the production season. Thus, the potential aquacultural producer must be keenly aware of the timing aspects of prices, revenues, and profits in order to properly manage the business.

Prices

Many elements found in the marketplace come together to determine the price which is eventually offered to the producer for the final product. Most of these elements are beyond the control of the individual producer, particularly in a market where there may be many producers of a given product. Therefore, the general agricultural producer and, in many cases, the commercial fisherman, are essentially price takers. The aquaculturist producing relatively small amounts of a product, which may also be "indistinguishable" from the local wild caught product, may also have little control over price received. However, the aquacultural producer who is in control of a significant portion of the supplies of a given product moved in the market, particularly on a local basis, may have an increased level of control over prices. This may also be true for the aquaculturist who has successfully marketed the unique attributes of his cultured product.

There are means by which the producer can at least exert some influence on the final price accepted. Methods of generating a price, such as bidding (closed or auction), linking price to that generated in another region, or letting local supply and demand dictate price, are examples of alternative means of arriving at a price (Mims and Sullivan, 1984; Nichols, et al, 1980). Product promotion can also have an impact on price. The producer may attempt to establish a pricing agreement with the first handler of the final product through forward contracting of prices (through either an oral, written, or bonded agreement), contracting a price during production, or simply agreeing on a price at the time of harvest. Attempts to "lock-in" a price may be of particular importance to aquacultural producers in Florida who are specializing in a species that has a wild counterpart produced by the commercial fishery. Prices received for fresh seafood can exhibit significant variance

within the year. Thus, a contracted price would serve to protect the producer from dramatic price shifts which can occur suddenly.

Having a detailed knowledge of the market and consistently delivering a high quality product can often be the most important factors in the producer's attempts to establish control over price. Constantly monitoring prices through private and public informational sources can remove some of the uncertainty regarding prices. However, the astute producer must recognize the inherently variable nature of prices and plan accordingly.

Revenue

The total revenue generated by the aquaculture operation has two major sources of uncertainty -- price received and level of production. The viability of controlling price has been discussed. The ability to control production is largely determined by the skill of the manager in facility operation and by variability in the environmental conditions during the production period. These factors are of utmost importance in forecasting the level of production and planning the use of funds. One of the most striking differences between traditional agriculture and aquaculture is that the row crop or cattle producer, except for some catastrophe, will have an accurate knowledge of the level of production simply through visual inspection of the standing crop. The aquacultural producer often does not know what the actual yield is until the production units are harvested (this is particularly true for pond culture systems). The inherent variability in production will vary across species. This places obvious constraints on financial planning during the production season. Important questions to be asked are, "What is the minimum revenue that can be tolerated financially?" and, "How long can income be forgone before the first crop must be sold?".

Another important aspect of revenue is the timely receipt of payment from the buyer. This can be of utmost importance to the new aquaculture business that is attempting to establish sound professional relations with local creditors and suppliers. Often acquired only through experience, knowledge of the reputable buyers in the market who are timely with payment can be extremely important, particularly if sales are made on a contract basis. This can be especially important in export marketing.

Profit

The value most likely scrutinized to establish the performance of a commercial enterprise for a given period is "profit" or net returns (revenue minus costs) (Table 2). This value is useful in determining the economic and commercial feasibility of a given commercial culture system. In general, economic and commercial feasibility are recognized in the presence of profit in the short and long run, respectively. To make a sound decision regarding the wisdom (in an economic sense, of course) of the aquacultural investment, a number of questions should be asked. Is the profit potential of the species chosen higher than all other technically feasible species? Will the expected profit be sufficient to compensate for the producer's labor, managment skills, and risk? And more fundamentally, is aquaculture the best alternative use for the land that has been selected for production?

Table 2: Sample budget for a catfish operation

10 ACRE CATFISH BUDGET (EXISTING POND); 2500 PER ACRE STOCKING RATE
ESTIMATED COSTS AND RETURNS; RECOMMENDED MANAGEMENT PRACTICES
ALABAMA, 1985

ITEM	WEIGHT EACH	UNIT	QUANTITY	PRICE OR COST/UNIT	VALUE OR COST	YOUR FARM
1. GROSS RECEIPTS						
CATFISH	1.00	LBS.	25000.00	.65	16250.00	
2. VARIABLE COST						
FINGERLINGS		EACH	26500.00	.08	2120.00	
FLOATING FEED (BAG)		TONS	22.43	265.00	5944.85	
CHEMICALS		APPL	1.00	700.00	700.00	
HIRED LABOR		HR.	25.00	3.50	87.50	
TRACTOR (FUEL,OIL & LUBE)		HR.	116.00	1.35	156.60	
EQUIPMENT REPAIR		DOL.			184.71	
INTEREST ON OPERATING CAP.		DOL.	3064.55	.13	398.39	
TOTAL VARIABLE COST					9592.05	
3. INCOME ABOVE VARIABLE COST					6657.95	
4. FIXED COST						
GENERAL OVERHEAD		ACRE	10.00	5.00	50.00	
INT. ON BLDG. AND EQUIPMENT		DOL.	5361.14	.12	643.34	
DEPR. ON BLDG. AND EQUIP.		DOL.			843.32	
OTHER F.C. ON BLDG. & EQUIP.		DOL.			74.40	
TOTAL FIXED COSTS					1611.06	
5. TOTAL COSTS					11203.11	
6. NET RETURNS					5046.89	
BREAKEVEN PRICE (PER LB. SOLD): TO COVER VARIABLE COSTS					.38	
TO COVER TOTAL COSTS					.45	

NET RETURNS TO LAND, EXISTING POND, OPERATOR'S LABOR AND MANAGEMENT
STOCKING RATE EQUALS 106 PERCENT OF HARVESTED FISH;
6 PERCENT LOSS BECAUSE OF DEATH AND UNHARVESTABLE FISH;
STOCKING OCCURS IN SPRING, CUSTOM HARVEST IN FALL.

SOURCE: Budgeting for Alabama Catfish Production, Alabama Cooperative Extension Service.

The potential investor in aquaculture must look deeper, however, than simply "revenue minus costs" to establish the true profitability of a given business operation. To the owner-operator of a business, true economic profit (as opposed to accounting profit) is realized only if a positive value exists after (1) expenses, (2) a fair return from the next best investment alternative for invested resources, (3) the value of owner managment skills, and (4) the value all contributed time/labor are deducted from gross revenue. The latter three values can often be rather subjective in nature (an exception for 3 and 4 would be in the case of an absentee owner). However, an investment decision will not be complete until these values have been taken into account. Only then can investors judge whether or not the business enterprise will provide an acceptable "profit". Note that zero true economic profit may still be acceptable. Given the track record of aquaculture in Florida, potential investors should consider very closely the opportunity costs or the "values forgone from the next best alternative" before deciding not only what species will be cultured, but also whether aquaculture is in fact the best use of the investment funds, physical resources, and management skills at hand.

WHAT ABOUT TAXES?

The commercial aquaculture business may be able to take advantage of certain tax deductions and credits similar to those available for an agriculture business. These may range from agricultural exemptions on property tax to investment tax credits for levee construction. There may also be specific local taxes pertaining to land or water use that should be considered. The potential commercial aquaculturist should consult a Certified Public Accountant (CPA) or tax attorney knowledgeable in dealing with agribusiness firms. With the exception of the south central portions of Florida where there is an established tropical fish industry, local CPA's may not be familiar with the tax advantages available to commercial aquaculture. The prudent investor may wish to search available extension literature pertaining to developed aquacultural industries in other states, and possibly contact CPA's in these regions, to get a general understanding of the tax system that relates to aquaculture. A detailed knowledge of the specific tax laws, however, should be the responsibility of a professional tax accountant or lawyer. In addition, attention should be given to periodic tax law changes, especially in a new and growing industry such as aquaculture.

IS OBTAINING FINANCING FOR AN AQUACULTURE BUSINESS A PROBLEM?

As has been suggested throughout the above discussion, there is inherent risk in commercial aquaculture. This is particularly true for the initiation of operations with a given species in a specific location where the technical, economic, and commercial feasibility have not been previously demonstrated. Except for a very few locations in Florida, a start-up commercial aquaculture operation of virtually any species may therefore be perceived as a risky proposition. An astute investor should understand the risk associated with commercial aquaculture before approaching potential lenders. This is especially true in Florida where lenders may have a somewhat biased perception of the risky nature of aquaculture, given the lack of an established aquacultural food-fish production industry in the state. The potential aquaculturist may have accepted and minimized risk through careful study and preparation.

The major task which remains is demonstrating to potential financiers that the investment will be a sound one.

The potential aquaculturist must be able to demonstrate complete knowledge of all aspects of the proposed culture system with a sound financial proposal - regardless of the funding source. This includes providing detailed financial statements on the magnitude and timing of costs, revenues, and profits over the planning horizon of the firm. These values can be demonstrated with pro forma budgets, income statements, cash flows, and balance sheets. Extension literature exists which describes the construction, interpretation, and use of these various financial statements. Consult your local county agricultural or marine extension agent for a list of these materials. In addition, some computer software is also available through private and university sources, which may further expedite the development of a complete financial statement. The exact requirements for information contained in such statements may vary with the lending institution involved. The borrower should contact these potential lending institutions for sample forms and data requirements necessary for an acceptable prospectus. In addition, the borrower must be able to describe adequately the product and to demonstrate that the target market exists. Only a comprehensive financial prospectus of the proposed commercial operation will have a reasonable chance of capturing the attention of lenders. Obviously, to produce such a prospectus requires a good deal of individual homework and research. Those reluctant to advance beyond the "pipe dream" stage most likely will be weeded out at this point. Only those who demonstrate the true worth of the credit risk will be rewarded with careful consideration by lenders.

There are several sources of credit available for the potential aquaculturist. Sources which may be knowledgeable of agricultural or aquacultural production would be the Farmers Home Administration and the Production Credit Association. These two credit sources have a history of providing capital to beginning aquaculture businesses. Contact the local offices of each of these institutions and carefully review the general terms of agreement for credit before presenting the prospectus to a loan officer. The local bank or savings and loan office may also be a good starting point in the search for capital. However, these sources may not be familiar with the peculiarities of agriculture or aquaculture. The Small Business Administration and the Economic Development Administration are additional potential sources of credit for the beginning small business. Venture capital (capital which is formed through a group of private investors) may also be considered as an additional source of credit. However, venture capitalists often require a high rate of return on investment.

SUMMARY

Commercial aquacultural production in Florida, with the exception of tropical fish, has not developed at the same rate as has been witnessed in other states. Studies have shown that non-technical rather than technical problems appear to be the major impediments to development in Florida. In particular, economic problems have provided a number of pitfalls for the development of a commercial aquacultural foodfish industry. This paper has attempted to address some of the major economic issues that a potential aquaculturist should consider at the commercial entry level in order to avoid

an unwise investment decision. These considerations should at least encompass technical feasibility, financial goals, marketing (in a time, location, and form sense), costs of facility construction and operation, prices to be received for the product, expected production, revenues, profits, taxes, and financing. The question of uncertainty in market prices and the potential variablity in production levels should be closely examined. Use this information to then assess the economic and/or commercial feasibility of the proposed operation (attempt to find as much information and data on successful and unsuccessful ventures as possible). Do plenty of research and generate the "facts and figures" needed to sufficiently address each of these areas of concern. Close and careful consideration of these topics, with respect to local operational and institutional (permitting) constraints, will contribute to a more economically sound decision of whether or not to invest in Florida aquaculture.

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