The University of Georgia

Center for Agribusiness and Economic Development

College of Agricultural and Environmental Sciences

The Feasibility of an Aquaculture Cooperative in Hart, Franklin, and Stephens Counties, Georgia

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Introduction

The Hart, Franklin, and Stephens County Joint Development Authorities commissioned The University of Georgia's Center for Agribusiness and Economic Development (CAED) to determine the economic feasibility of reconditioning abandoned farms and their buildings and operating them for aquaculture production in the tri-county region.

By revitalizing and operating these aquaculture production facilities, the Joint Development Authority would like to create an opportunity for area farmers to utilize and generate income from existing idle farm structures (i.e., outdated chicken houses, hog parlor facilities, and greenhouses).

The CAED has divided the market into two distinct groups with one being the area residents and the second is the ethnic food retail markets operating in Metropolitan Atlanta. The report will cover both of these markets starting with the area residents.

US Fish Market Trends

The U.S. Tilapia market can be segmented into four different markets; live fish, whole frozen fish, frozen fillets, and fresh fillets. The following section provides a brief overview for marketing the tilapia.

Live Tilapia

In recent years, the live market has experienced a slowdown in growth as the more traditional ethnic markets located in Los Angeles, San Diego, San Francisco, Vancouver, Houston, New Orleans, New York, and most importantly Toronto, seem to have slowed as demand has been met. Therefore, additional markets must be developed to sustain growth and increase the demand for tilapia. The most likely market for live fish is grocery stores and restaurants featuring live tanks, and local "farmer markets." Due to obvious constraints on shipping live fish to the U.S. from abroad, U.S. producers will continue to supply most, if not all of the demand for live fish.

Non-Live Tilapia[1]

The U.S. Economic Research Service produces an *Aquaculture Outlook* report detailing the U.S. Aquaculture market. The following information provides insight into the non-live segments of the U.S. tilapia market.

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[1]Economic Research Service, USDA Aquaculture Outlook /LDP-AQS-14/October 10, 2001 2

During the first half of 2001, the United States (U.S.) imports of tilapia increased considerably by 43% compared to the previous year. Over the last three years U.S. tilapia imports have almost doubled, going from less than 30 million pounds in 1998 to 57 million pounds in 2001. Although the bulk of these imports were whole fish, 33 percent of these imports were fresh or frozen fillets, and on a live weight basis these imports were equal to 98 million pounds.

After falling slightly in 2000, imports of frozen whole tilapia rose by 41 percent in first-half 2001, compared with a year earlier. While imports of frozen whole fish continue to dominate at 38.4 million pounds, a good percentage of the growth in imports is now coming from higher shipments of fresh and frozen fillets. Total imports of fresh fillets increased 50 percent to 11.8 million pounds, and imports of frozen fillets rose 38 percent to 6.9 million pounds.

Over the first six months of 2001, Ecuador shipped 5.9 million pounds of tilapia, roughly 50% of all fresh fillets, up 73% over the same period in 2000. Due to whether problems, Ecuador is diversifying into tilapia production and, it does not compete directly with either Taiwan or China.

Fish Consumption Frequency

Figure 1 indicates the U.S. per capita fish consumption from 1901 to 1999. There has been a positive trend in U.S. fish consumption since the early 1930. Per capita fish consumption was 10.3 pounds in 1999 and expected to increase in 2001. This increasing fish consumption trend is encouraging for the proposed aquaculture. As U.S. consumers demand more fish, additional sources will have to come online.

Live Fish Transportation and Sales Regulations Initiative

Since the proposed aquaculture initiative is going to market live and whole fish, the regulation pertaining to the transportation and marketing of live fish were investigated. According to Mark Norton with the Georgia Department of Agriculture, live fish were not regulated by the Department of Agriculture. Mr. Norton indicated that as long as the fish were sold live, the only regulations that the farmer must adhere to were through the Georgia Department of Natural Resources. Ted Hendricks with the Georgia Department of Natural Resources indicated that if the fish are produced in an approved re-circulated system, there are no regulations impacting the transportation of live fish except that the farm will have to register as an aquaculturalist. The aquaculturalist application can be obtained by contacting Ted Hendricks.

If the fish are not in a live state when they are sold, even while being packed on ice, they are subject to regulation by the State Department of Agriculture. This is true if the fish are sold directly to consumers or to wholesalers. However, if the fish are crossing state lines, those states need to be contacted to determine what their regulations are

regarding the transportation of live fish. In Georgia for instance, a company must have a wholesale fish dealer license.

Domestic Fish Production

If an aquaculturalist is producing and selling or re-selling domestic species indigenous to Georgia or the fish species has been recognized before 1992 as having an established population in Georgia's public waters, the registration is free. The certificate expires on April 1st two years after registration. For more information on determining whether a species is considered to be indigenous to Georgia, contact Ted Hendricks.

Exotic Fish Production

No license is needed for exotic fish if they are held in containers where no water is discharged except for periodic cleaning. This water must be filtered to remove all impurities that may be discharged and the water can only be disposed in a septic tack permitted by the county wastewater treatment system permitted by the Environmental Protection Division. Depending on the system to be utilized, it is important to explore these regulations in more detail with the Georgia Department of Natural Resources.

Mark Norton
Georgia Department of Agriculture
19 Martin Luther King, Jr. Drive, S.W.
Atlanta, Georgia 30334
(404) 656-3685

Ted Hendricks
Georgia Department of Natural Resources
Fisheries Management Section
2070 U.S. Hwy. 278, S.E.
Social Circle, GA 30279
(770) 918-6418

Consumer Telephone Survey Methodology

One component of the CAED's research is to investigate the local market for live, unprocessed fish. To obtain these objectives, the CAED implemented a telephone survey by the University of Georgia's Center for Survey Research, to obtain a better understanding of North East Georgia residents, as well as a South Carolina and North Carolina residents (North Carolina and South Carolina residents were interviewed because they reside within 60 miles of the proposed aquaculture initiative in the economically challenged area of Northeast Georgia, their awareness, purchasing habits, consumption habits, and the likelihood to purchase live and whole, unprocessed fish from local fish farmers. In addition, this survey research investigated the most effective method of informing consumers about the availability of live unprocessed fish and a fish farm operation. A random sample of 232 people was contacted and 71 indicated they did

not eat fish. Therefore, it was determined that 69% of the area residents are fish consumers and potential customers of the proposed aquaculture initiative.

In addition, the surveyor asked to speak to the household member that eats the most fish. If no one in the household eats fish, the survey was terminated and if the primary fish consumer did not initially answer the phone, the interviewer asked to speak to that person. Therefore, a screening question was used to eliminate potential respondents that do not consume fish and reflects the household's primary fish consumer.

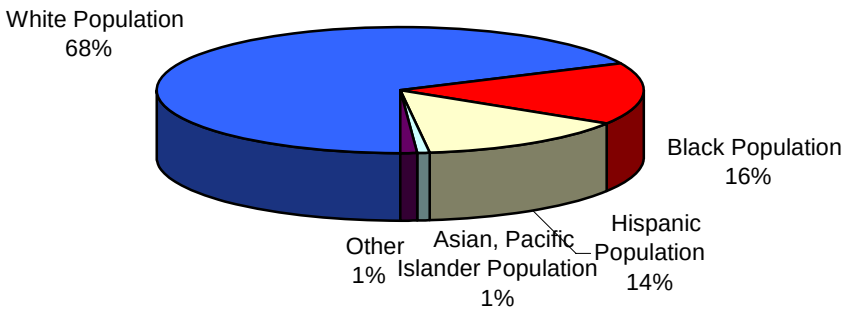
Local Market Area

It is very important to obtain a thorough understanding of the area market when considering a new business opportunity. The following are some highlights from the telephone survey:

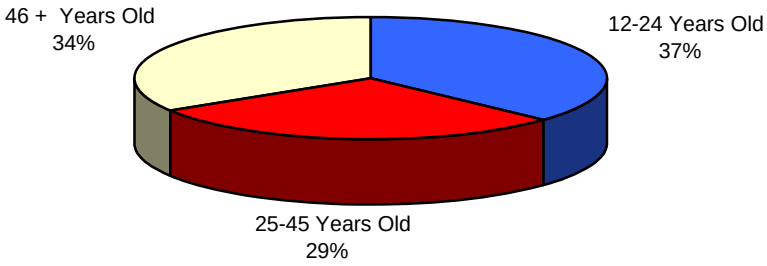
- 53% eat fish once a week or more often
- Roughly 19% purchase fresh fish weekly
- On average, the households eat roughly 4.0 pounds of fresh fish per month
- Aided awareness of all species except tilapia was high (>80% and 44%, respectively)
- One-quarter to one-third of respondents would be likely to purchase the various species (large mouth bass, perch, striped bass, shrimp, and flounder) excluding tilapia and eel, which was significantly lower (12%).
- Sixty percent or more of the respondents have eaten the various species (large mouth bass, perch, striped bass, shrimp, and flounder), again excluding eel and tilapia where the number is significantly lower (20% and 34%, respectively).
- 42% would purchase live or whole, unprocessed fish from a local fish market
- Respondents would travel approximately 27 miles to a local aquaculture farm

According to the results of the telephone survey, potential consumers are willing to travel approximately 27 miles to visit an aquaculture farm. Therefore, the demographics were obtained for three different distances of 25, 30 and 35 miles. All three distances are broken down in the appendix, and for the purpose of the investigation the 30 miles radius was used in the body of the paper. Besides the increased population the further the radius was extended the demographic breakdown was not statistically significant to display the 3 scenarios. Age, race, and income held proportionate to the population regardless to the radius. Due to the travel distance the respondent provided, the 30-mile radius appear appropriate to use for the investigation. There appears to be a significant population residing within this 30-mile radius with approximately 335,000 people and 131,000 households. The demographic breakdown of the population is seen in the pie charts below.

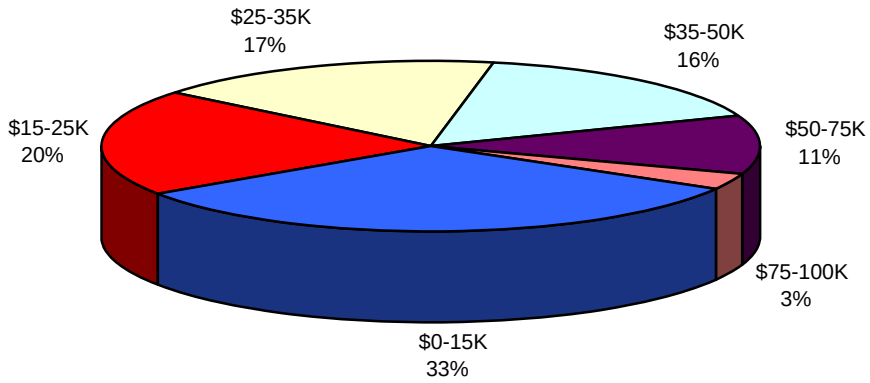
Population Distribution within 30 miles of Toccoa, Georgia



Age Distribution within 30 Miles of Toccoa, Georgia



Income Distribution within 30 Miles of Toccoa, Georgia



Likelihood to Visit Aquaculture Farm

To determine the local market potential for an aquaculture initiative, it is important to first determine the area resident's interest in visiting and purchasing fish from such an operation. However, it is important to remember that 31% of the area residents indicated that they do not eat fish. This is important and needs to be taken into consideration when calculating market potential.

The information in Table 1 indicates how likely respondents are to visit a local aquaculture facility to purchase live or whole, unprocessed fish. Approximately 42% of the respondents would visit such a facility. Given this figure, there appears to be a significant number of potential consumers in the local area.

Table 1. Q17. Likelihood to Buy Fish From Local Fish Farm

Response	**Percentage (n = 161)**
Very Likely	20.5%
Somewhat Likely	21.7%
Neither	2.5%
Somewhat Unlikely	13.7%
Very Unlikely	40.7%
Rf/Dk	1.2%
Mean	2.68

Using the reported likelihood to visit and purchase figures, it is possible to estimate the market potential in terms of likely visitors based on the area population figures. However, the total area population must be adjusted to reflect adult consumers since they are generally the head of household. According to the census data,

approximately 23%-24% of the area population is less than 18 years of age. Therefore, the total population must be adjusted down to reflect the adult population. This adjustment is introduced in the third column of table 2.

However, additional analysis is needed to determine interest in purchasing the different proposed species of live or whole, unprocessed fish. The first step is to determine how likely area residents are to purchase the various fish species. The information contained in table below provides insight into the likelihood of residents to purchase tilapia, bass, catfish, eel, flounder and perch from a local aquaculture farm as well the estimated market potential in terms of people.

Table 2. Likelihood to Purchase Different Species and Estimated Visitor Potential

Estimated Area Market Potential – No. of Visitors

Fish	Likely to Purchase*	30 miles (74,632)**
Large Mouth Bass	23.60%	17,613
Perch	27.90%	20,822
Striped Bass	30.40%	22,688
Eel	12.40%	9,254
Prawn (Shrimp)	31.70%	23,658
Flounder	29.20%	21,793
Tilapia	13.00%	9,702

* Percentage has been re-based to all respondent, including those who were unlikely to purchase fish from a local aquaculture farm. This provides a more accurate representation of potential customers.

** Population used in calculating consumption by distance were derived from population estimates in Appendix.

Perch, flounder, shrimp, and striped bass appear to be the most popular species in terms of attracting potential consumers with each having a total market potential of approximately 30,000 people residing within 35 miles of the proposed fish farm. Eel and tilapia have the least market potential with each having a total market potential of roughly 12,000 people. Again, these numbers are very encouraging but additional calculations are needed to derive the estimated consumption for the different species by distance.

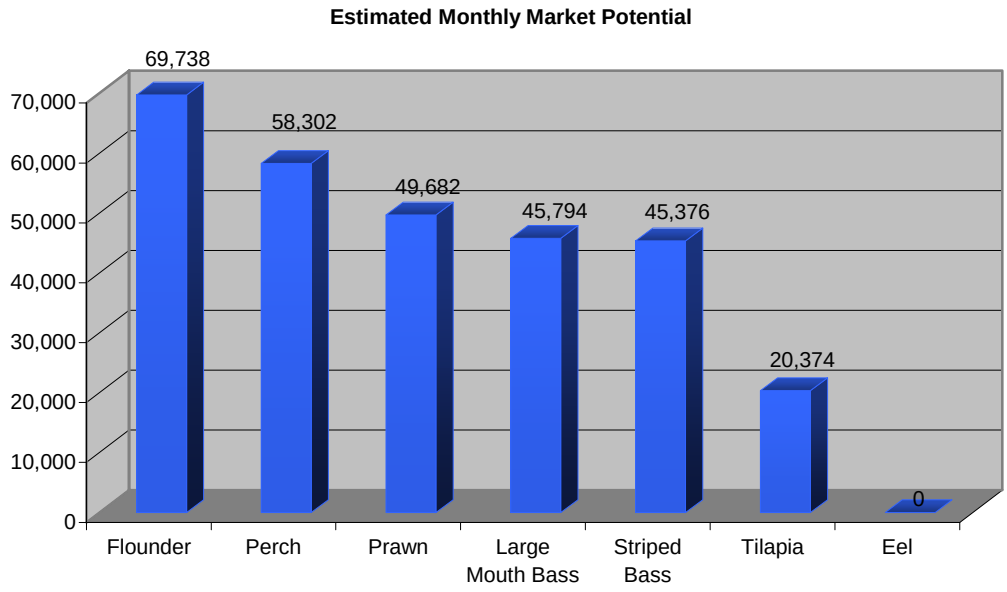
The information in table 2 provides an estimate of the number of potential consumers in the three different marketing areas. It is important to determine the total fish consumption potential in the marketing area as detailed below.

Estimated Area Fish Consumption

The survey data was used to estimate average monthly consumption of the different species. This consumption figure was multiplied by the number of potential consumers to estimate the total pounds of fish consumed monthly for the three marketing areas. Again, it is important to remember that this is the total estimated monthly consumption market potential for the area and is based on stated intentions and consumption levels. These estimates may reflect the most optimistic of circumstances. However, the information does provide the best estimate of how much fish is consumed monthly in the three marketing areas.

Graph 1was formulated using USDA data on per capita fish consumption and the population willing to eat fish in the given area.

Graph 1. Estimated Monthly Market Potential



Based on the results presented in Graph 1, the seven different species total monthly market potential can be broken down into significantly different levels of consumption. The first level would be flounder, follow by perch. The third level of potential includes prawn (shrimp), largemouth bass and striped bass. Tilapia is in the fourth level followed by eel. Also identified in the graph, is the market potential for tilapia and eel is significantly lower than for the other species. However, there does appear to be a significant market for Tilapia but unfortunately, there is not really an area market for live eel. The Tilapia live or whole market exists in the Metro-Atlanta Area in ethnic stores.

In addition to estimating the monthly market potential, it is important to determine how many pounds of these fish consumers purchase during a typical shopping trip. According to the study results, it appears that these shoppers, on average, purchase

approximately 2 pounds of fish per shopping trip, assuming this is a filet not a whole fish. Only 4.5% of the respondents indicated that they purchase fresh fish more than once a week. More than four in ten of the respondents reported purchasing fish once a month or less frequently. Interestingly, 25% of the respondents indicated that they never purchase fresh fish. It is important to remember people in this area typically purchase cleaned filleted fish. A cleaning table or service can be added relatively cheaply and additional income can be raised by charging a fee for this cleaning service.

This data is consistent with the consumption figures given that people may eat fish away from the home as well. Again, the purchase figure provides some insight into the quantity of fish visitors may be expected to purchase on a typical visit. Depending on the size of the fish, each visitor may purchase around two fish as there is waste with processing these fish and consumers typically purchase filets.

Expected Price Per Pound

The respondents were asked about how much they would be willing to pay for each of the species being considered. It is important to remember, that the number of respondents that were asked this question was low. The reason was people who are not willing to drive to an aquaculture farm and those that indicated they would not purchase a specific species were not asked this question.

However, the results in Table 3 provide a rough estimate of what area residents would be willing to pay per pound for fresh, unprocessed live or whole fish. The mean value is probably more reflective since it is not influenced as heavily as the mean value by extreme high and low values.

On average, it appears that the area respondents would be willing to pay as much as $3.00 per pound for perch and as much as $6.00 per pound for fresh shrimp. Again, the estimated value for eel should not be considered because of the lower number of responses.

Table 3. Amount Willing to Pay per Pound for Species
(Excludes respondents who were unlikely to purchase fish from a local fish farm)

Willing to pay	Tilapia (n=12)*	Eel (n=2)*	Striped Bass (n=24)*	Fresh Water Flounder (n=28)*	Perch (n=26)*	Prawn (n=26)*	Large Mouth Bass (n=21)*
Mean ($/lb.)	$4.42	$4.50	$4.12	$4.38	$3.99	$6.59	$4.47
Median ($/lb.)	$3.50	$4.50	$2.50	$3.99	$3.00	$6.00	$3.00

* Excludes the don't know respondents

Estimated Total Revenue Potential

Utilizing the respondents' willingness to pay for each of the species, it is possible to estimate the total monthly revenue potential for the various species. The monthly consumption potential was multiplied by the willingness to pay information to derive the estimated revenue potential from area consumers.

There appears to be significant revenue potential for the species listed in Table 3. However, it is important to remember that the willingness to pay, visitation and consumption figures are all based on stated intentions. The information in Table 3 is encouraging due to what appears to be a significant opportunity in the area for live or whole, unprocessed fish.

Shrimp, flounder, perch appears to have the largest potential market. Tilapia has a significantly smaller potential even thought it is a significant market in itself. These prices are subject to change based due to the nature of gathering them via a phone survey.

Table 4. Estimated Monthly Revenue Potential

Fish	Amount Willing to Pay/Lb.	Estimated Revenue
Flounder	$3.99	$278,255
Perch	$3.00	$174,906
Prawn (shrimp)	$6.00	$298,092
Large Mouth Bass	$3.00	$137,382
Striped Bass	$2.50	$113,440
Tilapia	$3.50	$71,309

** Consumption figures used in calculating revenue by distance were derived from estimates in table 64.

Asian Direct to Consumer Market or Secondary Market

The CAED attempted to interview consumers at the various ethnic markets in Metropolitan Atlanta. However, the market patrons were skeptical and we were unsuccessful in obtaining more than a few completed interviews due to communication issues surrounding various languages. To compensate for the lack of direct consumer interviews, the CAED conducted a limited survey with Chinese residents in the Athens area. The results should only be used as a guide since a large number of interviews were not obtained.

According to the survey data, it appears that Chinese residents in the Athens are willing to drive about 30 miles to purchase live or whole, locally grown unprocessed fish from an aquaculture farm. This is consistent with the people surveyed in the telephone survey.

Extrapolating these results to the Atlanta area, it appears that attracting the ethnic market consumers to the proposed aquaculture initiative farm in Toccoa, Georgia, may be unrealistic due to the required travel distance.

The following is a brief overview of the Chinese survey results. Less than one-third of the respondents reported eating any of the proposed fish species. They typically purchase about 4 pounds of fresh fish per shopping trip and their household consumes approximately six pounds of fresh fish per month. The respondents were neither likely nor unlikely to travel to an aquaculture farm to purchase live fish. Given the distance and

their lack of reported enthusiasm for visiting an aquaculture farm, it is unlikely they would travel to Toccoa, Georgia on a regular basis to purchase fish.

Marketing and Promotion

A key to the success of the proposed aquaculture initiative will be marketing the product to area consumers. To help the farmers direct market their product to area consumers, they need to know where these individuals look for information on food and new facilities.

This information provides insight into how best to contact potential area consumers. According to the research, consumers rely heavily on television advertising and newspaper inserts to gather information on food. However, radio appears to be the most efficient means of reaching potential consumers to inform them about the opening of the proposed aquaculture initiative farm and to remind them of its operation. Television and fliers should also be considered and included in the marketing mix. It is important for the proposed aquaculture initiative farm to think about its marketing plan and budget accordingly.

Table 5. Sources for Providing Information

Response	Q26. Information Source for Food	Q27. Best Way to Inform about Opening	Q28. Best Way to Inform About Operational Farm
Radio Advertisements	2.5%	41.0%	42.9%
Television Advertising/Promotion	19.3%	21.7%	18.0%
Flier	5.0%	14.9%	17.4%
Newspaper Insert	29.2%	7.5%	8.7%
Bill Board	0.0%	3.1%	2.5%
Other	35.4%	11.2%	8.7%
Dk/Rf/NA	8.7%	0.6%	1.9%

Apparent Metro Atlanta Live or Whole Fish Market

CAED representatives visited eight ethnic food retailers in the Eastern Atlanta metropolitan area. The retailers all carried fish products with seven of the eight offering live unprocessed fish. Tilapia and channel catfish were the most frequently noted fish

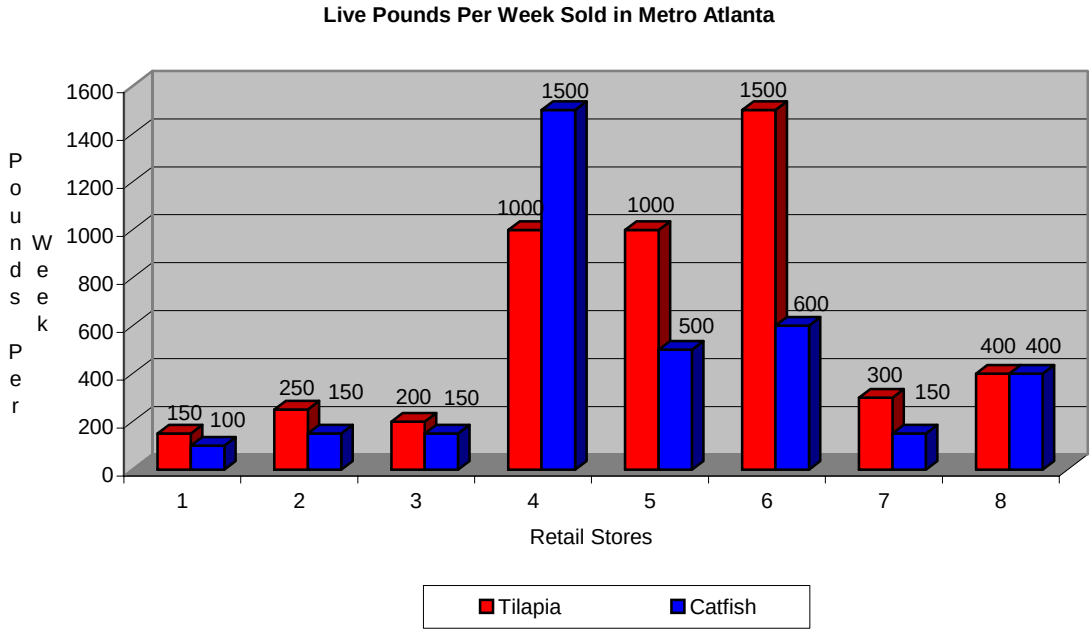
species being sold live. These retail stores had large tanks visible for customers to select fish and also offered a cleaning service for 50 cents per pound.

CAED conducted in-depth surveys with the food retailer's fish department managers to determine product movement of live, unprocessed fish, and their willingness to consider different varieties of fish and a local fish supplier. All of the managers reported their live fish suppliers were out of state. Some of the fish were being transported from California while most were being supplied from producers in surrounding southern states, primarily Alabama and Mississippi.

The fish department managers all expressed interest in meeting and working with new local suppliers. Interestingly, there was a lot of interest in a local supplier providing perch, flounder, trout, crappie, large and small mouth bass as well as other fish. The fish department managers were looking for a consistent supply of quality fish. They would be interested in purchasing fish on a weekly basis year around. After discussing their needs, it does not appear that supplying a large quantity of fish twice a year would benefit the ethnic retailers. Therefore, if the project wishes to sell fish in the live retail and wholesale markets, a system to raise the same species year round needs to be developed.

One of the larger markets indicated that they currently use approximately 1,500 pounds of Tilapia weekly and about 1,000 pounds of catfish. This market sells approximately 78,000 pounds of Tilapia and approximately 52,000 pounds of catfish annually. The remaining markets sold considerably less live, unprocessed fish weekly. One of the smaller markets indicated they sold 200 pounds of live unprocessed Tilapia and 150 pounds of live unprocessed catfish weekly. This would translate into approximately 10,400 pounds of Tilapia and 7,800 pounds of live catfish annually.

Graph 2. Apparent Live Pounds Per Week Sold in Metro Atlanta



There appears to be a market for live fish in the Atlanta Ethnic food retail market. However, to compete in the market, it is essential to offer a consistent quality product. These markets are accustomed to receiving fish weekly or more frequently and therefore would expect the same service from a local supplier. The market for fish other than Tilapia and catfish appear to be untapped. These stores consisted of large farmers markets to smaller grocery retailers in the Northeast section of Metro Atlanta.

Competitors

A search of the internet revealed a number of seafood wholesalers. To get a feel for the live fish market, the CAED identified 116 fish and seafood businesses nationwide. An attempt was made to contact each of the116 business. Of those that were contacted, none reported selling live fish. The CAED tried to identify fish and seafood wholesalers supplying the ethnic market but the department managers were reluctant to provide this information. We were able to ascertain that the fish are being transported from Alabama and Mississippi.

As a result of the ethnic markets reluctance to provide their suppliers, the CAED identified 31 businesses in the Atlanta area specializing in fish and seafood using the yellow pages. There are a number of competitors in the Atlanta area that sell the fresh and frozen fish, but none supplied live fish. One exception was wholesaler that called the CAED after we visited the Atlanta ethnic markets looking to purchase live fish for resell.

Ted Hendricks with the Georgia Department of Natural Resources also searched their databases for organizations that sell live fish. He was only able to identify a handful. Only two operations are currently registered in the state to produce and sell live tilapia (see appendix A). The Atlanta ethnic market is currently being supplied by three

companies that were identified by the CAED, two of the companies were out of state, Alabama and Mississippi and the third wholesaler was located in North Georgia but was a reseller not a producer. This individual was interested in purchasing fish from the proposed facility to service the Atlanta ethnic market.

Table 6. Tilapia Aquaculture Wholesale Market Report

(Market Week Ending)	Size (lbs.)	Price per pound	Number of Pounds
July 1998 (N.E.)	1.0-2.0	1.70	35,500
April 10, 1998	2.0	1.95	36,000
October 24, 1997	1.0-2.0	2.05	30,000
July 11, 1997	1.00-2.00	2.30	15,800
June 18, 1997	1.00-2.00	2.15	25,000
November 16, 1996	1.00-2.00	2.00	25,000

The fish department retailers were reluctant to provide information on what they are paying for their live fish. This may be in part due to the fact that the CAED explained that the reason for the survey was to collect information on a potential live fish supplier. The managers may have been reluctant to provide price information so that they can negotiate in the future.

The price of live tilapia ranged from $1.99 per pound to $2.99 per pound. Catfish were somewhat less expensive, $1.49 per pound to $2.49 per pound. According to one fish department manager, they typically mark up their live fish 30%. This is consistent with mainstream retailers mark up pricing strategies. The information in table 7 provides an estimate of wholesale live tilapia and catfish prices.

Table 7. Apparent Metro Atlanta Prices

	Retail Price		Wholesale Price	
Fish	**Low**	**High**	**Estimated low**	**Estimated high**
Tilapia	$1.99	$2.99	$1.50	$2.25
Catfish	$1.49	$2.49	$.99	$1.10
Eel	N/A	$6.99	N/A	N/A

Aquaculture Farm Feasibility

This section will explore the feasibility of operating aquaculture barns in Northeast Georgia. Cost figures we obtained SPF Aquaculture Center at the College of Veterinary Medicine at the University of Georgia.

Income

The income was derived by utilizing information obtained from the market research on wholesale prices. The total pounds were calculated by using the systems year round, to produce both a warm water crop, Tilapia & Shrimp, and a cold-water crop, perch and trout. This yields 163,842 pounds of product available for sale. The pound estimates came directly from the SPF Aquaculture Center staff. Multiplying the pounds per year by the wholesale price the entire system generates $430,800. Shrimp brought the highest price of $4.00 per pound, while Tilapia receives $1.00 per pound, Perch $2.00, and Trout $2.50. The total income produced amounted to $418,248. See appendix page 24.

Capital Cost

The capital cost figures include all equipment considered necessary to operate 20 systems. Included in these cost are building improvements and equipment.

Equipment:		Building/Land
Entire System	$110,000	Building Improvements
		$88,000
Generator	$18,000	
Trailers	$4,000	
Transport Tanks	$200	
Fish Haulers	$3,000	
Monitoring Equip	$1,200	
Ice Machines	$12,000	
Coolers	$200	
Blower	$600	
Pumps	$270	

The total capital cost amounts to $248,896, including tax. See appendix page 27.

Direct Cost

The figures for the fingerlings and delivery came from the SPF Aquaculture Facility with the College of Veterinary Medicine at the University of Georgia. The costs for fingerlings were all $.10 and for shrimp larva was $0.10. The delivery cost and contract cost on the fingerlings and larvae was $.05 apiece. The total cost amounted too $222,720. See Appendix page 24.

Fixed Costs

Fixed costs associated with the aquaculture facilities include the depreciation on the building, equipment, and interest on investment funds. The projected fixed costs for

this project is $68,386. The depreciation is used to cover physical deterioration and function obsolescence. Built into this model is a return on investments of 10%. If needed the deprecation can be substituted to cover the principals of a debenture. See Appendix page 24.

Direct Labor

Labor cost calculations include both salaried and hourly labor required to operate the aquaculture project. The labor figures are automatically adjusted with an increase in pounds. This cost came from the SPF Aquaculture Facility at the College of Veterinary Medicine. A salesperson/manager with the ability to communicate with the ethnic markets and create schedules staggering the fish production will be employed at $35,000 annually. Other labor includes bookkeeping and operating labor. The total labor figure amounted to $93,294. See appendix page 24.

Variable Costs / Other Direct Costs

Variable costs associated with this project include labor, utilities, insurance, repairs, rental agreements, disposal, and operating costs. All of this will change depending on the pounds of product produced. Positive relationships exist among the pounds processed and the variable costs. The total for this category is $87,550. The largest component of this cost was the utilities to operate the facilities and feed. See appendix page 24.

Total Cost & Profit/Loss

Adding the variable and fixed costs together sums the total cost of $440,226. The estimated profit amounts to $(21,452). It is important to remember this figure assumes Shrimp throughout the year and all fish produced are sold. The original plan did not include these assumptions. See appendix page 24.

Sensitivity Analysis

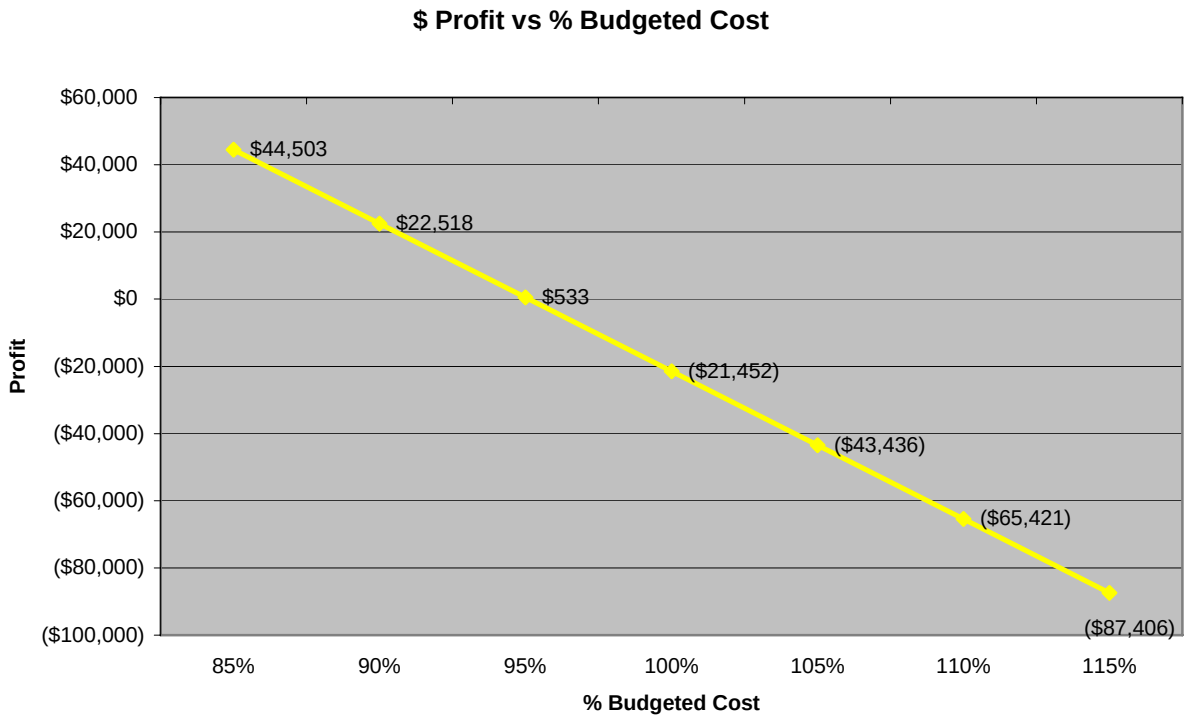
Profit versus Budgeted Cost

Assuming the figures used in the economic feasibility section are closely related to actual numbers used to operate the aquaculture facilities, the profitability for the project will be as follows.

The budget numbers include operating expenses (utilities, taxes, labor, supplies), fixed costs (interest on start up cost, deprecation) and income from sales of producing

fish. Then the costs are subtracted from the income resulting in the remaining profit or loss.

Graph 3. Change in Profit versus Change in Budgeted Cost.

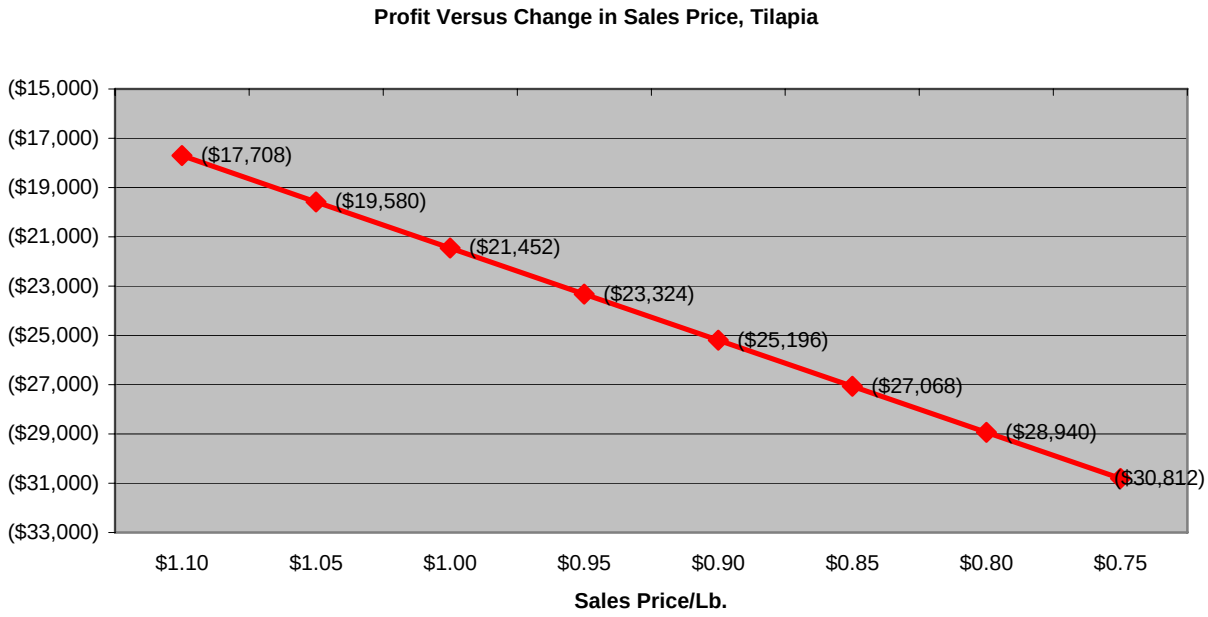


Graph 3 indicates a loss at 100% of the budgeted cost. The venture is profitable when the costs are reduced by 10% or more, however the operation is currently running as efficiently as possible. Many costs are subject to change; utilities for example can fluctuate periodically through the year depending on supply of their inputs. The Center for Agribusiness and Economic Development suggest a padding of 15-20% over budgeted cost to be safe. Often cost change after the start up of the business and the feasibility report.

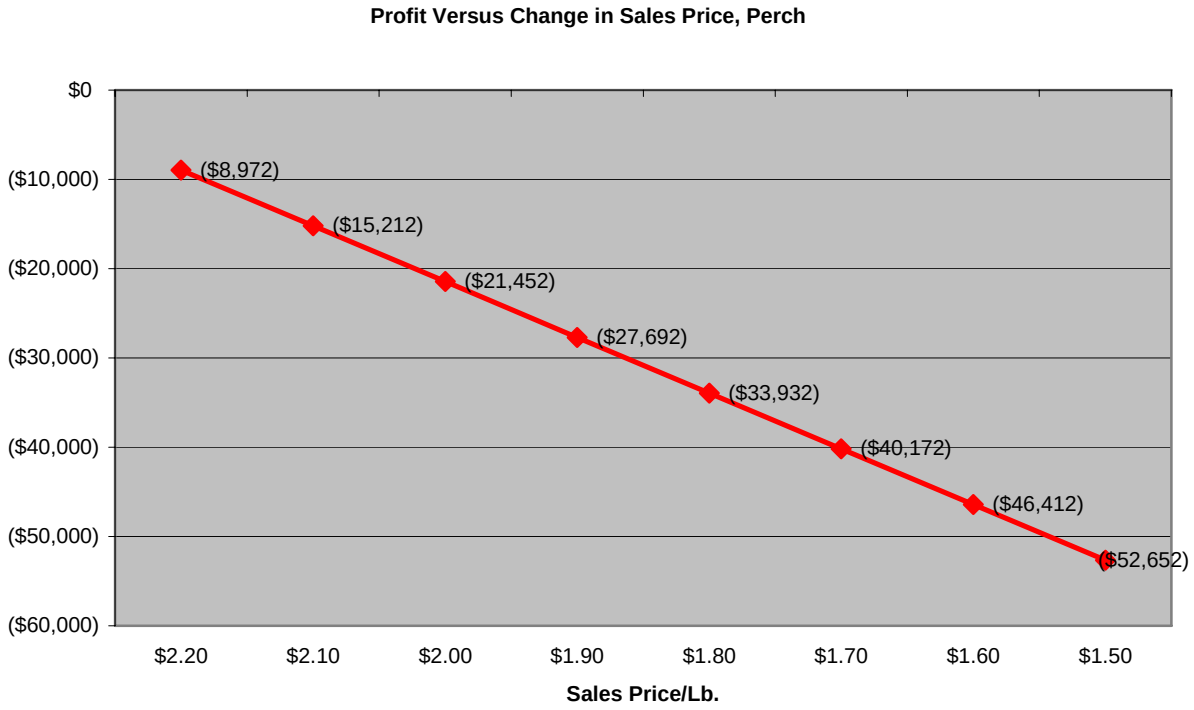
Profit versus Percent Over/Under Estimated Sales Price

This section indicates how the change in the sales price of fish/shrimp affects the profitability of the facility. The obvious result is as prices decrease profits decrease, but it is good to know if the operation can move with market saturation or fluctuation.

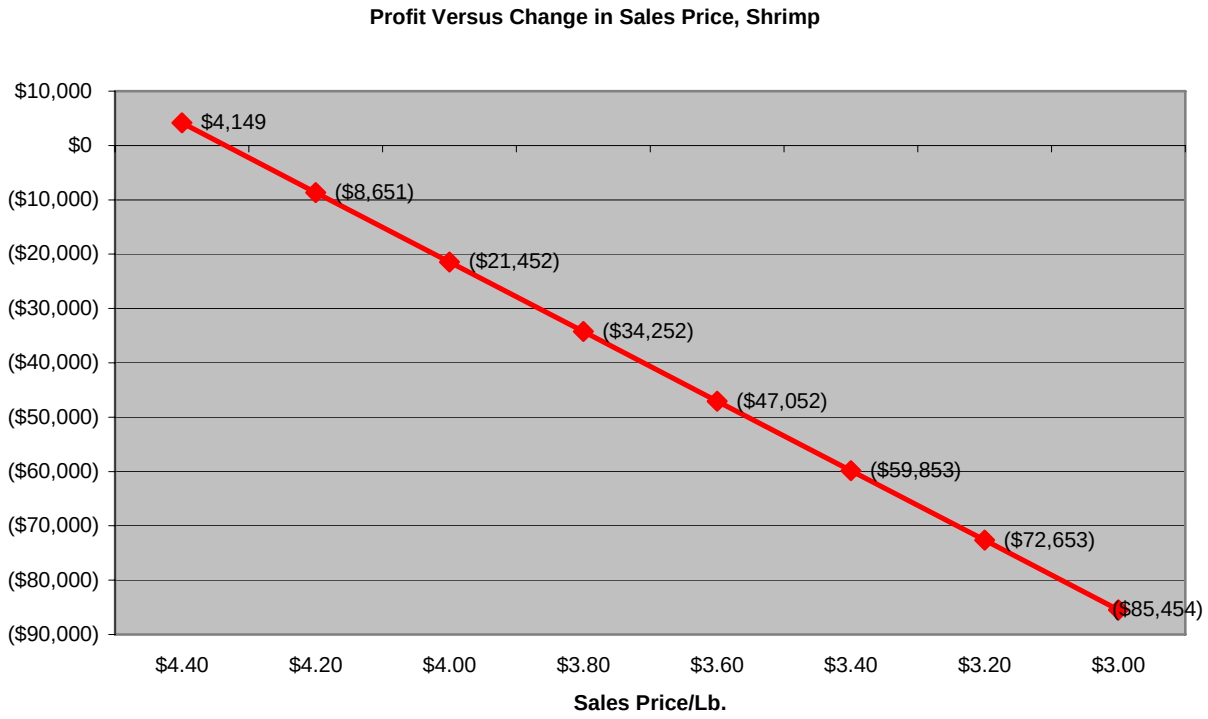
Graph 4. Profit versus Over/Under Estimated Sales Price, Tilapia.



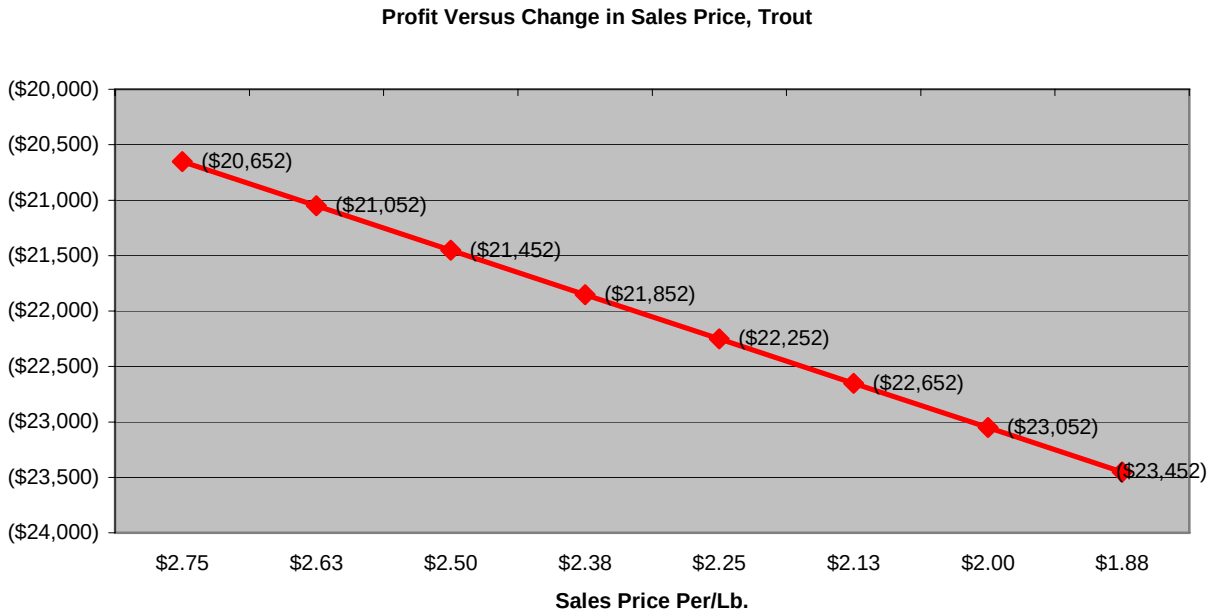
Graph 5. Profit versus Over/Under Estimated Sales Price, Perch.



Graph 6. Profit versus Over/Under Estimated Sales Price, Shrimp.



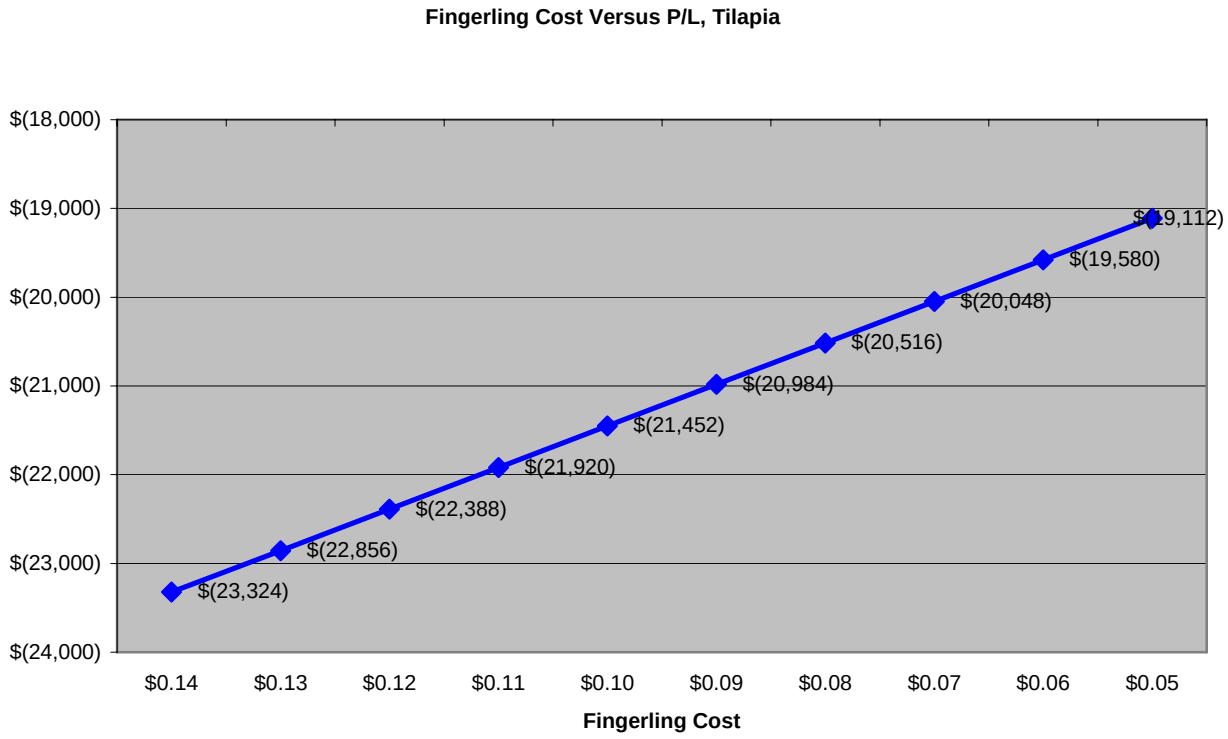
Graph 7. Profit versus Over/Under Estimated Sales Price, Trout.



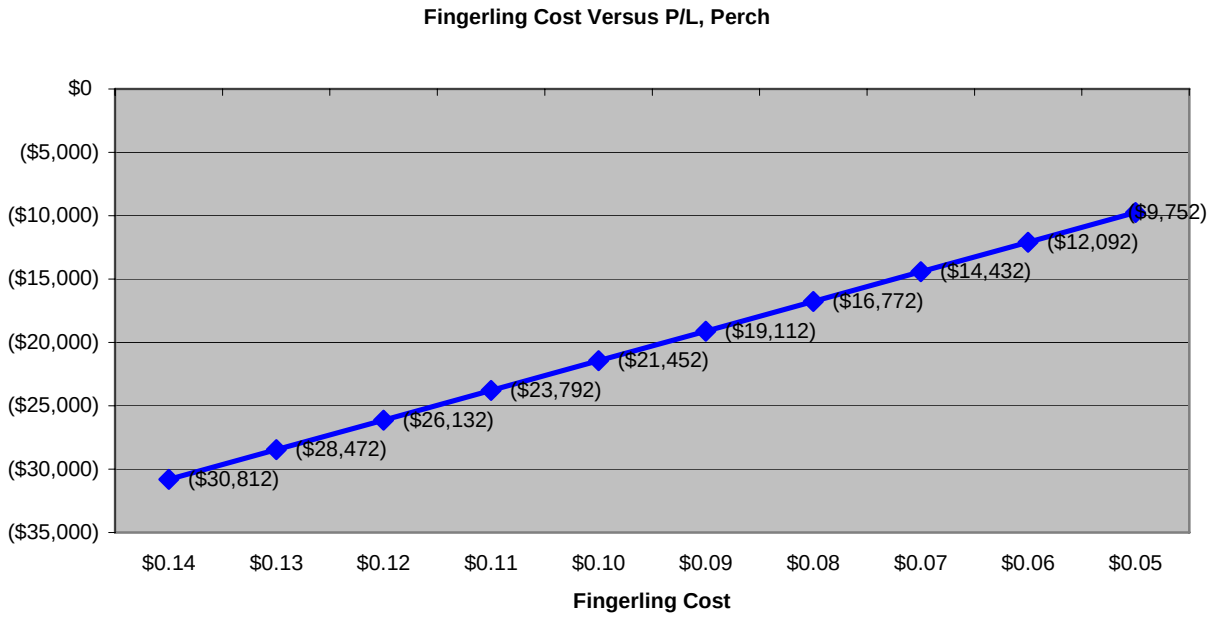
Profit Versus Direct Cost

This section investigates the relationship between the direct cost, fingerlings and larvae, and the affect on the profit. Often these cost change seasonally depending on other inputs and supplies. Immediately changing these cost affect the operations largest cost component.

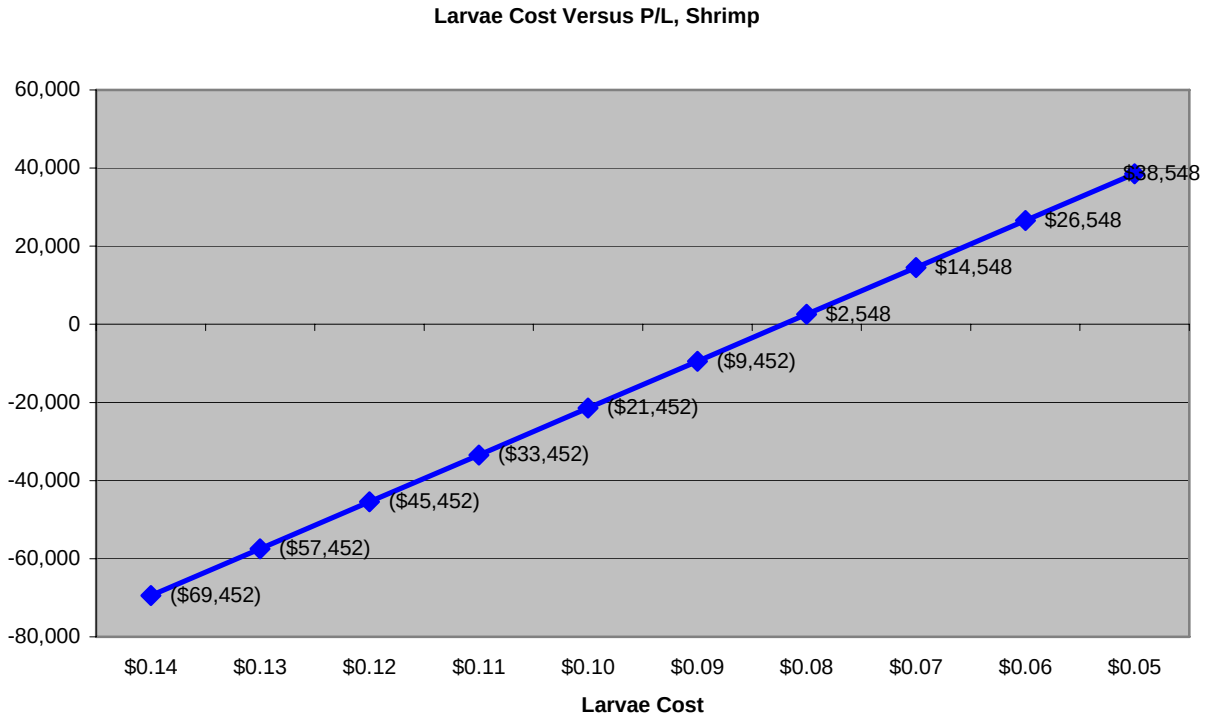
Graph 8. Profit Versus Direct Cost, Tilapia.



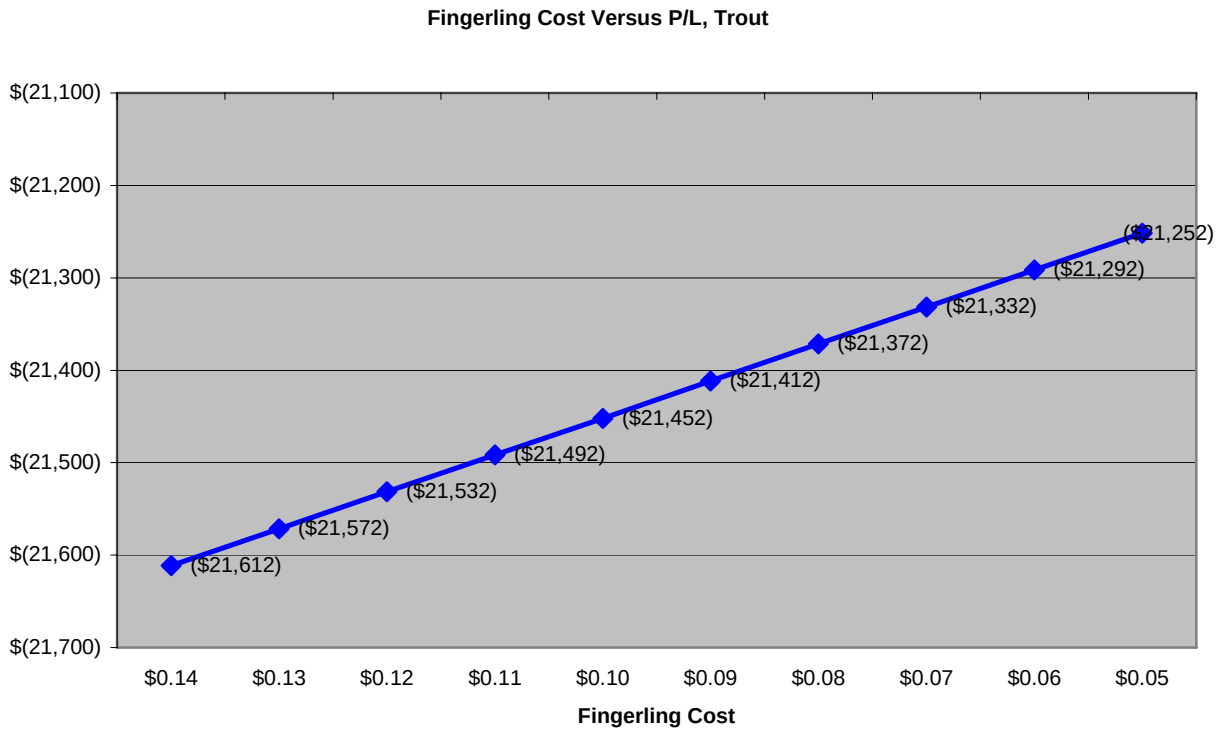
Graph 9. Profit Versus Direct Cost, Perch



Graph 10. Profit Versus Direct Cost, Shrimp.



Graph 11. Profit Versus Direct Cost, Trout.



Impact Analysis

Impact analysis is a key component of any feasibility study. An impact analysis shows the effect of a new venture on the economy. Building and implementing fresh fish production in Georgia will impact the economy on two levels. The new facilities will generate output as it begins selling fish. These sales will, in turn, generate additional sales as the producers purchase inputs. The suppliers to the producers will increase the purchase of their inputs, thus increasing demand for those items. These increased sales will ripple through the economy. An input-output model will capture and quantify these effects.

The input-output model, IMPLAN, was utilized for this project. The impacts of fish production were entered into the model based on Georgia. The direct impact is equal to the level of sales from the producers. Each direct impact then generates indirect impacts. These impacts are the ripple effects mentioned earlier. The direct and indirect effects can then be summed to give the total economic impact. IMPLAN can predict the effects of a new venture on output (sales), employment and tax revenue.

Table 8. Impacts of Fresh Fish Production

	Direct	**Indirect**	**Total**
Output	$418,248	$248,886	$667,134
Employment	7	3	10
Tax Revenue (State)	NA	NA	$27,108

Table 8 indicates the IMPLAN results. Output or total sales of fish production are estimated at $540,000. This production creates another $272,285 of output as the fish producers purchase inputs and cause ripples throughout the economy. Thus, the total impact of the first phase at an aquaculture production initiative in North Georgia is $809,585.

Employment in Georgia is also affected by the production of fresh fish. Eight individuals will be directly employed in fish production. The activity created by these producers will create employment for 3 others in Georgia.

Finally, fresh fish production will have an impact on state and local, non-education taxes. Roughly $40,000 of additional tax revenue will be available for collection due to the production of fresh fish.

Conclusion

There appears to be a sufficient market for live or whole aquaculture production in Georgia. If all the fish produced are sold at the current wholesales prices an economic profit can be attained by the operators. The key is to gain that market segments and stagger the fish production to meet the needs of the retail sellers.

The proposed operation does not appear to have any profit potential currently. Modifications to the cost structure and market may be needed to obtain a profit. The costs used for this study were supplied by ongoing research at the University of Georgia.

Entering any market will take time and patience. It is unrealistic to believe any enterprise can immediately produce a product and gain a substantial market share. The Center for Agribusiness and Economic Development feels the first level of production should be limited to a contract basis. This will help ensure that the majority of the product produced will be sold. Further expansion can occur as the reputation for a quality product increase. The manager of the cooperative will have to schedule the production and sales of fish from the holding tanks. In addition, the manager will have to be familiarized with fish to provide quality control assurances. It is important to have a manager or salesperson may weekly contact with purchasers of the final product. It would difficult to rely mainly on farm visit for income and the wholesale market needs to be pursued. Reputation is important when selling to the market, however new entrants into any market how no reputation, which is perceived often negatively. The inexperience of the producers and limited profit (loss) need to be addressed prior to any capital investment into the project.

Tables Representing Answers to Telephone Survey

The information in Table 1 reflect the how often the respondents eat fish. The data suggest that the respondents generally eat fish once every week or two. Only a small percentage of the respondents indicated they eat fish on a daily basis (3.1%) with a

significantly larger percentage (26.8%) reporting they eat fish once a month or less often. Grouping the respondents into two different categories based on their reported levels of consumption provides a frequent consumer group and an infrequent consumer group.

Frequent consumers are those that consumer fish once weekly or more often. The infrequent consumer group eats fish once every two weeks or less often.

Q1. How Often Eat Fish	
Frequency	**Percentage**
Frequent Consumers	
Daily	3.1%
More than once a week	18.0%
Weekly	32.9%
Infrequent Consumers	
Every two weeks	19.3%
Monthly	19.3%
Less than once a month	7.5%

When the respondents were asked approximately how many pounds of fresh fish they eat weekly or monthly, they indicated they eat approximately 1.5 pounds a week or

Q2. Types of Fish Generally Like to Eat (Open Ended and Multiple Responses)	
Frequency	**Percentage**
Channel Catfish	34.8%
Blue Catfish	27.3%
Trout	26.7%
Large Mouth Bass	18.6%
Flounder	14.9%
Perch	12.4%
Small mouth bass	11.8%
Crappie	10.6%
Tilapia	9.9%
Bream	7.5%
Striped Bass	6.2%
Shellfish	6.2%
Other	28.6%
None	3.7%
Dk/Rf	3.1%

Q3. How Often Typically Purchase Fresh Fish	
Frequency	**Percentage**
More than once a week	4.5%
Weekly	14.8%
Every two weeks	11.0%
Monthly	18.1%
Less than once a month	26.5%
Never	25.2%

On average, the respondents purchase about 2 pound of fresh fish on a typical shopping fish. This is consistent with the

Q4. Number of Pounds Purchased on a Typical Shopping Trip (Only those who purchase fresh fish)	
No. of Pounds	**Percentage (n=116)**
None	13.8%
0 < 1 pound	5.7%
1 < 2 pounds	20.7%
2 < 3 pounds	22.4%
3 < 4 pounds	10.3%
4 < 5 pounds	6.9%
5 < 10 pounds	10.3%
≥ 10 pounds	4.3%
Dk/Rf	6.0%
Mean	2.8 pounds
Median	2.0 pounds

Q5&5.1. Number of Pounds Respondent Eats in a Typical Week/Month (only those who purchase fresh fish)		
	Percentage (n=80)	**Percentage (n=74)**
Number of Pounds	**Week**	**Month**
None	7.4%	6.8%
0 < 1 pound	22.5%	9.5%
1 < 2 pounds	32.5%	21.6%
2 < 3 pounds	11.1%	23.0%
3 < 4 pounds	7.4%	10.8%
4 < 5 pounds	2.5%	5.4%
5 < 10 pounds	7.5%	9.5%
≥ 10 pounds	3.8%	2.7%
Dk/Rf	6.2%	10.8%
Mean	1.5 pounds	2.6 pounds
Median	1.5 pounds	2.0 pounds

Q8&8.1. Number of Pounds Household Eats in a Typical Week/Month (only those who purchase fresh fish)		
	Percentage (n=62)	**Percentage (n=54)**
Number of Pounds	**Week**	**Month**
None	3.2%	0.0%
0 < 1 pound	4.8%	3.7%
1 < 2 pounds	25.8%	14.8%
2 < 3 pounds	21.0%	24.1%
3 < 4 pounds	9.7%	5.6%
4 < 5 pounds	8.1%	7.4%
5 < 10 pounds	14.5%	25.9%
≥ 10 pounds	9.8%	11.1%
Dk/Rf	3.2%	7.4%
Mean	4.4 pounds	3.7 pounds
Median	2.0 pounds	2.0 pounds

(Aided - Multiple Responses)			
Fish	**Q9. Familiarity With Fish**	**Q10.Ever Eaten Fish**	**Likely to Purchase***
Large Mouth Bass	91.2%	64.4%	23.6%
Perch	90.7%	70.6%	27.9%
Striped Bass	87.0%	63.8%	30.4%
Eel	85.1%	20.0%	12.4%
Prawn	84.5%	61.9%	31.7%
Flounder	80.8%	59.4%	29.2%
Tilapia	44.7%	34.4%	13.0%
None	0.6%	0.0%	NA
Dk/Rf	0.6%	3.1%	NA
* based on all respondent, including those who were unlikely to purchase fish from local fish farm			

Frequency of Various Fish Consumption

Frequency	Tilapia (n=55)	Eel (n=32)	Striped Bass (n=102)	Fresh Water Flounder (n=95)	Perch (n=113)	Prawn (n=99)	Large Mouth Bass (n=103)
Weekly	9.1%	0.0%	2.0%	4.2%	6.2%	13.3%	1.9%
Monthly	21.8%	3.1%	11.8%	25.3%	16.8%	31.3%	16.5%
Less than monthly	69.1%	93.8%	86.3%	68.4%	76.1%	55.6%	81.6%
Don't know	0.0%	3.1%	0.0%	2.1%	0.9%	0.0%	0.0%
Mean* Pounds/week	1.1 lbs (n=4)	0.0 lbs (n=0)	1.5 lbs (n=2)	1.5 lbs (n=4)	1.8 lbs (n=6)	1.5 lbs (n=12)	1.5 lbs (n=2)
Mean** Pounds/month	2.4 lbs (n=12)	0.0 lbs (n=1)	2.1 lbs (n=12)	3.5 lbs (n=24)	3.8 lbs (n=6)	2.3 lbs (n=27)	2.7 lbs (n=16)

* respondents who reported eating fish once a week or more often
** respondents who reported eating fish less frequently than once a week

Q17. Likelihood to Buy Fish From Local Fish Farm During Festival **(Question was not asked to respondents who indicated they were unlikely to purchase fish from local fish farm)**	
Response	**Percentage (n=60)**
Very Likely	45.0%
Somewhat Likely	33.3%
Neither	10.0%
Somewhat unlikely	8.3%
Very unlikely	3.3%
Rf/Dk	0.0%
Mean	**4.08**

Q18. Distance Willing to Travel to Purchase Live Fish From Local Farm (excludes respondents who were unlikely to purchase fish from local fish farm)	
Miles	**Percentage (n=65)**
2 -5 miles	6.2%
6 < 10 miles	1.5%
10 < 15 miles	26.2%
15 < 20 miles	4.6%
20 < 25 miles	16.9%
25 < 30 miles	6.2%
30 < 35 miles	12.3%
35 < 40 miles	1.5%
50 miles	4.6%
60 + miles	6.2%
Dk/Rf	4.6%
Mean(miles)	27.1 miles
Median (miles)	17.5 miles

Likelihood To Purchase Species							
Fish	**Very Likely**	**Somewhat Likely**	**Neither**	**Somewhat unlikely**	**Very unlikely**	**Dk**	**Mean**
Prawn/Fresh water shrimp	49.2%	29.2%	0.0%	4.6%	13.9%	3.1%	3.98
Fresh Water Flounder	41.5%	30.8%	4.6%	4.6%	15.4%	3.1%	3.81
Perch	35.4%	33.9%	4.6%	7.7%	13.9%	4.6%	3.73
Striped Bass	33.9%	41.5%	0.0%	3.1%	18.5%	3.1%	3.71
Large Mouth Bass	26.2%	32.3%	4.6%	7.7%	23.1%	6.2%	3.33
Tilapia	15.4%	16.9%	7.7%	9.2%	35.4%	15.4%	2.62
Eel	0.0%	6.2%	0.0%	12.3%	75.4%	6.2%	1.33

Amount Willing to Pay per Pound for Species (excludes respondents who were unlikely to purchase fish from local fish farm)							
Willing to pay	**Tilapia (n=12)***	**Eel (n=2)***	**Striped Bass (n=24)***	**Fresh Water Flounder (n=28)***	**Perch (n=26)***	**Prawn (n=26)***	**Large Mouth Bass (n=21)***
Mean ($/lb.)	$4.42	$4.50	$4.12	$4.38	$3.99	$6.59	$4.47
Median ($/lb.)	$3.50	$4.50	$2.50	$3.99	$3.00	$6.00	$3.00
* Excludes the don't know respondents							

Characteristic	
Gender	**Percentage**
Male	49.1%
Female	50.9%
Educational Attainment	
Less than high school degree	14.9%
High school	27.3%
Some college/tech degree	29.2%
College graduate	14.9%
Advanced work/degree	11.2%
Refused	2.5%
No. Adults in Household (mean)	2.01
No. Children in Household (mean)	0.78
Age (mean)	43.0
Ethnicity	**Percentage**
White	82.6%
Black	10.6%
Hispanic	1.2%
Multi-Racial	1.9%
Don't know/refused	3.7%
Total Household Income	**Percentage**
≤$4,999	0.6%
$5,000-$9,999	0.6%
$10,000-$14,999	2.5%
$15,000-$19,999	3.7%
$20,000-$24,999	4.4%
$25,000-$29,999	5.0%
$30,000-$34,999	3.1%
$35,000-$49,999	13.7%
$50,000-$74,999	12.4%
$75,000+	17.4%
Don't know/refused	34.8%
Mean (average household income)	$51,667

The Center for Agribusiness & Economic Development

The Center for Agribusiness and Economic Development is a unit of the College of Agricultural and Environmental Sciences of the University of Georgia, combining the missions of research and extension. The Center has among its objectives:

> To provide feasibility and other short term studies for current or potential Georgia agribusiness firms and/or emerging food and fiber industries.
>
> To provide agricultural, natural resource, and demographic data for private and public decision makers.

To find out more, visit our Web site at: http://www.caed.uga.edu

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J. Scott Angle, Dean and Director