Agricultural Extension Service
The University of Tennessee

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Opportunities for Growth:

An Assessment of Tennessee's Aquaculture Production

A joint project by the
Tennessee Aquaculture Task Force
and The University of Tennessee
Agricultural Development Center

This project was funded by the Tennessee Department of Agriculture's "Agricultural Development Fund." The Agricultural Development Fund contains proceeds from the sale of Tennessee "Ag Tag" license plates.

Executive Summary

A joint project of the Tennessee Aquaculture Task Force and the Agricultural Development Center, funded by the Tennessee Department of Agriculture's "Agricultural Development Fund," was conducted during the summer of 2000 to assess the size, scope, inventory, situation and market capacity of Tennessee's existing aquaculture industry. A survey questionnaire was developed by a sub-group of the Aquaculture Task Force and reviewed and edited by the entire task force. The survey included questions to assess production and marketing tactics, as well as attitudes regarding opportunities for the development of aquaculture in Tennessee. The survey was completed by less than half of Tennessee's estimated total population of aquaculture participants and fish farmers. While freshwater shrimp production is recognized as a developing enterprise in Tennessee, the survey results indicate that early adopters in that enterprise were not included in the survey sample.

According to the results of the survey, very little concentration is evident for any particular aquaculture enterprise or in any single region of the state. Tennessee's aquaculture industry is comprised primarily of operators who consider their aquaculture activities as part-time operations.

The respondents to the survey represent approximately $3.5 million in annual gross aquaculture sales, primarily from catfish, tilapia, baitfish and trout operations[1]. A majority of operators sell either direct to consumers or to live haulers. Tennessee's aquaculture industry uses approximately 500 tons of feed annually. Tennessee's aquaculture producers are primarily optimistic about the future of aquaculture in Tennessee and most of those who are pessimistic are planning to get out of aquaculture in the next one to five years.

Most aquaculture producers get information to assist in managing their operations from The University of Tennessee Agricultural Extension Service, from other fish farmers or from other states' Extension Services. However, the greatest need for Tennessee's aquaculture industry has been identified as grower education programs, followed by a need for consumer awareness programs, technical production support and access to funding. The most often mentioned constraints facing aquaculture operators in Tennessee are labor, volume of products and the lack of a processor.

[1] The United States Department of Agriculture, National Agricultural Statistics Service, Census of Aquaculture (1998) reported approximately $3.9 million in total aquaculture sales in Tennessee in 1998.

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Foreword

In January 2000, The University of Tennessee Vice President for Agriculture, Dr. Jack Britt, and the Tennessee Commissioner of Agriculture, Mr. Dan Wheeler, appointed an Aquaculture Task Force. The 12-member task force was asked to develop a five-year plan for strengthening and promoting development of aquaculture in the state and to accomplish the following objectives:

1) Estimate the scope of the commercial aquaculture industry in the state at present.
2) Determine opportunities for Tennessee producers to produce aquacultural products for existing and emerging markets, and identify areas in commercial aquaculture for which Tennessee producers could be competitive.
3) Identify the research, educational and marketing efforts that need to be undertaken by The University of Tennessee Institute of Agriculture and the Tennessee Department of Agriculture to support development of a stronger, more diverse commercial aquaculture industry.
4) Provide estimates of the cost of implementing the recommendations in the five-year plan.

Members of the Tennessee Aquaculture Task Force:

- Chair — Dr. George Hopper, Head, Forestry, Wildlife and Fisheries Department
- Mr. Jim Caldwell, President, Tennessee Aquaculture Association
- Mr. Joe Gaines, Tennessee Assistant Commissioner of Agriculture
- Dr. Wes Harrison, Associate Professor, Agricultural Economics
- Dr. Tom Hill, Professor, Forestry, Wildlife and Fisheries (Extension)
- Mr. Rob Holland, Assistant Extension Specialist, Agricultural Development Center
- Mr. Jim Miller, Aquaculture Consultant and Chair of the Tennessee Aquaculture Advisory Board
- Dr. Roland Mote, Associate Dean, College of Agriculture & Experiment Station
- Mr. Dill Reeves, Fisheries Management Chief, Tennessee Wildlife Resources Agency
- Dr. Richard Strange, Professor, Forestry, Wildlife and Fisheries (Research and Teaching)
- Mr. Stanley Trout, Marketing Specialist, Tennessee Department of Agriculture
- Dr. Larry Wilson, Professor, Forestry, Wildlife and Fisheries (Research and Teaching)

This report is a summary of a survey which was implemented to address the Task Force's first objective – to estimate the scope of the commercial aquaculture industry in Tennessee. The survey was conducted through a joint-project of the Aquaculture Task Force and the Agricultural Development Center titled "Developing Markets for Aquaculture in Tennessee." A preliminary draft of this report appears in the strategic plan of the Aquaculture Task Force. Funding for the project was made available by the Tennessee Department of Agriculture's "Agricultural Development Fund." The Agricultural Development Fund contains proceeds from the sale of Tennessee "Ag Tag" license plates.

Questions and comments regarding the Tennessee Department of Agriculture's "Agricultural Development Fund" (Ag Tag) grant program should be forwarded to Mr. Keith Harrison, Marketing Chief, Tennessee Department of Agriculture, 615-837-5160. Questions and comments regarding this report and the "Developing Markets for Aquaculture in Tennessee" project should be forwarded to Mr. Rob Holland, Assistant Extension Specialist, UT Agricultural Development Center, 865-974-3824.

A special thanks is extended to John Brooker, Gary Dagnan, Wes Harrison, George Hopper, Tom Hill, Ray Humberd, Allyson Muth, Wanda Russell, Larry Wilson and Michele Wilson for their contributions to this report.

Background

A grant proposal was submitted jointly by the Tennessee Aquaculture Task Force and the Agricultural Development Center to the Tennessee Department of Agriculture's Agricultural Development Fund. The proposed project sought funding to assess the size, scope and market capacity of Tennessee's existing aquaculture industry. The proposal was accepted and funding was approved. Members of the Tennessee Aquaculture Task Force drafted and finalized a questionnaire to be used in a telephone survey of participants in Tennessee's production aquaculture industry.

A list of those individuals identified as existing and potential producers was assembled from a survey of county Agricultural Extension agents, the Tennessee Aquaculture Association, The University of Tennessee and the Tennessee Wildlife Resources Agency. A questionnaire was developed to determine information needed by the Aquaculture Task Force, such as production potential, processing potential, specie availability/preferences, emerging issues and emerging markets. The results of the survey were hypothesized to be critical components for the prioritization of the existing aquaculture opportunities in the state, such as: fee fishing, ornamental markets, baitfish, freshwater prawns, sportfish, catfish, better use of farm ponds, trout, tourism, pond-stocking and fresh markets.

The results of the survey were also to be used to assemble valuable teaching materials for use by the Aquaculture Task Force in the development of a five-year strategic plan, by county Agricultural Extension agents in interactions with farmers and growers, by value-added entrepreneurs in their development/consideration of new enterprises and by the Tennessee Aquaculture Association in their efforts to enhance aquaculture in the state.

The need for this type of project in Tennessee is well justified by the success of similar projects implemented in surrounding states that contributed to their aquaculture industry growth, expansion and success. Some examples include the success of the catfish industry in Mississippi, trout production in North Carolina, freshwater shrimp in Kentucky and the large baitfish industry in Arkansas.

Resources in Tennessee are not that different from those in the bordering states. Aquaculture is an undeveloped potential for Tennessee's farmers and the state's economy. The difference between the aquaculture success in those states and the lack of success in Tennessee may be that Tennessee has not implemented a strategic plan to promote market development.

The general argument that the project sought to combat was:

the Tennessee aquaculture industry is so fragmented, underdeveloped and misunderstood that no competitive advantage can be identified, no production volume can be achieved and no market potential fulfilled.

The project results were to serve as a building block for an opportunity-based development of aquaculture in the state. An enhanced aquaculture industry would better use Tennessee's aquaculture resources. In addition, the project was planned to provide an accurate and inclusive summary of the state's aquaculture industry. For example, in 1998 the National Agriculture Statistics Service reported only 39 aquaculture farms (with greater than $1,000 in sales) in Tennessee. However, aquaculture experts recently estimated as many as 400 fish farms in the state.

The Survey Sample

An original telephone survey list of 292 aquaculture participants in Tennessee was assembled from a survey of county Extension agents, the Tennessee Aquaculture Association, the Tennessee Wildlife Resources Agency and other aquaculture leaders in Tennessee. Many of the lists that the 292 names originated from were old and incomplete at best. Therefore, a relatively low response rate from these 292 names was expected. As a result of the survey, the list of 292 names of aquaculture participants in Tennessee was improved and reduced to 148 identified as potential survey participants. Of the 292 on the original list, 91 were reported "deceased" or "not in aquaculture," 27 were incorrect telephone numbers and 26 had disconnected telephone numbers, leaving 148 as potential participants. The improved list of 148 potential participants was then sent to each of the agencies/individuals that contributed to the original list of 292.

A draft questionnaire was developed by a sub-group of the Aquaculture Task Force and reviewed and edited by the entire Task Force. A copy of the final draft of the questionnaire is available in the appendix. The questionnaire was adapted for use in telephone sampling by the Human Dimensions Lab in the Forestry, Wildlife and Fisheries Department. The Human Dimensions Lab implemented the survey by making the telephone calls, asking the questions and recording the results. Each telephone number on the original list of 292 was called 10 times before the number was classified as incorrect.

Of the 148 identified as potential participants, 48 (34 percent) were never reached, 24 (16 percent) refused to participate in the survey and three (2 percent) only partially completed the survey. Therefore, 73 (48 percent) completed surveys were obtained. Of the 73 completed surveys, 61 identified themselves as active in aquaculture and 12 indicated that they were planning to get involved in aquaculture. The results of the survey presented in this report have been summarized as two separate data sets — for "those in aquaculture" and for "those planning to enter aquaculture."

Summary of Survey Results (Those in Aquaculture)

The 61 respondents who confirmed involvement in aquaculture represented operations in the 40 counties shown in Figure 1. Hawkins County was identified as the county with the most aquaculture operations with five (8.2 percent), followed by Gibson County with four (5.5 percent) and Clay County, Lawrence county and Wayne County with three each (4.1 percent).

Figure 1: Counties with Aquaculture Enterprises

As presented in Figure 2, approximately 38 percent (23 producers) of the active aquaculture participants in Tennessee indicated that their aquaculture enterprise was their full-time occupation, while 59 percent (36 producers) indicated that aquaculture was a part-time enterprise. However, it should be noted that based on the information provided by respondents, part-time operations only accounted for 11 percent of gross aquaculture sales reported by the survey, while full-time operations accounted for the majority of sales (89 percent).

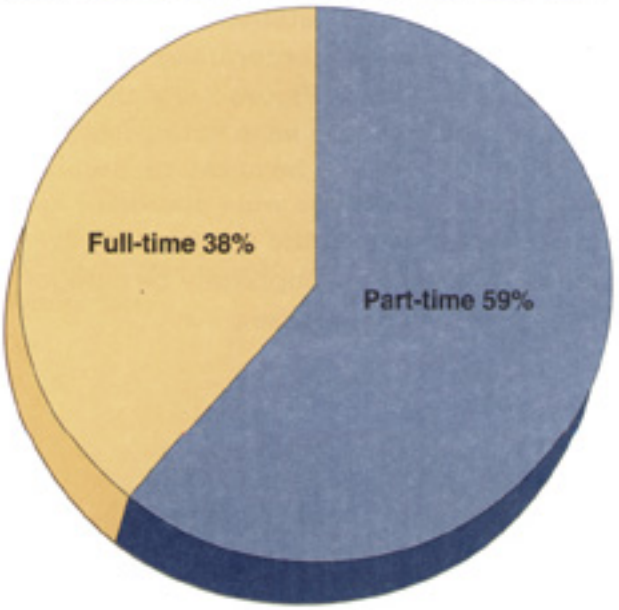

Figure 2: Full-time and Part-time Aquaculture Operations in Tennessee

A substantial portion (66 percent) of those producers who indicated aquaculture was a part-time enterprise reported earning less than $1,000 per year from aquaculture, while 82 percent reported generating less than $4,999. Only one part-time operator reported between $50,000 and $100,000. Examples of full-time occupations noted by the part-time aquaculture operators include retired, cabinet maker, self-employed, farmer, housewife, dentist, teacher, contractor, agriculture teacher, international consultant, student, mechanic, carpenter, equipment sales and campground manger. A detailed analysis of income generated by part-time operations from aquaculture is presented in Table 1.

Nineteen of the 23 producers (83 percent) who indicated aquaculture was their full-time operation agreed to answer the question regarding the level of annual sales. Of those who answered the question, 21 percent reported gross sales per year greater than $250,000, while a total of 65 percent reported more than $50,000. A detailed analysis of income generated by full-time operations from aquaculture is presented in Table 2.

Table 1:
Level of Annual Gross Sales from Aquaculture Reported by Part-Time Aquaculture Producers

Annual Gross Sales	Number of Producers	Percent[2]
Less than $1,000	24	67
$1,000 to $4,999	6	16
$5,000 to $9,000	1	3
$10,000 to $19,999	1	3
$$20,000 to $49,000	3	8
$50,000 to $99,999	1	3

Table 2:
Level of Annual Gross Sales from Aquaculture Reported by Full-Time Aquaculture Producers

Annual Gross Sales	Number of Producers	Percent
$5,000 to $9,999	1	5
$10,000 to $19,999	1	5
$20,000 to $49,999	2	11
$50,000 to $99,999	6	32
$100,000 to $149,000	2	11
$150,000 to $249,999	3	16
Over $250,000	4	21

[2] Percentages throughout this report may not sum to 100 due to rounding.

The likelihood of an operation being full-time or part-time seems to vary by enterprise type. A heavy majority of catfish operators (78.8 percent) are part-time, while most trout operators (71.4 percent) are full-time. The proportion of full-time and part-time participants in seven selected enterprises is presented in Table 3.

Table 3: Percentage of Full-time and Part-time Enterprises

	Full-Time (%)	Part-Time (%)
Catfish	21.2	78.8
Trout	71.4	28.6
Tilapia	43.0	57.0
Baitfish	100.0	00.0
Fee Fishing	20.0	80.0
Ornamentals	60.0	40.0
Sport/Game Fish	50.0	50.0

Survey participants were asked to indicate the portion of their total farm income derived from aquaculture enterprises. The median portion of total farm income derived from aquaculture enterprises was 80 percent, with an average of 66 percent.

Survey participants were asked to provide detailed information about their top two aquaculture enterprises. Examples include catfish, trout, hybrid-striped bass, tilapia, freshwater shrimp, baitfish, ornamental fish, sport/game fish, fee fishing, processor and restaurant enterprises.

Catfish was the most prevalent aquaculture enterprise, with 33 producers (37 percent) indicating that catfish was one of their top two income-generating enterprises. Catfish was followed by baitfish and ornamentals (14 percent), tilapia at 9 percent, and trout enterprises with 8 percent, respectively. While the "other" category accounts for 16 percent, no single activity mentioned in this category provided evidence of a substantial individual enterprise. Among the "other" enterprises listed, bluegill and minnows were mentioned by two respondents, while all other enterprises were mentioned by only one operator. Other enterprises mentioned in the "other" category include: amphibian research, bluegill, bream, crawfish, fish dealer, minnows, mussels, retail night crawlers, crickets and re-sell fingerlings. A detailed presentation of the top aquaculture enterprises in Tennessee is available in Figure 3 and the counties involved with each enterprise in Figures 4-10. It should be noted that while two minnow operations were classified as "other" enterprises in the survey, minnow operations should appropriately be categorized as baitfish enterprises.

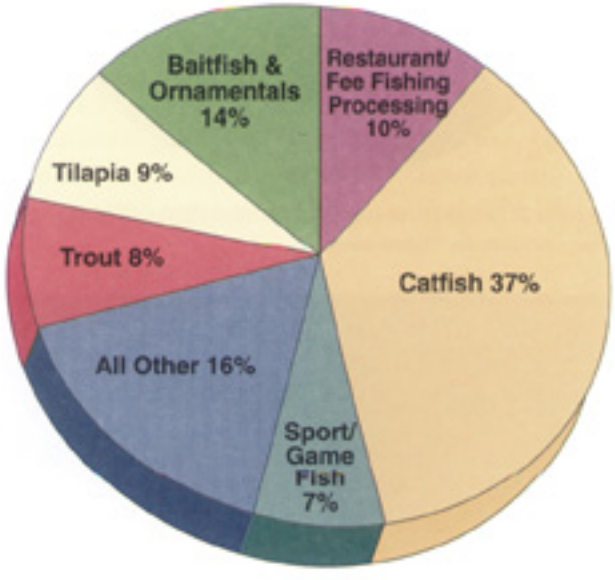

Figure 3: Top Aquaculture Enterprises in Tennessee

Ponds are the dominant production system for catfish in Tennessee, with approximately 88 percent of catfish operations using them. A majority of trout operations (55 percent) use raceways compared to ponds and tanks. Post-larva-stage freshwater shrimp and sport/game fish operations are totally

Figure 4: Counties with Catfish Enterprises

Figure 5: Counties with Tilapia Enterprises

Figure 6: Counties with Trout Enterprises

Figure 7: Counties with Sport/ Game Fish Enterprises

Figure 8: Counties with Baitfish Enterprises

Figure 9: Counties with Ornamental Fish Enterprises

Figure 10: Counties with Fee Fishing/Pay Lake Enterprises

concentrated (100 percent) in closed recirculating systems and ponds, respectively, while hybrid-striped bass, tilapia and baitfish enterprises are fairly equally split among a variety of systems. The types of production systems used for certain enterprises are presented in Table 4.

Table 4: Types of Production System Utilized for Certain Enterprises

Enterprise	Pond	Raceway	Tanks	Closed Recirculating
Catfish	88%	3%	3%	3%
Trout	27%	55%	18%	
Hybrid-Striped Bass		50%	50%	
Tilapia	13%	25%	25%	38%
Freshwater Shrimp Nursery				100%
Baitfish	50%	13%	25%	13%
Ornamental Fish	60%		20%	20%
Sport/Game Fish	100%			
Other	64%	9%	18%	9%

As expected, the average annual production, average sales price and an operation's portion of annual gross sales varied by enterprise type and production system. For example, the average annual per-pond production of trout is 13,250 pounds, while trout production in raceways is 20,375 pounds. Similarly, the average sales price varied from a low of $1.69 per pound for catfish to a high of $7.50 per pound for ornamentals. And, for those operations with catfish, the catfish contributed an average of 79 percent to annual gross income while processing enterprises contributed 39 percent. A detailed comparison of production, sales price and portion of annual gross sales by enterprise is presented in Table 5.

Producers indicated that direct-to-consumer sales represented the most popular marketing outlet for aquaculture production in Tennessee. Sales to live haulers and for fee fishing represented the second and third most popular market outlets, respectively. A

Table 5: Production and Sales by Aquaculture Enterprise for Those Active in Aquaculture

Enterprise	Average Annual Production Per Enterprise (pounds)		Average Sales Price (per pound)	Average Percent of Annual Gross Sales per Enterprise
	Ponds	Raceway		
Catfish	10,829	n/a	$1.69	79
Trout	13,250	20,375	$2.50	60
Tilapia	80,000	40,000	$1.96	52
Baitfish	21,766	1,142	$4.83	59
Ornamental Fish	200	n/a	$7.50	47
Sport/Game Fish	1,000	n/a	$2.00	42
Fee Fishing	3,200	n/a	$2.00	77
Processor			n/a	39
Restaurant			n/a	62

detailed listing of the market outlets utilized is shown in Table 6.

Table 6: Market Outlets Utilized	
Market Outlets	**Percent**
Direct to Consumers	25%
Live Hauler	20%
Fee Fishing	19%
Wholesaler	11%
Restaurant	8%
Other (Broker, Contracts, State Hatcheries, Research Institutions, International Markets)	7%
Bait Dealers	5%
Processor	3%
Grocery Store / Supermarket	2%

By answering "yes" or "no" to a specific set of criteria, producers were asked to identify constraints that might prevent their participation in some marketing outlets. Sixty-one producers participated. (See the appendix for additional detail regarding the question.) Only 11 percent (49 of the 427 responses) of the responses were "yes" answers citing a constraint. Of the constraints affirmed, volume[4] (31 percent), other (23 percent) and lack of a processor (18 percent) were the most prevalent reasons for a lack of participation in some markets. The proportional frequency of marketing constraints is shown in Figure 11.

While there were no identical responses in the "other" category, several responses indicated a contentment with current marketing arrangements and therefore no reason to participate in any other market outlets. Some of the "other" reasons given against market outlet variation include:

- "I'm not going to participate in any other outlet."
- "The price offered by the wholesale market."

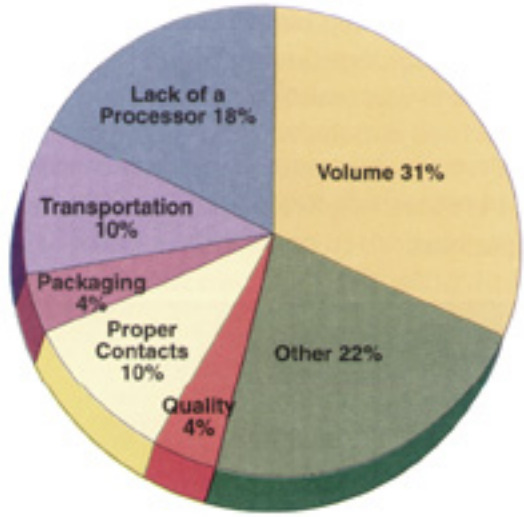

Figure 11: Proportional Frequency of Marketing Constraints

- "Dwindling research budgets."
- "Lack of funds."
- "My hands are full with everything else."

Producers were asked whether their opinion about the outlook/future of aquaculture in Tennessee was optimistic, pessimistic or neutral. As presented in Figure 12, 63 percent indicated that their opinion and outlook about aquaculture in Tennessee was optimistic, while 20 percent and 17 percent were neutral and pessimistic, respectively.

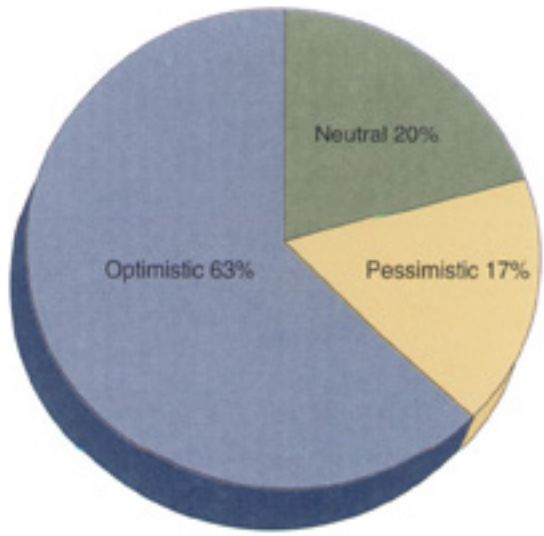

Figure 12: Tennessee Producer Opinion about the Outlook of Aquaculture

[4] Mentioned as a constraint to marketing, "volume" often refers to a single producer not having the minimum amount of product (fish) required to participate in a particular marketing method.

The relationship between attitude about the future of aquaculture and full-time or part-time status is presented in Table 7. For those who said their outlook was pessimistic, 70 percent were part-time operators, while 51.4 percent of those who were optimistic were full-time operators.

Table 7: Relationship Between Attitude about Aquaculture Future and Full-time or Part-time Status

	Optimistic (%)	Neutral (%)	Pessimistic (%)
Full-Time	51.4	16.7	30
Part-Time	48.6	83.3	70

Producers were asked to indicate major constraints to growth faced by their aquaculture business. Labor, lack of processing facilities, "other" and markets were the most frequently indicated constraints. The portion of affirmed constraints indicated for each individual constraint is presented in Table 8.

Table 8: Constraints to Growth of Tennessee's Aquaculture Industry

Constraint to Growth	Percent
Labor	18
Lack of Processing Facility	16
Other	16
Water	13
Markets	12
Land	10
Information	8
Availability of Fingerlings	6
Feed	2

Constraints mentioned in the "other" category include:

- "It costs a lot of money to dig a pond."
- "Marketing!"
- "We have a problem with the availability of prawns."
- "Otters keep getting in my catfish."
- "The TWRA places a dead hand on Tennessee's agriculture industry."
- "Drought and conditions of water availability."
- "Being under TWRA regulations."
- "A diagnostic lab."
- "Over-regulation by the government."
- "Consumer awareness."

Producers were asked about the feed source for their aquaculture operation. The local feed store was the most frequent supplier of feed, while an out-of-state feed company was the second most frequent source of feed. This ranking of feed source did not vary as the size of the operation increased. For example, for operations using more than the median amount of feed, the local feed store and out-of-state feed company were the most used feed sources. The use of each feed source is presented in Table 9.

Table 9: Use of Certain Feed Sources

Source of Feed	Percent
Local Feed Store	63
Out-of-State Feed Company	17
"Fish Feed" Company	12
Local Feed Mill	5
Other	3

The average amount of feed used by each enterprise was reported at 23,467 pounds. However, 18.4 percent of the operators used 2,000 pounds and the median amount of feed used per operation was 6,000 pounds. Respondents reported that approximately 500 tons of fish feed were used in Tennessee in 1999.

Eighty-two percent of the respondents indicated that they needed additional funds during the start-up period of their aquaculture operation. Only 21 percent of those who had to obtain start-up money found it "extremely frustrating," while 40 percent found the experience "difficult" and 40 percent found it easy. One reason so many producers felt that obtaining start-up money was "easy" may be because a majority (56 percent) obtained their start-up funds from their personal savings. The second most frequent funding source for start-up money was the "small business administration" and "other source," each mentioned by 16 percent of the respondents. "School funds" were the most often cited funding source in the "other" category. Other examples of funding sources listed in the "other" category include line of credit, credit card, FFA, friends and parents, Farm Service Agency and USDA. A local lender was mentioned by 9.3 percent of the respondents.

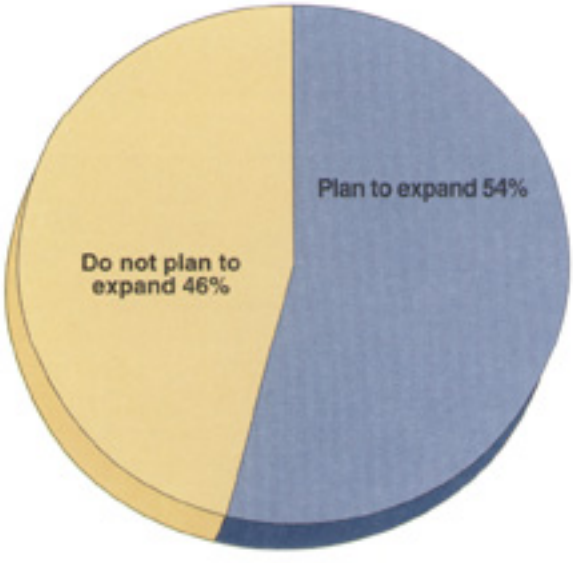

Figure 13: Plan to Expand Aquaculture Business in Next 1 to 5 Years

As presented in Figure 13, 54 percent of the respondents indicated that they were planning to expand their aquaculture operation in the next one to five years.

As presented in Figure 14, 35 percent of the respondents indicated they were planning to leave aquaculture in the next one to five years. Reasons cited for leaving aquaculture include "I'm ready to retire," "I am 85 years old," "I am 69 years old," "I am 80 years old," "Lack of a processing facility to depend on," "I don't have too many fishermen so I'm losing money every day," "It is hard to be profitable," "Health reasons" and "We can't grow enough fish in the space we have to be profitable."

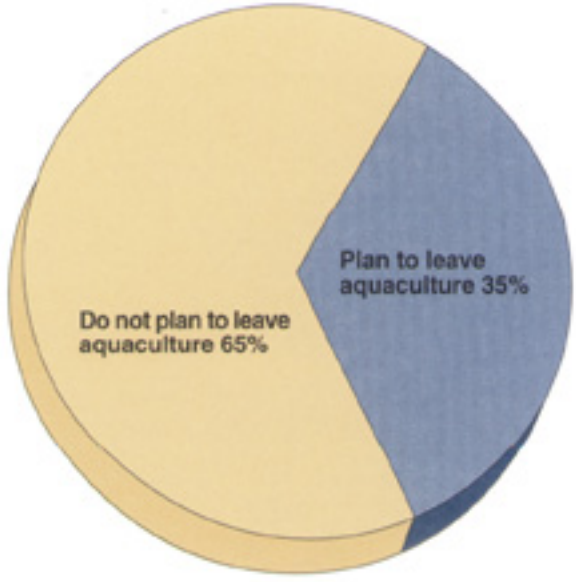

Figure 14: Plan to Leave Aquaculture in Next 1 to 5 Years

Tables 10 and 11 present information about the relationship between respondent attitudes about the future of aquaculture and their plans to expand or exit their aquaculture enterprises. As expected, a majority (73 percent) of those operators who are optimistic about the future of aquaculture are planning to expand their operations in the next one to five years. Most (60 percent) of those pessimistic about the future were not planning to expand.

Nine out of ten (90 percent) of those optimistic about the future of aquaculture are not planning to exit aquaculture, while almost seven out of 10 (66.7 percent) of those pessimistic are planning to exit.

Respondents were asked to identify the source of information that they use to help manage their aquaculture business. Respondents were allowed multiple responses and a total of 157 answers were given. The University of Tennessee Agricultural Extension Service was the most often used information source with 16.6 percent of the responses, followed by other fish farmers/aquaculturists (14.6 percent), other states' Extension Services (12.1 percent) and trade magazines (10.8 percent). Examples of information sources listed in the "other" category include workshops, personal experience, sea grant programs, Aquaculture Union in Chattanooga, feed supplier, the markets, Aquatic Ecosystems and books. A detailed listing of the use of specific information sources is presented in Table 12.

Table 10: Relation Between Attitude about Aquaculture Future and Plans to Expand in the Next One to Five Years

	Optimistic	Neutral	Pessimistic
Plan to expand aquaculture in next five years	73%	16.7%	40%
Do not plan to expand aquaculture in next five years	27%	83.3%	60%

Table 11: Relation Between Attitude about Aquaculture Future and Plans to Exit Aquaculture in Next One to Five Years

	Optimistic	Neutral	Pessimistic
Plan to exit in next five years	10%	37.5%	66.7%
Do not plan to exit in next five years	90%	62.5%	33.3%

Table 12: Use of Information Sources by Those Active in Tennessee Aquaculture

Information Source	Percent of Responses
The University of Tennessee Agricultural Extension Service	16.6
Other Fish Farmers/Aquaculturists	14.6
Other states' Extension Services	12.1
Trade Magazines	10.8
"Other"	10.2
Web Sites (Internet)	7.6
Tennessee Aquaculture Association	7.0
Tennessee Department of Agriculture	6.4
United States Department of Agriculture	5.1
Neighbors	3.8
Trade Newspapers	3.8
Southern Regional Aquaculture Center	3.8

During the telephone survey, a list of 17 services that may or may not be needed to enhance the growth of Tennessee's aquaculture industry were read by the caller. The respondents were asked to rate each of the services on a scale of one to five, where one referred to "Strongly Disagree" and five implied "Strongly Agree" with the need for a given service. The average rating for each service ranged from 2.84 to 4.15 on the 5-point scale. The average rating for each service is presented in Figure 15.

Educational programs for aquaculture producers/growers was identified as the highest priority, with an average rating of 4.15 followed by consumer awareness programs with an average rating of 4.14. However, there was no difference in the average rating of the next two rated services: technical production support (4.11) and access to funding (4.11). With average ratings less than 3.50, international marketing assistance, production contracts and feed mills were the lowest-rated services perceived to enhance aquaculture in the state.

Figure 15: Average Ratings for Agreement That Certain Services Are Needed (Ratings based on a 5-point scale, with 1 = strongly disagree and 5 = strongly agree)

Summary of Survey Results (Those Planning to Enter Aquaculture)

Twelve respondents indicated that while they are not currently actively involved in aquaculture, they plan to get into aquaculture in the near future. Forty-two percent of those planning to get into aquaculture are planning it as a full-time business, while the remaining 58 percent plan on aquaculture being a part-time enterprise.

Ten counties were identified as the location for planned aquaculture enterprises: Bedford, Gibson, Grundy, Hamilton, Lewis, Morgan, Rutherford, Sequatchie, Wilson and Fentress.

While catfish is currently Tennessee's leading aquaculture enterprise, only 27 percent of those respondents planning to get into aquaculture are planning to include catfish. However, 55 percent of those planning to get into aquaculture are planning to include tilapia, and 30 percent are planning to include freshwater shrimp. Only 20 percent are planning to include hybrid-striped bass and 10 percent are planning to include trout, sport/game fish and baitfish. There was no interest expressed in fee fishing, ornamental fish or paddlefish enterprises.

Marketing plans by those planning to get into aquaculture varied, with most all looking for multiple market outlets. More than half (60 percent) of those planning to get into aquaculture are planning to sell directly to a restaurant, while about half (50 percent) indicated plans to sell to a live hauler, directly to consumers and/or a wholesaler. A little less than half (40 percent) indicated plans to sell to a grocery store.

None of those planning to get into aquaculture indicated that their opinion of the future of aquaculture in Tennessee was "pessimistic." Half described their opinion as "optimistic," while half described it as "neutral."

Regarding a source of feed for their potential aquaculture enterprise, 42 percent indicated that they did not know where they would obtain feed. About one-fourth (25 percent) indicated they would obtain feed from a local feed store, while 17 percent are planning to purchase from an out-of-state feed company and 8 percent are planning to obtain feed from a local feed mill and a fish-feed company.

Approximately 42 percent of those planning to get into aquaculture are planning to use their personal savings as the source of start-up money for the enterprise. Seventeen percent are planning to obtain start-up funds from the Small Business Administration, government loans and "other sources," while 8 percent are planning on a local lender, a grant or simply don't know where they will obtain start-up funds.

The most frequently named sources of aquaculture information used by those planning to get into aquaculture were (in order of frequency): the Tennessee Aquaculture Association, Tennessee Department of Agriculture, trade magazines, Web sites (Internet), The University of Tennessee Agricultural Extension Service and other states' Extension Services.

Conclusions and Implications

As a result of this survey, a more accurate list of Tennesseans with an interest in production aquaculture now exists. An out-of-date and inaccurate list of 292 names has been updated to 148 current names, this new list has been shared with those individuals and agencies that contributed to the initial list. However, it is disappointing that of the current list, only 73 completed surveys for this study — 61 considered themselves to be actively involved in aquaculture, while 12 were planning to get into aquaculture.

Those in aquaculture had operations in 40 counties, representing 42 percent of Tennessee's 95 counties. Very little regional aquaculture concentration seems to exist, although four counties reported three or more aquaculture operations. While 59 percent of the operations considered their aquaculture enterprise a part-time operation, less than 11 percent of Tennessee's aquaculture sales were from the part-time operations. Sixty-six percent of the part-time operations reported less than $1,000 in annual gross sales, while 65 percent of the full-time operations reported more than $50,000.

Catfish, tilapia and fee-fishing operations were more likely to be part-time operations, while trout, baitfish or ornamentals were more likely to be full-time. Catfish was reported as one of the top two income-generating enterprises by more operators than any other enterprise (37 percent), followed by baitfish and ornamentals (14 percent), tilapia at 9 percent, and trout enterprises with 8 percent, respectively.

Very little concentration within enterprises was evident across the state. Some concentration may exist for catfish in the lower Middle and West Tennessee areas (around the Tennessee River) and in the Smoky Mountain region of East Tennessee. Most tilapia enterprises were located north of Interstate 40, but stretched from Gibson County in the West to Knox County in the East. Trout operations were mostly in East Tennessee counties, while most fee-fishing operations were located on or within one county of the southern state border, stretching from the Mississippi River in the West to Bradley County in the East.

The results of this survey provide a very limited investigation into production systems and yields per system. This may be due to an apparent lack of understanding and some confusion about the units used to quantify production systems (acres, gallons, pounds, tons), harvests and sales. Many respondents also seemed to have trouble focusing on production systems and yield information for particular enterprises (species). This may be an indication of the widespread management practices of many Tennessee aquaculture producers. However, the survey results do indicate that ponds are more likely to be the production system for catfish, baitfish, ornamentals and sport/game fish, while raceways are more likely to be the production system for trout. Closed recirculation systems are most likely to be the production system for freshwater shrimp nurseries and tilapia.

Direct sales to consumers, live haulers or through fee-fishing operations were the most frequently used market outlets. Volume and lack of a processor were mentioned as the most common marketing constraints for aquaculture in Tennessee.

A majority of Tennessee aquaculture producers described their attitude about the future of aquaculture as optimistic. Fifty-four percent of Tennessee's aquaculture operations indicated plans to expand during the next one to five years, while 35 percent indicated plans to exit the aquaculture industry. Interestingly, 66 percent of those planning to get out of aquaculture considered the future of aquaculture to be pessimistic. Labor and lack of a processing facility were the primary constraints to growth for

Tennessee's overall aquaculture industry.

Possibly due to the fact that most aquaculture operators are part-time enterprises, most aquaculture feed was purchased from local feed stores. The average amount of feed purchased in a year by all operators was 23,467 pounds. The total amount of feed used for Tennessee's aquaculture industry is estimated at approximately 500 tons per year.

Most operators indicated they needed additional funding during the start-up phase of their operation. However, only 21 percent considered obtaining this funding to be extremely frustrating. Most operators (56 percent) used personal savings as their source of start-up funds.

The most common sources of information for those actively involved in aquaculture in Tennessee were The University of Tennessee Agricultural Extension Service, other fish farmers and other states' Extension Services.

When asked to rate the need for services for Tennessee's aquaculture industry, those active in aquaculture indicated that the greatest need was for grower education programs. However, grower education programs were closely followed by a need for consumer awareness programs, technical production support and access to funding. Services receiving the lowest rating were international marketing assistance, production contracts and feed mills.

Based on the information from this survey, there is very little evidence to show that Tennessee has a competitive advantage from an obvious, single production-based opportunity. This does not mean that an aquaculture opportunity is not available in Tennessee. It does, however, provide support for further investigation into and pursuit of a balanced production-marketing based opportunity. While the respondents to the survey represent approximately $3.5 million in annual gross aquaculture sales, primarily from catfish, tilapia, baitfish and trout[5], there is very little concentration in any one enterprise or in any one region. Similarly, the Tennessee aquaculture industry could be accurately described as a diversified industry comprised of mostly part-time operators.

[5] The United States Department of Agriculture, National Agricultural Statistics Service, Census of Aquaculture (1998) reported approximately $3.9 million in total aquaculture sales in Tennessee in 1998.

APPENDIX

Good Morning/Afternoon!
This call is on behalf of the "Aquaculture and Fish Farming Task Force" at The University of Tennessee. We are surveying Tennessee fish farmers and aquaculture participants in order to enhance Tennessee's aquaculture industry. We would appreciate it if you would be willing to answer a brief questionnaire. I assure you that all responses will be protected and the name and location of your operation will not be disclosed.
Will you participate in our study? Additional information may be obtained from Dr. Tom Hill (U.T. Fisheries Specialist) Rob Holland (Agricultural Development Center) or Dr. George Hopper (Task Force Chairman) (865) 974-3824.
The survey will take about 10 minutes depending on the details of your aquaculture enterprise.

1) Are you involved in fish farming or aquaculture in some way (raise fish/shellfish, operate a fee-fishing lake or grow anything under water)?
____ Yes (If yes proceed to question 2)
____ No (If no say "thank-you for your time, there are no other questions, good-bye.")

2) What county is your aquaculture enterprise in? _____

3a) Do you consider yourself to be a full-time or part-time aquaculture operator?
____ Full-time ____ Part-time

3b) If part-time, what is your full-time occupation? _____

4) What portion of your total farm income does your aquaculture enterprise represent?
_____ (answer in percent)

5) Which of the following best describes the level of gross sales from your aquaculture products in 1999?

Part-Time (answer in #3a)

___ less than $1,000
___ $1,000 to $4,999
___ $5,000 to $9,999
___ $10,000 to $19,999
___ $20,000 to $49,999
___ $50,000 to $99,999
___ $100,000 to $149,999
___ over $150,000

Full-time (answer to #3a)

___ over $250,000
___ $150,000 to $249,999
___ $100,000 to $149,999
___ $50,000 to $99,999
___ $20,000 to $49,999
___ $10,000 to $19,999
___ $5,000 to $9,999
___ $1,000 to $4,999
___ less than $1,000

6) Now I am going to ask you a series of questions to describe your aquaculture business.

6a) Which of the following are included in your aquaculture operation?			For those items answered yes in question 6a . . .				
			6b) . . . what production system do you use? (Pond, raceway, tanks, cages, closed recirculating - - there may be multiple systems for an individual enterprise)	6c) What is the size of each system? (acres, tanks, gallons per sq. ft.)	6d) What is your average annual production (total pounds of production per system)	6e) What is your average sales price per pound of production	6f) What percent of annual gross sales does each enterprise from #6a represent?
	Yes	No					
Catfish							
Trout							
Hybrid Striped Bass							
Tilapia							
Freshwater Shrimp							
Baitfish							
Fee Fishing (pay lake)							
Ornamental Fish							
Paddlefish							
Processor							
Restaurant							
Sportfish/Gamefish							
Other _____							
Other _____							

7) Which of the following marketing outlets do you use? . . . . . and what percent of sales does each represent?

Market Outlets		Percent of Sales
___	Live Hauler	_____
___	Processor	_____
___	Wholesaler	_____
___	Restaurants	_____
___	Grocery Stores/Supermarkets	_____
___	Fee Fishing	_____
___	Direct to consumer	_____
___	Bait dealers	_____
___	Other _____	_____

8) What other marketing methods do you plan to pursue? _____

9) What reasons, if any, might keep you from participating in some market outlets?

___ volume
___ processor
___ transportation
___ other _____
___ packaging
___ proper contacts
___ quality

10) What is your opinion/outlook about the future of aquaculture in Tennessee? Would you say you are pessimistic, optimistic or neutral?

___ Optimistic ___ Pessimistic ___ Neutral

11) What major constraints to growth does your aquaculture business face?

___ labor
___ availability of fingerlings
___ land
___ markets
___ other _____
___ feed
___ information
___ water
___ processing facility

12) How much feed do you normally use in your aquaculture operation in an average year (in pounds or tons) ?

_____

13) Where do you buy feed for your aquaculture operation?

___ Local feed store (co-op, etc.)
___ Fish feed company
___ Local feed mill
___ Out-of-state feed company
___ Other _____

14) How did you obtain start-up money (capital) to get started in your aquaculture business?

___ Personal savings
___ Local lender (bank, farm credit services)
___ Small Business Administration
___ Government loan
___ Grant
___ Other _____

15) How would you describe the experience of obtaining start-up money?

___ Easy ___ Difficult ___ Extremely frustrating

16a) Do you have plans to expand your aquaculture business in the next 1 to 5 years?

___ Yes ___ No

16b) If no to #18a, do you plan to get out of aquaculture in the next 1 to 5 years?

___ Yes ___ No

16c) If yes, why? _____

17) Which of the following do you use to obtain information to help manage your aquaculture business?

___ University of Tennessee Agricultural Extension Service
___ Tennessee Aquaculture Association
___ Tennessee Department of Agriculture
___ Trade Magazines
___ Web sites (Internet)
___ Extension Service from other state(s)
___ USDA
___ Neighbors
___ Trade Newspapers
___ Other Fish Farmers/Aquaculturists
___ Southern Regional Aquaculture Center
___ Other _____

18) Now I am going to read you a list of services that you may or may not think are needed for growth in Tennessee's aquaculture industry. Please rate your level of agreement with each statement using a scale of one to five, where 1 equals Strongly Disagree and 6 equals Strongly Agree.

Strongly Disagree . . . . . Disagree . . . . . Neutral . . . . . Agree . . . . . Strongly Agree
1 . . . . . 2 . . . . . 3 . . . . . 4 5

Do you think that there is a need for . . .

_____ . . . farmer/grower cooperatives
_____ . . . processing firms
_____ . . . better access to funding (loans)
_____ . . . diagnostic lab
_____ . . . market (price) information
_____ . . . access to more market outlets
_____ . . . more technical (production/growing) support
_____ . . . more marketing support
_____ . . . production contracts
_____ . . . feed mills
_____ . . . more production research
_____ . . . grower education programs
_____ . . . consumer awareness programs
_____ . . . market news service
_____ . . . domestic market research
_____ . . . feasibility studies
_____ . . . international marketing assistance
_____ Other _____

This concludes our questionnaire. We greatly appreciate your participation.

Additional information may be obtained from Dr. Tom Hill (UT Fisheries Specialist) Rob Holland (Agricultural Development Center) or Dr. George Hopper (Task Force Chairman) (865) 974-3824.

Visit the Agricultural Extension Service Web site at:
http://www.utextension.utk.edu/

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