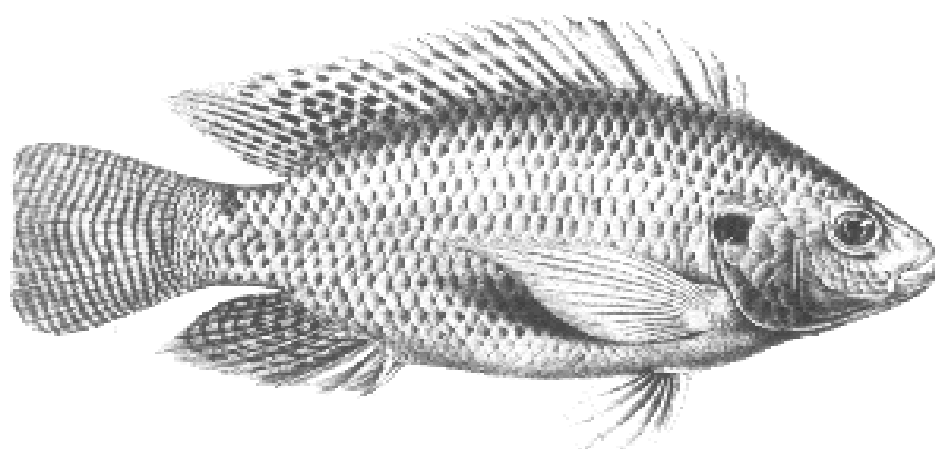


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Markets for Northern Plains Aquaculture – Case Study of Tilapia



**Theresa K. Golz
William C. Nelson**

**Department of Agricultural Economics
Agricultural Experiment Station
North Dakota State University
Fargo, ND 58105-5636**

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Table of Contents

	<u>Page</u>
List of Tables	iii
Abstract	v
Highlights	vi
Introduction	1
Production	1
NAFFC Production	1
United States Production	2
Long-term Domestic Production	3
Survey Description and Procedures	3
Survey Results for Businesses Handling Tilapia	4
Business Function	4
Sales and Selling Frequency	5
Seasonality	5
Supply Sources	5
Product Form, Price, and Size	6
Necessary Characteristics of Tilapia Suppliers	7
Seafood Species Handled by Tilapia Businesses	8
Potential Markets for Tilapia	9
Survey Results for Businesses Not Handling Tilapia	10
Business Function	10
Reasons for Not Handling Tilapia	10
Factors Needed to Handle Tilapia	11
Reasons Why Tilapia Was Not Considered	11
Seafood Species Handled by Non-Tilapia Businesses	12
Necessary Characteristics of Seafood Suppliers	13
Sensory Evaluation of Tilapia	14
U.S. Market	16
Marketing	17
Tilapia Prices	19
Market Potential	20
Advertising	21

Table of Contents (continued)

	<u>Page</u>
Imports	21
The Future U.S. Market for Tilapia	25
Conclusions and Recommendations	26
Conclusions	26
Recommendations	26
References	28
Appendix 1. Tilapia Mail and Telephone Survey Description and Procedures	31
Appendix 2. Tilapia Mail Survey Instrument	35
Appendix 3. Tilapia Telephone Survey Instrument	39
Appendix 4. Seafood and Tilapia Marketing Survey	45
Appendix 5. Sensory Evaluation at North Dakota State University, Fargo and Brainerd, Minnesota	55

List of Tables

Table		Page
1	North American Fish Farmers Cooperative Tilapia Marketed, in Pounds, 1995-1998	2
2	Domestic Tilapia Production, in 1,000 pounds (live weight), 1991-1998, U.S.	3
3	Primary and Secondary Functions of Tilapia Businesses, 1998, North Central Region.	5
4	Sources of Tilapia Purchased by Tilapia Businesses, 1998, North Central Region	6
5	The Form and Amount of Tilapia Purchases and Sales by Tilapia Businesses, 1998, North Central Region	6
6	Tilapia Businesses' Average Purchase and Selling Prices for Tilapia (February-April 1998), North Central Region	7
7	Preferred Size of Tilapia Fillet Based on Seafood Business Survey, 1998, North Central Region	7
8	Tilapia Supplier Characteristics, by Tilapia Businesses, 1998, North Central Region	8
9	Type of Seafood Handled by Tilapia Businesses, 1998, North Central Region	8
10	Type of Finfish Handled by Tilapia Businesses, 1998, North Central Region	9
11	Type of Shellfish Handled by Tilapia Businesses, 1998, North Central Region	9
12	Primary and Secondary Functions of Non-Tilapia Businesses, 1998, North Central Region	10
13	Why Businesses Did Not Handle Tilapia, 1998, North Central Region	11
14	Factors for Handling Tilapia, 1998, North Central Region	11
15	Why Non-Tilapia Businesses Were Not Interested in Handling Tilapia, 1998, North Central Region	12
16	Type of Seafood Handled by Non-Tilapia Businesses, 1998, North Central Region	12

List of Tables (continued)

<u>Table</u>		<u>Page</u>
17	Type of Finfish Handled by Non-Tilapia Businesses, 1998, North Central Region	13
18	Type of Shellfish Handled by Non-Tilapia Businesses, 1998, North Central Region	13
19	Seafood Supplier Characteristics, 1998, North Central Region	14
20	Results from Casserole Taste Testing, All Participants, 1997, North Dakota State University, Fargo	14
21	Results from Casserole Taste Testing, by Ethnic Origin, 1997, North Dakota State University, Fargo	15
22	Results from Fish Taste Testing, March 1997, Brainerd, Minnesota	15
23	Results from Fish Fillet Taste Testing, 1997, North Dakota State University, Fargo	16
24	Primary and Secondary Markets for Domestic and Imported Tilapia, 1998, U.S.	17
25	Average Tilapia Prices Per Pound, 1997 (U.S.\$)	19
26	Imports of Tilapia, Whole Frozen, Fresh and Frozen Fillets, in Pounds, 1992-1997, U.S.	21
27	Imports of Tilapia, in Pounds, 1996-1997, by Country	23
28	Tilapia Import Prices for Whole Frozen, Fresh and Frozen Fillets, 1992-1997, by Country	24

Abstract

The purpose of this study is to identify and investigate alternative fresh and frozen fillet markets for tilapia within the region. The competition for this market is primarily an imported product from Asia and Central America. Total imports plus domestic production has increased from 16.95 million pounds in 1992 to 70.74 million pounds in 1997.

Thirty-seven of the 79 respondents handled tilapia in their business. Thirty of these businesses handled and preferred fresh fillets while ten handled frozen tilapia. The tilapia businesses were clear in their preferences: 5 to 7 ounce fillets, quick delivery response time, constant supply, taste and size, and suppliers oriented toward customer service. Twenty-six of the 37 respondents were open to new suppliers.

The responding businesses which did not handle tilapia gave their reasons: lack of demand due to customer unfamiliarity, name recognition and taste of tilapia. The need for an established market, i.e., consumer demand, was the major factor.

The domestically produced tilapia did not test well in any of the three sensory perception taste tests. The results of these tests indicate both a quality issue and a variation in quality from test to test. These issues need to be solved prior to initiating a marketing effort for fresh and frozen fillets.

Key Words: tilapia, North American Fish Farmers Cooperative, North Central Region, sensory evaluation, production, prices, size, imports.

Highlights

North American Fish Farmers Cooperative is the major marketer of locally produced tilapia in the region. It has expanded its marketings from 19,301 pounds in 1995 to 419,125 pounds in 1998. This rapid expansion has been based upon the selling of live fish to ethnic markets in large eastern cities of the United States and Canada. However, as producers in the North East region increase their product, from 450,000 pounds in 1993 to 3.5 million in 1998, the higher transportation cost of the North American Fish Farmers Cooperative (NAFFC) becomes a significant issue in future expansion. The purpose of this study is to identify and investigate alternative fresh and frozen fillet markets within the region. The competition for this market is primarily an imported product from Asia and Central America. Total domestic production of tilapia has increased from 5 million pounds in 1991 to 18.2 million pounds in 1998. Total imports plus domestic production have increased from 16.95 million pounds in 1992 to 70.69 million pounds in 1997.

One hundred and fifty seafood businesses were contacted by telephone and 79 interviews were completed successfully. Thirty-seven of the 79 respondents handled tilapia in their businesses. Thirty of these businesses handled and preferred fresh fillets while ten handled frozen tilapia.

The tilapia businesses were clear in their preferences: 5 to 7 ounce fillets, quick delivery response time, constant supply, taste and size, and suppliers oriented toward customer service. Twenty-six of the 37 respondents were open to the possibility of dealing with new suppliers.

The responding businesses which did not handle tilapia gave their reasons: lack of demand due to customer unfamiliarity, name recognition, and taste of tilapia. The need for an established market, i.e., consumer demand, was the major factor needed. These businesses agreed with the tilapia businesses with respect to their preferences for fillet size, service, and consistency.

Three sensory perception taste tests were performed, one with fish in a casserole and two with baked fillets. The domestic tilapia did not test well in any of the tests. In the casserole test, the tilapia was ranked lower in appearance, flavor, and mouthfeel by all consumer groups than the alternatives. Tilapia was ranked high in color by the participants at the Minnesota Aquaculture Association and North American Fish Farmers Cooperative Conference annual meeting in Brainerd, Minnesota, but low in flavor, and mouthfeel. In a test at North Dakota State University, Fargo, it was ranked low in color, high in flavor, and medium in mouthfeel. The results of these tests indicate both a quality issue and a variation in quality from test to test. These issues need to be resolved prior to initiating a marketing effort for fresh and frozen fillets.

Markets for Northern Plains Aquaculture – Case Study of Tilapia

Theresa Golz and William Nelson*

Introduction

The United States and the Northern Plains tilapia industry have focused on meeting the demand for live tilapia. This market has been concentrated in large cities in the eastern United States and Canada with substantial oriental populations. The United States demand for frozen fillets and whole fish has been met through lower cost imports from Asia and Central America. Increased competition for the live markets is occurring. Aquaculture operations have expanded into the eastern United States and Canada, allowing them to capture a transportation advantage over North American Fish Farmers Cooperative (NAFFC) tilapia. The ability of eastern fish farmers to deliver fresh fish faster has created a significant barrier to the Northern Plains tilapia market. This barrier needs to be considered and overcome. One solution would be value-added processing of frozen fillets and pre-prepared tilapia products: breaded tilapia and stuffed tilapia.

This study will provide the information necessary to expand the product's marketing scope in the region. Study components include evaluating of customer acceptance and market trends, analyzing competition and potential partners, and recommending target markets.

The objectives are to:

Evaluate consumer acceptance for fresh and frozen tilapia fillets.

Analyze consumption and price trends in domestic and international markets for tilapia value-added products

Analyze the import trends for value-added tilapia products by importing country.

Identify the competition, domestic and international, by share of market and product.

Recommend target markets and market entry strategies.

Production

NAFFC Production

The NAFFC was organized in 1991 as Dakota Aquaculture. Currently there are 25 members and associate members. Eight members are producing tilapia and are located in four states and one Canadian Province. There are four producers in North Dakota, one in Minnesota, one in Michigan, one in South Dakota, and one in Manitoba. The cooperative was formed to create agricultural opportunities in rural America through aquaculture. These members raise and market tilapia, which are sold to ethnic markets for live fish in the eastern United States and Canada, i.e., New York, Chicago, Toronto, and Winnipeg. To continue to grow, tilapia needs to expand into the domestic fresh and frozen fillet markets.

*Research Assistant and Professor in the Department of Agricultural Economics at North Dakota State University, Fargo.

The total number of pounds of tilapia marketed by the NAFFC has increased from 1995 to July 31, 1998 (Table 1). As more NAFFC members begin production and if existing producers increase production, the number of pounds marketed should continue to rise.

**Table 1. North American Fish Farmers
Cooperative Tilapia Marketed, in Pounds, 1995-
1998**

Year	Tilapia Marketed
1995	19,301
1996	78,080
1997	123,800
1998	419,125

United States Production

Domestic production of tilapia has increased more than 200 percent from 1991 to 1995, making it the fastest growing aquaculture species. In 1991, production was five million pounds; in 1995 production hit 15.075 million pounds (Table 2). Tilapia production has increased 21 percent from 1995 to 1998. Although tilapia production has increased ever since data were first compiled, production from individual farms has varied dramatically. When one farm stumbles, others have managed to fill the market gap so that total production increased slightly in 1996 and 1997. The larger farms lack consistent production, and their sales fluctuate wildly from month to month and year to year (ATA, 1998). Domestic production of tilapia increased from 16.86 million pounds in 1997 to 18.191 million pounds in 1998, up 7.9 percent (Table 2). The North Central, North East, and Tropical regions each increased production from 1997 to 1998 by 122, 78, and 4 percent, respectively, while the Southern and Western regions decreased production by 10, and 22 percent, respectively.

The North Central region posted the biggest gain, jumping 72 percent from 995 thousand pounds in 1996 to 1.7 million pounds in 1997 (Table 2). The volume more than doubled from 1.7 million pounds in 1997 to 3.8 million pounds in 1998. The most significant newcomers in this region are Min-Aqua Coop in Minnesota and the Genesis Farm with Iowa Power and Light (ATA, 1998). Production in the North Central region is expected to increase substantially again in 1999 if market prices can be increased. The Southern region is also projected to have a major increase, led by Blue Ridge Aquaculture of Virginia and the start-up of a project in Texas. Production in the Tropical region has been steady for several years but could increase with the development of one major project.

The Western region led the nation in tilapia production in 1996 at 8.27 million pounds. California, in the Western region, produced 6.2 million pounds, which is 75 percent of the total Western region's production. The other four regions' combined production totaled 7.695 million pounds which is 7 percent less than the Western region.

In 1997, the Western region again led the nation in tilapia production at 8.94 million pounds, with California leading all other states with 6.7 million pounds produced and sold. The region showed a severe decline in production from nearly nine million pounds in 1997 to seven million pounds in 1998. Most notable was the decline and sale of Solar Aquafarms, of California, once the nation's largest tilapia producer. The 30-acre facility was sold to a consortium of overseas investors in 1998. The farm name has been changed to US Aquafarms.

Table 2. Domestic Tilapia Production, in 1,000 pounds (live weight), 1991-1998, U.S.

Region	1991	1992	1993	1994	1995	1996	1997	1998
North Central			200	450	985	995	1,715	3,800
North East			450	1,400	1,850	2,600	1,970	3,510
Southern			4,850	3,125	4,000	3,750	3,850	3,472
Tropical			650	305	340	350	385	400
Western			6,350	7,700	7,900	8,270	8,940	7,009
Total	5,000	9,500	12,500	12,980	15,075	15,965	16,860	18,191

Source: American Tilapia Association, 1997 and 1998.

Long-term Domestic Production

As larger new farms come on-line in the North Central region and farms in the Southern and Western regions continue to expand, production is expected to steadily expand. Demand for fish is expected to continue to rise in the United States. The National Fisheries Institute (NFI) set a goal of 20 pounds per capita consumption by 2000. The NFI anticipates the increased consumption to come mainly from aquaculture. In 1990, about 15 percent of U.S. seafood consumption came from fish farming, but the percentage could easily rise to 25 percent by 2000.

Survey Description and Procedures

The objective of establishing the marketing status and potential for tilapia products within the supply, wholesale, and consumer marketing channels was achieved through a telephone survey, after the low response to a mail survey. (Appendix 1 and 2).

Starting in October 1997, telephone numbers were secured for the 218 meat and seafood businesses selected for the mail survey. Directories on the Internet were used to locate telephone numbers that corresponded with the addresses that were used in the mail survey. Another 29 seafood businesses from the National Fisheries Institute membership directory, were added to the sample, bringing the total sample size to 247.

Two survey instruments were designed: one for businesses that handled tilapia and one for businesses that did not handle tilapia. Both of the instruments were similar to the mail survey, except shorter (Appendix 3). The survey instruments were modeled after a “seafood and tilapia marketing telephone survey” conducted in 1996 by Engle (1997) (Appendix 4). Seafood buyers listed in the National Fisheries Institute’s Blue Book were identified in Atlanta, Chicago, Los Angeles, Miami, New York, and San Francisco. Brokers, distributors, importers, traders, and wholesalers from 85 companies were telephoned (Engle, 1997). A 78 percent response rate was achieved from the telephone interviews, of which 22, or one-third, sold tilapia.

Thirty-one businesses were no longer listed on the seafood and/or meat business’ Internet Web Sites. Also, 18 telephone numbers were inaccessible. Therefore, the number of businesses in the sample was lowered to 198. Twenty-eight telephone numbers were disconnected, 17 did not sell any seafood, and three were duplicates (operating under two names). Therefore, 97 of the businesses were not interviewed, dropping those interviewed to 150.

Seventy-nine telephone interviews were completed, for a response rate of 53 percent. Of the 79 completed surveys, 37 handled tilapia and 42 did not handle tilapia. Of the completed telephone surveys, only three businesses had returned the mail survey. However, four of the mail surveys that were returned blank were completed as a telephone survey.

Survey Results for Businesses Handling Tilapia

Businesses handling tilapia will be referred to as tilapia businesses. Thirty-seven businesses of the completed 79 telephone surveys handled tilapia. The businesses were asked to indicate what function they represented in the seafood industry.

Business Function

Each of the tilapia businesses was asked in which function their business was involved. The businesses were also asked to indicate what percent of their total business fell into one of three primary functions: supply, wholesale, and consumer. If a business indicated it was a supplier, then its choices were a producer/grower, importer, or processor. These businesses supplied the seafood to the distribution market. A wholesale business was either buy/sell or commission sales. A buy/sell business buys the seafood from a supplier and resells to another business. Commission sales provide the same service; however, the commission business never assumes ownership of the seafood product but acts primarily as a middleman between buyers and sellers. A consumer-oriented business markets the seafood commodity to institutions, restaurants, specialty fish stores, and grocery/retail.

The primary function of 23 of the tilapia businesses was in the wholesale level of handling seafood, 10 businesses were involved in consumer, and four businesses were involved in supply (Table 3). Each of the 37 businesses could have secondary functions within the seafood business. The primary function supply, had four businesses within the category; however, of those businesses three were involved in processing, and two bought and sold seafood.

Most businesses were involved in the wholesale aspect of handling seafood (62.2 percent), of those businesses, buying and selling seafood was 96 percent of their function (Table 3). The primary function of 10 (27 percent) of the tilapia businesses was consumer oriented. One-hundred percent of the consumer tilapia businesses marketed the tilapia to grocery/retail stores.

Table 3. Primary and Secondary Functions of Tilapia Businesses, 1998, North Central Region

Primary Function	Number in Primary Function	Producer/ Grower	Imports	Processor	Buy / Sell	Commission Sales	Grocery/ Retail
Supply	4	1	1	3	2		
Wholesale	23	0	0	0	22	5	3
Consumer	10	0	0	0	2	0	10

Sales and Selling Frequency

The amount of tilapia handled was 217,950 pounds per year with an average of 5,890 pounds per tilapia business per year. Twenty-four tilapia businesses (65 percent) preferred to purchase tilapia weekly, seven (19 percent) purchased monthly, and six (16 percent) purchased tilapia yearly.

Seasonality

Six of the 37 businesses indicated the amount of tilapia handled changed substantially by season. Five of the businesses responded that the amount handled increased from 20 percent to 50 percent during the winter months/holiday's and the Lenten season. One business indicated the tilapia handled decreased 25 percent during the summer months. The other respondents simply replied that tilapia demand was "about the same all year." However, further research on seasonal demand fluctuations could enhance a more profitable timing of production and sales. Customized timing is one element of successful niche marketing (Riepe, 1998).

Supply Sources

Approximately one-half of the respondents immediately knew the source of tilapia handled in their businesses. However, the remaining respondents were unsure whether the tilapia was farm-raised or wild caught, and whether it was produced in the United States or another country. Therefore, caution should be applied when interpreting the results in Table 4.

Table 4. Sources of Tilapia Purchased by Tilapia Businesses, 1998, North Central Region

Source	Number
Costa Rica	12
U.S. supplier/wholesaler/distributor	8
Regal Springs (farm-raised, Florida) ¹	5
Fish Breeders (farm-raised, Idaho) ²	3
U.S. wholesaler but unknown country	2
Unknown	2
Indonesia	1
Florida (wild caught)	1
Boston	1
Honduras	1
Ecuador/Thailand	1
India	1
Taiwan	1
Total*	39

¹ Regal Springs raises tilapia in Bradenton, Florida, near St. Petersburg in southwest Florida.

² Fish Breeders raises tilapia in Hagerman, Idaho, near Boise.

*Some businesses purchased from more than one source.

Product Form, Price, and Size

According to the seafood respondents to the survey, fresh tilapia is preferred to frozen. Thirty seafood businesses indicated that they handled fresh tilapia and 10 businesses handled frozen tilapia. The most common type of fresh tilapia purchased and sold is boneless, skinless fillets, followed by whole gutted, and boneless, with skin on fillets (Table 5). The preference for frozen tilapia is also boneless, skinless fillets, and then whole gutted.

Table 5. The Form and Amount of Tilapia Purchases and Sales by Tilapia Businesses, 1998, North Central Region

Form	Fresh Purchases and Sales	Frozen Purchases and Sales
Live	0	0
Whole gutted	4	3
Fillets, boneless w/skin	1	0
Fillets, boneless, skinless	25	6
Smoked, dressed	0	0
Dried, dressed-breaded fillet	0	1

The tilapia businesses' average purchase price (February-April 1998) for fresh tilapia is \$3.69/pound for boneless skinless fillets and \$2.04/pound for whole gutted (Table 6). The average selling price for fresh tilapia is \$5.11/pound for boneless, skinless fillets, and \$2.78/pound for whole gutted. The price variation between purchase and resale for fresh tilapia is \$1.42 for boneless, skinless fillets, and \$.74 for whole gutted tilapia. The frozen boneless, skinless fillets differ in purchase price to selling price by \$.78 and \$.71 for whole gutted. The fresh boneless with skin difference between purchase and selling price is \$3.25. However, only one business purchased and resold that product, and the accuracy of this number should be questioned.

Table 6. Tilapia Businesses' Average Purchase and Selling Prices for Tilapia (February-April 1998), North Central Region

	Average Purchase Price		Average Selling Price	
	Fresh	Frozen	Fresh	Frozen
	-----price per pound-----			
	-			
Whole gutted	2.04	.44	2.78	1.15
Fillets, boneless w/skin	1.75	--	5.00	--
Fillet, boneless, skinless	3.69	2.54	5.11	3.32
Dried, dressed--breaded fillet	--	3.40	--	--

Unfortunately, 17 seafood businesses didn't reply regarding their preferred size of fillet. According to the survey respondents who handled tilapia, the most popular size of fillet was the 5-7 ounce, followed by the 4-6 and 6-8 ounce (Table 7). According to a seafood and tilapia marketing survey by Engle (1997), respondents indicated when choosing a fresh fillet the top choices were either a 4-6 ounce or 5-7 ounce fillet. However, survey respondents preferred frozen fillets in either 3-5 ounce or 4-6 ounce. Frozen fillets of tilapia ranged in size from a 2-3 ounce to a 12-20 ounce fillet.

Table 7. Preferred Size of Tilapia Fillet Based on Seafood Business Survey, 1998, North Central Region

	-----Fillet Size, in Ounces-----								
	3-5	4-6	5-7	6-8	7-9	3-5 & 5-7	5-7 & 7-9	4-6 & 6-8	No Reply
Response Numbers	1	4	7	3	2	1	1	1	17

Necessary Characteristics of Tilapia Suppliers

Six questions were asked regarding tilapia suppliers (price, delivery response time, supply consistency, taste consistency, fillet size, and customer service) (Table 8). The first five categories were all considered very important. Supply, taste consistency, and customer service all ranked equally in importance. Although price and fillet size were considered by most to be very important, a significant number of businesses ranked those characteristics as somewhat important or less important.

Table 8. Tilapia Supplier Characteristics, by Tilapia Businesses, 1998, North Central Region

Category	Very Important	Somewhat Important	Not Very Important	Not Important At All
Price	23	11	2	1
Delivery Response time	29	8	0	0
Supply Consistency	34	2	1	0
Taste Consistency	32	32	4	0
Fillet Size	19	13	1	0
Customer Service	30	7	0	0

Seafood Species Handled by Tilapia Businesses

According to seafood literature, tilapia is considered a “whitefish.” Some wholesale and retail businesses reported that they have marketed tilapia as whitefish rather than tilapia. Cod, walleye, pollock, and orange roughy are also considered whitefish and, therefore, were chosen to determine the demand for these four species.

All four of these species were handled by nearly all of the seafood businesses that also handled tilapia. Cod was handled most commonly as fresh and a frozen fillet. Walleye, pollock, and orange roughy were handled most commonly as a frozen fillet (Table 9).

Table 9. Type of Seafood Handled by Tilapia Businesses, 1998, North Central Region

Type	Fresh Fillet	Frozen Fillet	Fresh Whole Fresh Fillet	Fresh Fillet Frozen Fillet	All Fresh and Frozen	Total
Cod	5	8	2	13	6	34
Walleye	2	9	4	8	8	31
Pollock	2	17	0	6	2	27
Orange Roughy	1	24	1	6	1	33

The businesses were also asked if they handled other types of finfish or shellfish and in what form. Other species were mentioned by the businesses; however, only the most frequent responses are displayed in Table 10.

Table 10. Type of Finfish Handled by Tilapia Businesses, 1998, North Central Region

Type	-----Form-----					Total
	Fresh	Frozen	Fresh & Frozen	Didn't Specify		
Salmon	10	3	4	3	20	
Perch	3	2	3	0	8	
Dover Sole	4	0	3	0	7	
Tuna	4	0	0	2	6	
Halibut	2	1	1	2	6	
Catfish	4	0	1	0	5	
Swordfish	2	2	0	1	5	

Salmon, in the fresh form, was the major type of finfish most tilapia businesses handled (Table 10). Clams, shrimp, and oysters were the predominant species of shellfish handled by businesses handling tilapia (Table 11). Most of the shellfish was preferably handled in the fresh form.

Table 11. Type of Shellfish Handled by Tilapia Businesses, 1998, North Central Region

Type	-----Form-----				Total
	Fresh	Frozen	Fresh & Frozen	Didn't Specify	
Clams	14	0	0	2	16
Shrimp	2	9	2	2	15
Oysters	11	0	1	3	15
Crab/Crab Legs	0	5	1	4	10
Mussels	9	0	0	1	10
Lobster	0	4	1	0	5

Potential Markets for Tilapia

Twenty-six of the 37 businesses handling tilapia indicated their name could be forwarded to the NAFFC to potentially get into the wholesale and retail market for processed fish. Three businesses indicated they were looking for a supplier of tilapia.

Survey Results for Businesses Not Handling Tilapia

Businesses not handling tilapia will be referred to as non-tilapia businesses. Forty-two businesses that completed the telephone survey indicated they were non-tilapia businesses. The businesses were asked to indicate what function they represented in the seafood industry.

Business Function

Each of the non-tilapia businesses was asked in which function its business was involved. The businesses were also asked to indicate what percent of their total business fell into one of three primary functions: supply, wholesale, and consumer. The same definitions were given as mentioned in the section on tilapia business function. The non-tilapia businesses were involved in several functions. Twenty of the businesses were involved in the wholesale level of seafood, 14 businesses in consumer, and eight in the supply level of handling seafood (Table 12).

Table 12. Primary and Secondary Functions of Non-Tilapia Businesses, 1998, North Central Region

Primary Function	Number in Primary Function	Producer/ Grower	Imports	Processor	Buy/ Sell	Commission Sales	Grocery/ Retail	Specialty Fish/ Ethnic
Supply	8	1	4	3	1			
Wholesale	20				16	6	3	
Consumer	14				4		13	1

Most businesses were involved in the wholesale aspect of handling seafood (48 percent), 80 percent of them were involved in buying and selling seafood (Table 12). Fourteen non-tilapia businesses handled seafood at the consumer level, and 93 percent of these businesses marketed their product through grocery/retail. At the supply level, one-half of the supply was provided from imports and 38 percent from processors.

Reasons for Not Handling Tilapia

Approximately one-half of the respondents (22) considered handling tilapia while the other half (20), had not considered tilapia (Table 13). Most businesses that answered why they don't handle tilapia, indicated it was due to no demand or market. The taste of tilapia, consumer's unfamiliarity, and no name recognition were also listed as obstacles to handling tilapia.

Table 13. Why Businesses Did Not Handle Tilapia, 1998, North Central Region

Reason	Number of Businesses
Changed selling pattern	1
Previously sold tilapia but no market or demand	9
Previously sold live tilapia but wasn't commercially acceptable and had no equipment to fillet	2
Central America has low cost labor and operating costs-U.S. can't compete	2
Unfamiliar with product--no time to research	2
Lack of availability	2
Customers didn't like the taste	3
Tilapia name not recognized	2
Wholesalers didn't provide samples	1
Doesn't fit into other products they handle	2

Factors Needed to Handle Tilapia

A follow-up question concerned factors for handling tilapia (Table 14). According to the businesses surveyed, if a market were established, then these businesses would have handled tilapia. Taste was mentioned as an important factor in handling tilapia.

Table 14. Factors for Handling Tilapia, 1998, North Central Region

Reason	Number of Businesses
Established market	10
National advertising	2
Value-added products	1
Better tasting product	3
Profit potential	1
Tilapia source	1

Reasons Why Tilapia Was Not Considered

The 20 businesses that had not considered handling tilapia were asked why (Table 15). Of the businesses that answered this question, two reasons were mentioned the most. Six businesses had never heard of tilapia and another six indicated their business was too specialized to handle tilapia.

A survey conducted by Engle (1997), "Seafood and Tilapia Marketing Survey," also asked for reasons why seafood business respondents did not sell tilapia. Several of the same reasons were cited as in this study; too expensive to develop a new product, don't sell fish, and no consumer demand.

Table 15. Why Non-Tilapia Businesses Were Not Interested in Handling Tilapia, 1998, North Central Region

Reason	Number of Businesses
Never heard of tilapia	6
Rather handle other meats than seafood	2
No consumer demand	1
Never been approached to handle tilapia	1
Competition with large customers that handle other types of seafood	2
Specialized business	6
Too expensive	1

Only two businesses answered the follow-up question regarding what factors would lead you to be interested in tilapia. One business suggested a name change, and the other requested more information about the product.

Respondents of the Engle (1997) survey advised tilapia growers on how to ensure continued market growth for farm-raised tilapia: quality, pricing, consistency (quality, size, and supply), and marketing.

Seafood Species Handled by Non-Tilapia Businesses

All 42 of the businesses indicated they handle other types of fish. The four species listed in Table 16 were handled by about one-half of the seafood businesses that did not handle tilapia. Cod and orange roughy were handled most frequently. In all four of the species, frozen fillets were the most popular form of handling.

Table 16. Type of Seafood Handled by Non-Tilapia Businesses, 1998, North Central Region

Type	Fresh Fillet	Frozen Fillet	Fresh Fillet Frozen Fillet	All Fresh and Frozen	Total
Cod	1	22	3	1	27
Walleye	2	12	2	2	18
Pollock	0	19	0	1	20
Orange Roughy	0	27	0	0	27

The businesses were also asked if they handled other types of finfish or shellfish. The most frequent answer was salmon and catfish (Table 17).

Table 17. Type of Finfish Handled by Non-Tilapia Businesses, 1998, North Central Region

Type	-----Form-----				
	Fresh	Frozen	Fresh & Frozen	Didn't Specify	Total
Salmon	4	2	2	3	11
Catfish	5	4	0	1	10
Perch	5	3	0	0	8
Dover Sole	1	5	2	0	8
Halibut	0	3	3	0	6
Haddock	0	5	0	0	5
Tuna	0	4	1	0	5

Non-tilapia businesses preferred handling frozen shrimp (Table 18). Crab, lobster, and oysters were other shellfish businesses handled.

Table 18. Type of Shellfish Handled by Non-Tilapia Businesses, 1998, North Central Region

Type	-----Form-----				
	Fresh	Frozen	Fresh & Frozen	Didn't Specify	Total
Shrimp	2	16	0	7	25
Crab/Crab Legs	0	5	1	4	10
Lobster	0	3	0	6	9
Oysters	6	1	0	2	9
Clams	5	0	0	1	6
Scallops	0	3	1	1	5

Necessary Characteristics of Seafood Suppliers

Six questions were asked regarding seafood supplier characteristics (Table 19). All six of the categories were rated as very important. However, fillet size had a significant number of businesses indicating that it was somewhat or not very important, or not applicable to their business.

Table 19. Seafood Supplier Characteristics, 1998, North Central Region

Category	Very Important	Somewhat Important	Not Very Important	Not Important At All	Not Applicable
Price	29	12	0	1	0
Delivery Response Time	26	12	4	0	0
Supply Consistency	37	5	0	0	0
Taste Consistency	37	3	1	0	1
Fillet Size	18	16	3	1	4
Customer Service	27	11	3	1	0

Sensory Evaluation of Tilapia

Sensory evaluation of tilapia produced by local producers was compared to frozen imported tilapia. The tests were conducted by Dr. Edna Holm, Department of Food and Nutrition, North Dakota State University (NDSU), in controlled testing environments. Evaluating tilapia by taste testing was conducted three times. Two tests were conducted at NDSU and the other at the Minnesota Aquaculture Association and North American Fish Farmers Cooperative Conference at Brainerd, Minnesota. The evaluation form was a 9-point hedonic scale (Appendix 4).

The first test compared a casserole-type preparation using local tilapia and imported tilapia purchased at a local supermarket. Local and imported frozen tilapia fillets were separately prepared in a spicy tomato-based casserole. NDSU faculty, staff, and graduate students were invited on a scheduled basis to sample the fish preparation. A total of 93 persons participated in the test. There were 64 Americans, 25 Asians, and 4 “other” as indicated on the evaluation form.

The two types of casseroles were compared for appearance, flavor, mouthfeel, and overall acceptability in a sensory evaluation test (Table 20).

Table 20. Results from Casserole Taste Testing, All Participants, 1997, North Dakota State University, Fargo

Tilapia Source	Appearance	Flavor	Mouthfeel	Overall
NAFFC	6.2	4.9	5.7	5.2
Imported	7.2	6.9	6.8	7.1

In all four of the categories, the local tilapia rated lower than the imported tilapia. The results were summarized by ethnic origin to determine any change in the rankings (Table 21).

Table 21. Results from Casserole Taste Testing, by Ethnic Origin, 1997, North Dakota State University, Fargo

Ethnic Origin	Source	Appearance	Flavor	Mouthfeel	Overall
American	NAFFC	6.3	4.5	5.6	4.9
	Imported	7.4	7.1	6.9	7.2
Asian	NAFFC	6.0	6.0	6.2	6.2
	Imported	6.6	6.5	6.7	6.7
Other	NAFFC	5.5	3.5	5.3	4.8
	Imported	7.3	7.0	6.5	7.3

The results indicate that the imported supermarket tilapia continued to rank higher than the locally produced. However, the Asians ranked the local and imported tilapia higher in all four categories than the American or “other” taste testers. It should be noted that Asians ranked the local tilapia nearly as high as the imported variety in this study.

The second test was conducted at the Minnesota Aquaculture Association and North American Fish Farmers Cooperative Conference at Brainerd, Minnesota. The study compared frozen fillets of orange roughy, pollock, and halibut fillets to frozen imported tilapia and frozen NAFFC (locally grown) fillets. Two samples of tilapia fillets were prepared: one from local production and one from imported tilapia (reportedly Thailand) purchased from a local supermarket. The fillets were each brushed with butter and lemon juice and baked in a 325° oven until the fish flaked. The cooking was done in the kitchen of the resort where the convention was held. A sample of each fish was presented to 91 volunteer convention participants; consisting of fish farmers, processors, marketers, and other interested persons. The fillets were compared based on color, flavor, mouthfeel, and also given an overall score (Table 22).

Table 22. Results from Fish Taste Testing, March 1997, Brainerd, Minnesota

Sample	Color	Flavor	Mouthfeel	Overall
Orange Roughy	7.4	6.6	6.5	6.7
Cod	7.1	7.7	7.5	7.6
Pollock	6.0	5.7	5.7	5.8
Halibut	4.8	4.4	5.0	4.5
NAFFC Tilapia	7.1	5.5	5.2	5.7
Imported Tilapia	6.9	6.0	5.7	6.2

According to Table 22, orange roughy ranked the highest in color, while cod ranked the highest in flavor, mouthfeel, and overall score. Halibut rated the lowest in all categories. The locally produced tilapia ranked higher than the imported supermarket tilapia in color but was lower in flavor, mouthfeel, and overall score.

The third test was conducted in the sensory facilities of the Department of Food and Nutrition at NDSU. The study compared frozen fillets of orange roughy, cod, pollock, halibut, and imported tilapia. The fish fillets were each brushed with butter and lemon juice and baked in a 325° oven until the fish flaked. NDSU faculty, staff, and graduate students were invited on a scheduled basis to sample the fish. A total of 75 persons participated in the study.

The fillets were compared for color, flavor, mouthfeel, and overall rating (Table 23). Halibut rated the highest in color, but orange roughy ranked the highest in flavor, mouthfeel, and overall score. Pollock ranked the lowest in color and flavor. Halibut ranked the lowest in mouthfeel and overall score. Tilapia ranked near the lowest in color and mouthfeel but nearly the highest for flavor and overall score. However, this was not locally produced tilapia but imported frozen fillets. This does suggest that there is potential for tilapia to be a competitor with other white fish. Flavor should be a major concern for tilapia producers. Characteristics that are pertinent in attaining flavor are fish diet, water quality and circulation, water temperature, and purging fish before marketing (Engle, 1997).

Table 23. Results from Fish Fillet Taste Testing, 1997, North Dakota State University, Fargo

Sample	Color	Flavor	Mouthfeel	Overall
Orange Roughy	6.75	6.88	7.50	6.50
Cod	6.88	5.25	6.63	5.63
Pollock	5.00	4.75	6.88	5.13
Tilapia	5.50	6.38	6.38	5.88
Halibut	7.50	5.50	5.25	5.00

Participants were encouraged to comment on the evaluation form. Most comments were negative relative to all the fish tested. However, our concern is regarding tilapia comments. In Test No. 1, the flavor of the NAFFC tilapia was described as: “muddy, strong fishy, musty, and seaweed-like.” In Test No. 3, the comments were: “rubbery, odd flavor, not fish-like, reminds me of tuna, and color sad.”

As shown in Test No. 3, the imported tilapia rated high in flavor. This is a positive sign and should be a goal for locally produced tilapia. Flavor should be a major concern for tilapia producers.

U.S. Market

Aquaculture scientists have had a lengthy interest in tilapia for its cultural characteristics. The commercialization in America occurred in the 1990s. In 1995, tilapia was the fish that more people wanted to taste and frequently tried (Redmayne, 1992). Articles on tilapia have become a regular addition to *Seafood Leader*, *Seafood International*, *Seafood Buyers Guide*, *Seafood Business: The Seafood Handbook*, and USDA’s *Situation and Outlook Report* (Engle, 1997).

Aquaculture researchers conducted production studies with tilapia at Auburn University, Auburn, Alabama in the 1960s. Again in the mid 1970s, interest in evaluating the market potential for tilapia in Alabama emerged. The market tests were conducted in east central Alabama. The two-year supermarket tests demonstrated a rapid increase in sales as consumers sampled the product and became familiar with it.

In the second year of supermarket tests, the name was changed from “African perch” to “tilapia” (Engle, 1978). This study demonstrated that, while the name “tilapia” may be an unusual name to U.S. consumers, it held no negative connotations that would hinder sales (Engle, 1997).

The success of the direct sales tests of tilapia led to the establishment of a live fish market at Auburn University. Demand grew rapidly in the east Alabama area for live “jalopies” (common name adopted by individuals buying tilapia live), and these efforts foreshadowed the subsequent development of markets for live tilapia across the country.

There are three distinct markets for tilapia: live, fresh, and frozen. The live market is primarily dominated by domestic producers (Table 24). The frozen and fresh markets are primarily dominated by imported tilapia. The domestic market provides a secondary market in fresh and frozen tilapia. The North American market for tilapia is highly segmented (Redmayne, 1992). The high end in terms of price is a live market supplied by small producers scattered throughout the United States. Tilapia farms are multiplying by exploiting ethnic markets for live and fresh whole fish (Redmayne, 1992). Fresh and frozen fillets, mostly imported, are sold through importers, wholesalers, and distributors to retail grocers and restaurants.

Table 24. Primary and Secondary Markets for Domestic and Imported Tilapia, 1998, U.S.

Source	Live	Fresh	Frozen
Domestic	primary	secondary	secondary
Imported	NA	primary	primary

Domestically produced tilapia has a higher cost than that of tilapia produced in tropical climates (Engle, 1997). Therefore, domestic producers seek a higher price for fish sold live. The live market, which is domestically produced, is supplied through live haulers who deliver tilapia to Asian wholesalers primarily in New York, Toronto, and other eastern cities, along with Los Angeles on the West Coast.

Marketing

Identifying the market is considered the first step in a successful production plan. Five W’s are considered important to the success of a marketing plan. *Who* is buying, *what* are they buying, *where* are they buying, *when* are they buying, and *why* are they buying? The retailer, consumer, wholesaler, etc., will be judging the quality of the product. If a low quality product is sold, the likelihood of a return

purchase is slim. In what form are they buying the product? Is the market demand for live fish, fresh fillet, or frozen fillet, and what size product is necessary to meet the needs of the buyer? Where are they buying the product? There are the traditional markets, i.e., wholesale, retail, or farm level, but how about direct sales to institutions (schools, hospitals), convention centers, and airlines? When are they buying? Is there a specific season when demand for seafood is higher, i.e., lent, holidays? Is there more demand on certain days of the week or time of the day? Why are they buying a specific seafood item? Is it topnotch quality, price of the product, size of the product, service, or satisfaction (Klontz, 1992).

According to Kahl (1997), the live market dominated sales from domestic farms in 1996 with processed fish accounting for only about 20 percent of total sales. In the West, market conditions have been unsteady, and distributors compete for Oriental markets and periodically sell at or below cost.

As production is expected to continue to increase in 1999, a strain on the existing Oriental live market is expected as is happening in the West. There are signs that prices for live tilapia may fall as farms compete for a market share. Prices for large tilapia delivered to New York and Toronto fell from \$2.30 a pound in April to \$1.80 in May (ATA, 1998). Prices are expected to drop further only if live fish are not diverted into specialty niche markets (outside the mainstream China towns).

Prices for live tilapia are set by supply and demand at each location and delivery time. Prices are also affected by the quality, average size of the fish, color, and appearance. Generally, larger domestic producers are willing to sell at lower prices than are small operators in order to ensure a market share. Big farms lose big money during periods when production is not maximized (supply exceeds demand). High costs of production; feed, electricity, freight to market, labor, and low market prices may decrease United States tilapia production. Unfortunately, tilapia buyers tend to shop for the best prices and switch suppliers regularly, indicating no loyalty. Tilapia buyers who purchase solely on price will not necessarily be receiving a quality product (ATA, 1997). This can be due to sickly or off-flavored fish delivered to wholesalers at a low price in order to unload them rapidly.

The American Tilapia Association is encouraging producers to develop new markets close to home rather than ship fish across the nation. Farmers in the Northeast region have had success selling to markets in Washington, District of Columbia, Philadelphia, Boston, and Montreal. Potential markets exist in Chicago, Atlanta, Denver, Kansas City, and St. Louis that are virtually untapped (ATA, 1998). A competitive advantage in freight costs and fish condition exists for the producer who is closest to the market.

According to the American Tilapia Association, the Latino population, especially in the Southwest, should be targeted as customers of live fish. On weekends, potential customers search the fish farms for live fish for parties and fiestas. Many of these customers are willing to pay top dollar for live tilapia. In Texas, an aquaculture farm has installed live tanks in supermarkets and retail outlets with good success.

According to a Seafood and Tilapia Marketing Survey (Engle, 1997), respondents indicated that they received new product and marketing ideas from various sources. The most frequent source of

new ideas was from the trade press, followed by retail customers, distributor sales representatives, suppliers, staff, trade shows, newspaper/magazines, and other seafood companies.

The majority of the survey respondents did not think that sales of tilapia would increase due to increases in the price of catfish or cod (Engle, 1997). In other words, most respondents do not perceive tilapia to be a substitute for either catfish or cod. However, 70 percent of the companies surveyed that sell tilapia expected their tilapia sales to increase in the next two years by 10 to 100 percent (Engle, 1997).

Tilapia Prices

In the whole fish market, live tilapia retail prices are higher than whole fresh or whole frozen prices (Table 25). In the fillet market, the large producers receive a lower retail price than medium producers. However, producers who supply tilapia to the small niche markets receive a premium price.

Table 25. Average Tilapia Prices Per Pound, 1997 (U.S. \$)

Market	FOB Farm	Wholesale	Retail
Whole Fish			
Live	1.25-2.00	1.80-2.40	2.99-5.99
Whole Fresh	1.05-1.60	1.20-2.00	1.99-3.49
Whole Frozen or Wild		0.30-0.70	0.99-2.99
Fillets			
Frozen (imported)		2.50-3.00	3.49-4.99
Fresh (imported)		3.35-3.75	3.99-6.99
Fresh (domestic)			
Large producers	3.40-3.75	3.60-4.00	4.00-6.00
Medium producers	3.60-4.00	3.80-4.20	4.50-6.00
Small niche	4.00-5.00		5.00-8.00

Source: American Tilapia Association. 1997.

A marketing study was conducted on farm-raised hybrid striped bass (Kahl, 1997). Among those surveyed were hybrid striped bass producers, fish wholesalers (listed in Who's Who in the Fish Industry, 1994-95), and a sample of grocery retailers. According to the responding wholesalers and retailers, a large majority sell aquaculture products. Most of the sellers market the seafood products as farm-raised or aquaculture. The top four farm-raised products most commonly sold by retailers (in order of importance) are: (1) catfish, (2) salmon, (3) shrimp, and (4) trout. Wholesalers and retailers agree that consistent supply and consistent quality are the main advantages of aquaculture products as compared to wild caught products. Wholesalers and retailers also agreed that less flavor, higher prices, and limited variety are the three most important disadvantages of aquaculture products.

Contracting is being used to buy hybrid striped bass. Nineteen percent of wholesalers and 15 percent of retailers contract. More than half of those wholesalers who do not contract would consider contracting. Thirty-six percent of those retailers who do not contract would consider the practice (Kahl, 1997).

According to the seafood and tilapia marketing study by Engle (1997), 55 percent of respondents indicated that farm-raised fish receive a higher market price than wild-harvested fish of the same species. Eighty-two percent agreed that the supply of farm-raised fish was more stable than that of wild-caught fish.

Market Potential

Some importers have begun value-added programs to diversify the tilapia frozen fillet products line (Engle, 1997). New products include breaded fillets, nuggets, marinated fillets, and 1-2 pound IQF (individual quick frozen) polybag presentations.

The fresh fillet market for tilapia has been east of the Mississippi River, along the Atlantic Coast, from Florida to Maine. Florida and Southern California are particularly strong markets for tilapia due to familiarity of Asian and Hispanic populations with the product (Engle, 1997).

Solar Aquafarms, located in California, has been the largest tilapia producer. Solar's strongest market is Los Angeles, where Asians and Hispanics account for 65 percent of sales, mostly whole and dressed (Shaw, 1995). They sell near home and in low-cost product forms that reduce air freight costs and production costs of the fish.

Areas with Asian markets such as San Francisco, Seattle, Washington, and New York prefer live or whole-dressed fish. Markets such as Boston, St. Louis, Chicago, the Great Lakes area, and New York prefer IQF of fresh boneless, skinless fillets (Swanson, 1995).

However, other areas that sell freshwater fish may have potential. For example, the Chicago/Wisconsin area has a population of 10 million, per capita fish consumption of 15.9 pounds, and consumes 159 million pounds of fish and seafood annually. Of this, 70 percent of the fish sold are finfish (111 million pounds) and 25-35 percent are freshwater fish, mostly whitefish (Gleckler et al., 1991).

A survey of seafood buyers in the North Central region in 1991 (Gleckler et al., 1991) found low demand for tilapia and few respondents with tilapia sales in the region. There was a general low level of localized distribution and a lack of wild-caught or farm-raised fish in the markets which stemmed from low buyer awareness. Only 10.3 percent of seafood buyers said that they had any desire to sell tilapia.

Respondents of the Engle (1997) survey advised tilapia growers on how to ensure continued market growth for farm-raised tilapia. The first factor was quality. Tilapia is viewed as a fish that absorbs impurities and odors and should be raised in clean water. The second comment was that the

price of tilapia must come down to be competitive. Consistency was mentioned in terms of quality, size, and supply. Different sizes of fish, including loin, steak, or portion cuts, must be consistent with trends in the seafood market. Fourth, marketing was needed to advertise to consumers. National advertising should educate consumers about the fish, its quality, and freshness. The tilapia industry should follow the marketing approach used by the Australian orange roughy industry, including detailed literature on seafood counters, demonstrations, taste tests, etc. The industry needs sales people to promote farm-raised tilapia as a cleaner, better product. Fifth, the fillet should be larger. Finally, supply must be consistent so consumers will develop confidence in the product.

Advertising

Over time, the number and sizes of advertisements in major seafood trade magazines have increased (Engle, 1997). For example, in *Seafood Leader*, *Seafood Business*, and *Seafood International*, the number of advertisements for tilapia increased from two in 1992 to 11 in 1995. Since 1994, three to four companies have maintained advertisements, and the total advertising space has increased three times.

The survey of seafood respondents (Engle, 1997) indicated the need for additional education and information for consumers to build a strong consumer base for the product. Tilapia growers and importers have promoted their product through the seafood trade press to wholesalers and distributors. However, the tilapia industry needs to promote the product to consumers.

Imports

Total U.S. imports of tilapia have increased each year from 1992 to 1997 (Table 26). Throughout the time period approximately 80 percent of the total imports have been in the whole frozen category. Imports increased 621 percent from 1992 to 1997. Imports of tilapia products increased from 41.9 million pounds in 1996 to 53.8 million pounds in 1997, a 28 percent increase (Table 26). Tilapia imports of whole frozen, fresh fillets, and frozen fillets have increased from 1996 to 1997. Imports of whole frozen tilapia increased 25 percent, and fresh and frozen fillets each increased 37 and 47 percent, respectively.

Table 26. Imports of Tilapia, Whole Frozen, Fresh and Frozen Fillets, in Pounds, 1992-1997, U.S.

Year	Whole Frozen	Fresh Fillets	Frozen Fillets	Total
1992	6,660,625	475,024	319,565	7,455,214
1993	22,101,567	1,289,548	1,347,154	24,738,269
1994	24,899,201	1,958,911	5,164,134	32,022,246
1995	26,538,597	3,213,010	4,765,974	34,517,581
1996	33,588,379	4,539,110	3,734,656	41,862,145
1997	42,069,128	6,211,000	5,497,466	53,777,594

Taiwan emerges as the leader in whole frozen and frozen fillets (Table 27). In 1996 and 1997, 94 percent and 97 percent, respectively, of the United States imports of whole frozen tilapia were from Taiwan. Taiwan and Indonesia had 36 percent and 34 percent, respectively, in frozen fillets, in 1996. In 1997, Taiwan and Indonesia had 34 percent and 44 percent, respectively. In 1996 and 1997, the United States imported the most fresh fillets from Costa Rica, 52 percent and 59 percent, respectively.

Tilapia is the third largest aquaculture import. Imports of fresh fillets from Central and South America continue to grow rapidly. Imports had grown 50 percent in August 1996 in comparison to 1995 volumes. Costa Rica remains the largest supplier of fresh fillets, increasing nearly 12 times from 1992 to 1997. Honduras and Ecuador increased eight and two times, respectively, from 1993 to 1997. Miami is the primary port of entry, accounting for 97 percent of fresh fillet imports.

The average price of imports from 1996 to 1997 for whole frozen and fresh fillet tilapia has decreased from \$.71 to \$.57 per pound, a 20 percent reduction (Table 28). Table 28 indicates the countries from which the United States has imported the largest volume of tilapia. Not all countries exporting tilapia to the United States are represented. In the whole frozen market, most countries realized an increase in the price per pound from 1995 to 1996 and then a decrease in the price in 1997. Thailand is the only country that experienced an increase in price from 1995 to 1997.

The average import price of whole frozen tilapia decreased from \$.67 to \$.57 per pound from 1992 to 1997, a 15 percent reduction. During this time period, the average import price of whole frozen tilapia has been Taiwan's price due to the large percentage imported.

The fresh fillet price per pound varied from 1995 to 1997 by country. However, the total price per pound increased from \$2.46 to \$2.56 in 1995 to 1996 and then decreased to \$2.25 in 1997, a 12 percent reduction. The frozen fillet price per pound has also varied by country. However, the total price per pound increased from \$1.88 to \$2.05 from 1995 to 1997, a 9 percent increase.

The import price variations among countries within commodities are somewhat difficult to explain. According to Dave Harvey (USDA, ERS), the higher costs could be associated with a demand for a specific color of tilapia, specialized market, size of fish requested, continuity with supplier, and premium for rush orders. The lower costs of Taiwan can be attributed to the large quantity of tilapia supplied.

Table 27. Imports of Tilapia, in Pounds, 1996-1997, by Country

Country	Whole Frozen		Fresh Fillets		Frozen Fillets		Total	
	1996	1997	1996	1997	1996	1997	1996	1997
Mexico			14,557	2,691			14,557	2,691
Honduras	161,282	91,049	281,450	360,169			442,732	451,218
Costa Rica			2,378,099	3,642,335			2,378,099	3,642,335
Jamaica			356,844	624,105	163,451	213,844	520,295	837,949
Columbia			494,219	12,245			494,219	12,245
Ecuador	869,539	375,811	991,540	1,323,920	251,152	237,926	2,112,231	1,937,657
Belize	293,344	221,771			43,307		336,651	221,771
Thailand	136,001	8,782			488,842	493,174	624,842	501,956
China	232,001	113,364					232,000	113,364
Taiwan	31,704,972	41,008,779			1,334,982	1,852,622	33,039,954	42,861,401
Nicaragua					54,058	173,463	54,058	173,463
Indonesia					1,273,103	2,410,034	1,273,103	2,410,034
Other	191,240	249,572	22,401	245,535	125,761	116,403	339,404	611,510
Total	33,588,379	42,069,128	4,539,110	6,211,000	3,734,656	5,497,466	41,862,145	53,777,594

Table 28. Tilapia Import Prices for Whole Frozen, Fresh and Frozen Fillets, 1992 - 1997, by Country

Country	Whole Frozen						Fresh Fillets						Frozen Fillets					
	1992	1993	1994	1995	1996	1997	1992	1993	1994	1995	1996	1997	1992	1993	1994	1995	1996	1997
Mexico	--	--	--	0.33	--	--	--	2.98	2.82	3.24	3.24	3.24	--	2.73	2.79	--	--	--
Honduras	1.63	--	--	--	0.41	0.25	--	2.74	2.77	3.08	2.98	2.29	--	--	1.61	--	0.38	2.44
Costa Rica	2.04	--	--	--	--	1.28	2.27	2.49	2.49	2.50	2.47	2.14	--	--	2.50	--	--	--
Jamaica	1.83	1.97	--	2.45	2.54	2.20	--	--	--	1.86	2.89	3.13	2.12	2.01	1.97	2.02	1.91	1.93
Columbia	0.88	1.02	2.14	--	--	--	2.33	2.68	2.33	2.32	2.58	2.46	--	--	--	--	--	--
Ecuador	--	--	--	0.66	0.69	0.57	--	1.50	1.61	2.17	2.55	2.12	--	--	2.77	2.00	2.06	2.22
Belize	--	--	--	0.75	0.67	0.63	--	--	--	--	--	--	--	--	--	--	0.68	--
Thailand	0.56	0.70	0.51	0.46	0.76	1.14	--	--	--	--	--	--	2.28	1.80	2.42	2.86	2.83	2.90
China	--	0.46	0.52	0.47	0.79	0.57	--	--	--	1.94	--	--	--	--	--	1.78	2.33	--
Taiwan	0.66	0.57	0.57	0.64	0.71	0.57	--	--	--	--	--	1.71	0.65	0.56	0.75	1.31	1.68	1.66
Nicaragua	--	--	--	1.97	1.83	1.39	--	--	2.24	2.27	1.97	2.46	--	--	2.46	1.70	1.00	1.73
Indonesia	0.63	--	0.80	--	--	--	--	--	--	--	--	--	2.10	2.16	2.13	1.92	2.10	2.21
Total	0.67	0.57	0.57	0.65	0.71	0.57	2.29	2.52	2.45	2.46	2.56	2.25	1.44	1.62	1.26	1.88	2.00	2.05
-- indicates zero																		

The Future U.S. Market for Tilapia

Tilapia imports have increased each year from 1992 to 1997 (Table 26). The frozen whole tilapia imports comprise approximately 80 percent of the total imports from 1992 to 1997. Tilapia imports are forecast to expand and should allow tilapia to move into large food service markets (USDA, 1996).

United States domestic tilapia production has consistently increased from 1991 to 1997 (Table 2) and is expected to continue to increase. Domestically produced tilapia is primarily sold in the live market. An abundance of live tilapia is sold in the Oriental market, in the West Coast, and in specific large cities in the North East. The large supply of live tilapia has driven the prices down and is expected to drop further if live tilapia isn't diverted into specialty niche markets. The American Tilapia Association is encouraging producers to develop new markets close to home or tap into cities with potential markets that aren't saturated.

United States production of tilapia has increased since data were first compiled in 1991. However, production from individual farms has varied dramatically. The large farms have lacked consistent production, resulting in sales fluctuations from month to month and year to year. This instability of tilapia farms must be addressed and overcome in order to move to a higher level of product consistency and quality.

Careful attention to market development, guaranteeing product quality, quantity supplied, sizing, packaging, and shelf lives, will be critical factors that determine whether tilapia succeeds in the U.S. seafood market (Engle, 1997). Price, delivery response time, supply consistency, taste consistency, fillet size, and customer service are important supplier characteristics in order to achieve customer satisfaction and continued supply from that seafood business

Additional market research is needed to determine what type of tilapia product is preferred. The product most requested by seafood businesses in the North Central Region was a fresh and frozen, boneless, skinless fillet.

Sensory testing indicates an important factor regarding flavor of tilapia. Flavor was considered a "must" in order to compete with other white flesh fish. When the flavor of tilapia was acceptable, it could compete with orange roughy and cod.

Innovative market research is needed to evaluate the size and potential of the live fish market in the United States. As output has expanded, the live market has become saturated and driven the market price lower. The processed fish market needs to be considered, including cost factors and competition from outside the United States.

Outside the United States, domestic markets in Latin America are likely to continue to grow. In Latin American countries with year-round tropical temperatures, tilapia production costs should remain low.

As indicated in the two surveys of seafood businesses, there is a great need for education and information on tilapia. This will help build a stronger customer base for the product. Grocery/retail businesses and consumer respondents repeatedly indicated that the lack of education is the main reason for the low demand for tilapia. The tilapia industry needs to support the product in order to inform the consumer.

Conclusions and Recommendations

North American Fish Farmers Cooperative is the major marketer of locally produced tilapia in the region. It has expanded its sales from 19,301 pounds in 1995 to 419,125 pounds in 1998. This rapid expansion has been based on selling live fish to ethnic markets in large eastern cities in the United States and Canada. However, as producers in the North East region increase their production, from 450,000 pounds in 1993 to 3.51 million pounds in 1998, the higher transportation cost of the NAFFC becomes a significant issue in future expansion. The purpose of this study is to identify and investigate alternative fresh and frozen fillet markets within the region. The competition for this market is primarily an imported product from Asia and Central America. Total consumption of tilapia has increased from 5 million pounds in 1991 to 15 million pounds in 1995.

One hundred and fifty seafood businesses were contacted by telephone and 79 interviews were completed successfully. Thirty-seven of the 79 respondents handled tilapia in their business. Thirty of these businesses handled and preferred fresh fillets while 10 handled frozen tilapia.

Conclusions

Tilapia businesses were clear in their preferences: 5 to 7 ounce fillets, quick delivery response time, consistent supply, taste and size, and suppliers oriented toward customer service. Twenty-six of the 37 respondents were open to new suppliers.

The responding businesses which did not handle tilapia gave their reasons: lack of demand due to customer unfamiliarity, name recognition, and taste of tilapia. The need for an established market, i.e., consumer demand, was the major factor needed. These businesses agreed with the tilapia businesses with respect to their preferences for fillet size, service, and consistency.

Three sensory perception taste tests were performed, one with fish in a casserole and two with baked fillets. The domestic tilapia did not test well in any of the tests. In the casserole test, it was ranked lower in appearance, flavor, and mouthfeel by all consumer groups than the alternatives. It was ranked high in color by the participants in the Minnesota Aquaculture Association and North American Fish Farmers Cooperative Conference annual meeting, but low in flavor and mouthfeel. In a test at North Dakota State University, it was ranked low in color, high in flavor, and medium in mouthfeel. The results of these tests indicate both a quality issue and a variation in quality from test to test. These issues need to be resolved prior to initiating a marketing effort for fresh and frozen fillets.

Recommendations

Although the total consumption of tilapia has risen dramatically, most of this increase is due to low-cost imports. Domestic production has difficulty competing with the low-cost labor, facility's investment and feed inputs; therefore, must compete on quality and service. Brokers and distributors indicated a willingness and desire to consider new sources of supply, but were very specific in their requirements.

In order to compete and expand into a fresh and frozen fillet market, Northern Plains aquaculture producers first need to produce and process a high quality product that ensures consistency in size, appearance, mouthfeel, and flavor. The growing environment, water characteristics, and feed mix/level, need to be evaluated in terms of their influence upon quality characteristics. In addition, the processing, from purging to final packaging, needs to be evaluated in terms of quality control. Once the product is of consistent high quality, the next step in marketing can be addressed.

The standard four "P's" in marketing are (1) product positioning, (2) place, (3) price, and (4) promotion. Added to this set of marketing concepts is the goal of supply channel synchronization. Product positioning was discussed in the previous paragraph. As it is difficult for domestic production to compete with imports on the basis of price, suppliers must seek a comparative advantage in quality and service, positioning their product at the high quality, high price end of the spectrum.

Place refers to the product distribution system, i.e., the network of distributors, brokers, and retailers who move the product to the consumer. Long-term alliances and partnerships among the players in the supply channel is the preferred relationship. Each business involved in bringing the product to the consumer's plate is considered a partner in the process and has its reputation and profitability on-the-line. Consistent, high quality product and stable price are important in establishing these relationships. Also, responsiveness in terms of providing product when demanded is important to synchronize the movement of a product from the farm gate to consumers' plates. Flexibility in both production and processing is necessary.

Price refers not just to market price but includes the set of discounts and incentives to the partners in the supply channel and to the consumer. Price becomes part of an integrated marketing strategy. Price determination is based on production/processing costs, prices of the competition, and the characteristics of the demand for the product.

Promotion is a necessary part of any marketing plan. It needs to be coordinated with the marketing partners in the supply channel to assist in moving the product into supermarket shelves and restaurant menus, and finally to the consumer. "AIDA," or getting the consumers' ATTENTION, stimulating their INTEREST, generating DESIRE for the product, and, finally, moving the consumer to ACTION or purchase of the product are guidelines to use in the promotional process.

In summary, distributors and brokers appeared open to new domestic sources of supply; however, producers/processors need to provide a high quality consistent product to differentiate it from the competition and develop a marketing plan to move the product through the supply channel and stimulate consumer demand for a domestically produced and processed product.

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Appendix 1
Tilapia Mail and Telephone Survey
Description and Procedures

Tilapia Mail and Telephone Survey Description and Procedures

A total of 218 seafood and/or meat businesses were identified for the mail survey. The seafood and/or meat businesses name and addresses were obtained searching the Internet in the North Central Region. A variety of Internet sites were used, however the US West Dex Yellow Pages and White and Yellow Pages (Find a Business) were utilized the most extensively. The sample included cities in ND, SD, MN, WI, IL, CO, KS, MO, and IA. The mail survey instrument can be found in Appendix 2.

A three-section survey instrument was developed for the mail survey. The first section contained questions regarding the types and form of fish handled. Questions about white flesh fish were asked: quantity sold, percent changed, point of purchase, transportation rates paid, average prices, the percent of white flesh fish distributed to outlets, and the percentage and time of year sold. In section 2, the focus narrowed to whether they handled tilapia and ranking characteristics of their supplier of tilapia. How frequently purchased, which season/s purchased, average purchase price, and form in which the tilapia was purchased were also asked in this section. The expectation of future tilapia sales was also asked. Section 3 addressed the issue of potential interest in tilapia. Seafood businesses that did not handle tilapia, were asked whether they would consider handling it and why.

The two page survey was mailed to 218 meat and/or seafood businesses in the North Central Region on June 6, 1997. Eight were returned to sender, and only a few completed surveys were returned. Approximately 210 surveys were mailed on June 30, 1997, 18 were returned to sender. Twelve completed surveys were returned and six blank surveys were returned.

The extremely low response rate is thought to have happened because of the length and detailed questions asked in the mail survey. Another reason which was determined later in the telephone survey, may have been due to the number of businesses not handling seafood, or no longer in business at all. This resulted in the surveys being discarded or being returned to sender.

Because of this low response rate, a telephone survey was used. A minimum of questions would encourage participants to complete the telephone survey.

Two survey instruments were designed for the telephone survey: one for those who handled tilapia and one for those who did not handle tilapia. Both of the survey instruments were similar to the mail survey except shorter. The telephone survey instruments can be found in appendix 3.

The telephone survey for those handling Tilapia consisted of three sections. The first section asked what percentage their business was involved with each function, i.e., supply, wholesale, consumer. In section two, questions were asked regarding the frequency, average amount purchased and source of tilapia handled. If the amount of tilapia handled changed substantially by season, and which season, and what amount of change was also asked. Average purchase and selling price and what form the tilapia was handled completed the questions in the second section. In section 3 the business was asked to rank characteristics of their supplier of tilapia. They were asked whether their business handled other forms of fish, and if so, what type and form that they handled. They were also

asked whether they approved having their name of business forwarded to NAFFC to make further contacts.

The telephone survey for those not handling tilapia consisted of three sections also. The first section asked what percentage their business was involved with each function, i.e., supply, wholesale, and consumer. Section two asked whether they would consider handling tilapia in the future and why. In section three, whether the business handled other forms of fish and what type and form that they handled were asked. Also, the business was asked to rank characteristics of their supplier of fish.

Appendix 2
Tilapia Mail Survey Instrument

Section 1. Firm Information

1. What percent of fish do you handle in these forms?

	Fresh whole	Fresh fillet	Frozen whole	Frozen Fillet	Live	Total
						100%
Cod						100%
Walleye						100%
Pollock						100%
Tilapia						100%
Orange Roughy						100%
Other Finfish						100%
Other Seafood (shellfish,etc.)						100%
	100%	100%	100%	100%	100%	100%

2. Please fill in the following information as thoroughly as possible for 1996.

WHITE FLESH FISH

Type of Fish	Cod	Orange Roughy	Tilapia	Walleye	Pollock	Other Finfish	Other Seafood (shellfish,etc)	
Annual quantity sold 1996 lb., kg, etc.								
% Change in Quantity Supplied in last 3 years lb., kg, etc.								
Season Available: Fall, Spring, All,etc								
Your point of Purchase for Supply CIF FOB etc.								
Transportation Rates paid (if applicable)								
² Aver. Acquisition Price								
³ Aver. Wholesale Price								
⁴ Aver. Retail Price								
Name of Major fish Suppliers								

¹ Rates paid for shipment to your establishment

³ Price charged to Outlets Grocery Store, Restaurants

² Price paid for fish at original acquisition

⁴ Price sold to public

3. Percentage of your white flesh fish distributed to each outlet?

_____ Grocery Stores _____ Public _____ Specialty Fish Stores
 _____ Restaurants _____ Ethnic Stores* _____ Other

*Stores specializing in Chinese, Japanese, etc items

4. What percentage of your white flesh fish are sold during these time periods?

Jan - April _____% May - Sept _____ % . Oct - Dec _____ %

Section 11. Interest in Tilapia

1. Please rank the following criteria in your selection of a domestic supplier of **Tilapia**. (Circle one)

	<i>very</i>		<i>somewhat</i>		<i>not</i>
	<i>important</i>		<i>important</i>		<i>important</i>
Price	1	2	3	4	5
Delivery Time	1	2	3	4	5
Supply Consistency	1	2	3	4	5
Taste Consistency	1	2	3	4	5
Fillet Size	1	2	3	4	5
Customer Service	1	2	3	4	5

2. Do you handle Tilapia? Yes No
 If Yes, continue to end of Section 11
 If No, go to Section III

3. Please estimate how frequently you purchased Tilapia last year and the aver. purchase size (ie. You purchase Tilapia in March everyday, so you would check Daily-Jan-Apr, etc.)

Purchase Frequency	Seasons		Aver. Purchase Amount (lb.)
	Jan-Apr	May-Sept Oct-Dec	
Daily			
Once/week			
Once/month			
Once/year			
Never			

4. Please estimate prices paid for the following Tilapia products last year.

Product Form	Fresh \$/lb	Frozen \$/lb
Live		
Whole, gutted		
Fillets, boneless, skin-on		
Fillets, bone less, skinless		
Smoked, dressed		
Dried, dressed		

5. Do you expect your Tilapia sales in the next 2 years to: ___increase ___decrease ___unchanged
 in the next 5 years to: ___increase ___decrease ___unchanged

Section 111. Potential Interest in Tilapia

1. Have you considered handling *Tilapia*? ___ Yes ___ No

If yes, why did you decide not to handle *Tilapia*?

If **no**, what factors would lead you to interest in Tilapia?

Appendix 3
Tilapia Telephone Survey Instrument

Survey Instrument for Those Businesses Handling Tilapia

Name of Business _____

Name of Respondent _____

Title _____

Address (if different) _____

Phone (check if ok) _____

Email address _____

Which of the following functions is your business involved with:

Supply

Producer/Grower

Imports _____%

Processor _____%

Wholesale

Buy/sell _____%

Commission Sales _____%

Consumer

Institutional _____% Restaurant _____%

Specialty
Fish/ethnic
_____%

Grocery/
Retail
_____%

Importer- One whose business is the importation and sale of goods from a foreign country

Broker- An agent middleman who for a fee or commission negotiates contracts of purchase and sale between buyers and sellers without himself taking title to that which is the subject of negotiation and usually without having physical possession of it.

Trader- A person whose business is buying and selling or barter

Wholesaler- A merchant middleman who sells chiefly to retailers, other merchants, or industrial, institutional and commercial users mainly for resale or business use - also called jobber

Distributor- One that markets a commodity

1. Do you handle Tilapia?
_____ Yes

2. Please estimate how frequently you handled Tilapia last year and the average amount.

<u>Frequency</u>	<u>average amount purchased</u>	<u>Sources</u>
Daily	_____	_____
Once/week	_____	_____
Once/month	_____	_____
Once/year	_____	_____
Never	_____	_____

b. Does the amount you handle change substantially by season?

_____ yes _____ no (go to #3)

<u>Frequency</u>	<u>Season</u>		<u>Fall</u>
	<u>Winter</u>	<u>Spring</u>	
Daily	_____	_____	_____
Once/week	_____	_____	_____
Once/month	_____	_____	_____
Once/year	_____	_____	_____

3a. Please estimate the prices paid for Tilapia products last year.

<u>Product form</u>	<u>Fresh\$/lb.</u>			<u>Frozen \$/lb</u>		
	<u>Low</u>	<u>High</u>	<u>or Average</u>	<u>Low</u>	<u>High</u>	<u>or Average</u>
Live	_____	_____	_____	_____	_____	_____
Whole gutted	_____	_____	_____	_____	_____	_____
Fillets, boneless w/skin	_____	_____	_____	_____	_____	_____
Fillets, boneless, skinless	_____	_____	_____	_____	_____	_____
Smoked, dressed	_____	_____	_____	_____	_____	_____
Dried, dressed	_____	_____	_____	_____	_____	_____

3b. If purchased and resold please estimate the prices sold for Tilapia products last year.

<u>Product form</u>	<u>Fresh\$/lb.</u>			<u>Frozen \$/lb</u>		
	<u>Low</u>	<u>High</u>	<u>or Average</u>	<u>Low</u>	<u>High</u>	<u>or Average</u>
Live	_____	_____	_____	_____	_____	_____
Whole gutted	_____	_____	_____	_____	_____	_____
Fillets, boneless w/skin	_____	_____	_____	_____	_____	_____
Fillets, boneless, skinless	_____	_____	_____	_____	_____	_____
Smoked, dressed	_____	_____	_____	_____	_____	_____
Dried, dressed	_____	_____	_____	_____	_____	_____

4. Rank the following criteria in your selection of a domestic supplier of Tilapia.

(1)	(2)	(3)	(4)
very	somewhat	not very	not important
important	important	important	at all

Price _____
Delivery Response time _____
Supply Consistency _____
Taste Consistency _____
Fillet Size _____
Customer Service _____

5. Do you handle other types of fish?

____ Yes ____ No (go to #6)

Fresh	Fresh	Frozen	Frozen	Live
Whole	Fillet	Whole	Fillet	

In what forms do you handle cod _____

In what forms do you handle Walleye _____

In what forms do you handle Pollock _____

In what forms do you handle Orange Roughy _____

In what forms do you handle Other Finfish _____

In what forms do you handle other seafood (shellfish) _____

6. Do you approve if we forward your name of business to North American Fish Farmers Cooperative for purposes of potentially getting into the wholesale and retail market for processed fish. Currently they only sell to a live market.

Survey Instrument for Those Businesses Not Handling Tilapia

1. Do you handle Tilapia?

____ No

2. Have you considered handling Tilapia?

____ Yes ____ No

If yes, why did you decide not to handle Tilapia?

If yes, what factors would lead you to do so?

If no, why aren't you interested in handling Tilapia?

If no, what factors, would lead you to be interested in Tilapia?

3. Do you handle other types of fish?

____ Yes ____ No (go to #6)

Fresh	Fresh	Frozen	Frozen	Live
Whole	Fillet	Whole	Fillet	

In what forms do you handle cod _____

In what forms do you handle Walleye _____

In what forms do you handle Pollock _____

In what forms do you handle Orange Roughy _____

In what forms do you handle Other Finfish _____

In what forms do you handle other seafood (shellfish) _____

4. Rank the following criteria in your selection of a domestic supplier of Tilapia.

(1)	(2)	(3)	(4)
very	somewhat	not very	not important
important	important	important	at all

Price _____

Delivery Time _____

Supply Consistency _____

Taste Consistency _____

Fillet Size _____

Customer Service _____

Appendix 4
Seafood and Tilapia Marketing Survey

SEAFOOD AND TILAPIA MARKETING SURVEY

1. General Information -

- 1.1 Name of Respondent:
- 1.2 Position/Title:
- 1.3 Company Name:
- 1.4 Address:
- 1.5 Telephone:
FAX No.
EMAIL:

1.6 Please rank your top 5 best selling (value) FISH SPECIES sold in your store(s) last year, and indicate each as a percentage of total annual seafood sales.

<u>SPECIES or PRODUCT</u>	<u>PRODUCT FORM</u>	<u>SEAFOOD SALES% (value)</u>
(1) _____	_____	_____
(2) _____	_____	_____
(3) _____	_____	_____
(4) _____	_____	_____
(5) _____	_____	_____

1.7 Please estimate the annual percentage of fish and shellfish you sell (value)?

FINFISH _____% (value) SHELLFISH _____% (value) TOTAL=100%

1.8 Please estimate the annual percentage of fish products you sell (value)?

_____ % RETAIL _____ % FOOD SERVICE (ready-to-eat)

1.9 Please estimate the annual percentage of fish you sell (value)?

MARINE FISH _____% (value) FRESHWATER FISH _____% (value) = = 100 %

1.10 Please estimate the annual percentage of fish you sell (value) in the following forms?

	<u>% marine fish (value)</u>	<u>%freshwater fish (value)</u>	<u>total %</u>
FRESH OR CHILLED	_____ %	_____ %	<u>=100%</u>
LIVE	_____ %	_____ %	<u>=100%</u>
FROZEN	_____ %	_____ %	<u>=100%</u>
SMOKED or CURED	_____ %	_____ %	<u>=100%</u>
CANNED	_____ %	_____ %	<u>= 100%</u>
OTHER	_____ %	_____ %	<u>=100%</u>

1.11 Please indicate the level you agree, disagree or are neutral (3) with the following.

(circle appropriate number)
agree ----- disagree

1 2 3 4 5 Farm-raised fish receive a higher market price
than wild-harvest fish of the same species.

1 2 3 4 5 Supply of farm-raised fish is more stable than
wild fish stocks.

1 2 3 4 5 Fish farms in the U.S.A. have high water quality.

2. MARKET CHANNELS

2.1 Do you sell tilapia? _____ Yes _____ No

2.2 From which of the following do you obtain your supplies of fish? Please indicate the percentage of all fish and of tilapia that you obtain from each type of supplier.

<u>ALL FISH</u>	<u>TILAPIA</u>
_____ % importers	_____ % importers
_____ % processing plants	_____ % processing plants
_____ % brokers	_____ % brokers
_____ % wholesalers	_____ % wholesalers
_____ % trader	_____ % trader
_____ % fish farms	_____ % fish farms
_____ % independent jobbers	_____ % independent jobbers
_____ % producers/fishermen	_____ % other, specify:

2.3 Please rank the following general types of customers in order of annual percentage of both all fish products you sell (value) and tilapia? Beginning with (1) representing highest annual percentage sold annually, (2) is 2nd highest sold annually, and so on

<u>ALL FISH</u>	<u>TILAPIA</u>
_____ retail grocers	_____ retail grocers
_____ chain restaurants	_____ chain restaurants
_____ single-unit restaurants	_____ single-unit restaurants
_____ brokers	_____ brokers
_____ traders	_____ traders
_____ exporters	_____ exporters
_____ other distributors	

3. Product Form and Packaging

3.1 Please estimate the annual percentage of sales (value) for the following product forms of all fish and of tilapia (fresh + frozen = 100%):

Product Form	ALL FISH		TILAPIA	
	Fresh	Frozen	Fresh	Frozen
Whole, gutted	%	%	%	%
Fillets, boneless, skin-on	%	%	%	%
Fillets, boneless, skinless	%	%	%	%
Fillets, deep-skinned	%	%	%	%
Fillets, IQF	%	%	%	%
Dried, dressed	%	%	%	%
Smoked, dressed	%	%	%	%

3.2 Please estimate the annual percentage of sales (value) for the portion sizes of fillets that you sell:

Fillet Size	Fresh		Frozen	
	All Fish	Tilapia	All Fish	Tilapia
1-2 oz.				
2-3 oz.				
3-4 oz.				
3-5 oz.				
4 oz.				
4-6 oz.				
5-7 oz.				
5-8 oz.				
6-10 oz.				
Other, specify____ _____ _____				

3.3 Please estimate the annual percentage of sales (value) for the following portion sizes of whole-dressed fish?

<u>ALL FISH</u>		<u>TILAPIA</u>	
_____ 5-7 oz.	_____ 13-15 oz.	_____ 5-7 oz.	_____ 13-15 oz.
_____ 5-9 oz.	_____ 15-17 oz.	_____ 5-9 oz.	_____ 15-17 oz.
_____ 6-20 oz.	_____ 16-20 oz.	_____ 6-20 oz.	_____ 16-20 oz.
_____ 7-9 oz.	_____ 16-28 oz.	_____ 7-9 oz.	_____ 16-28 oz.
_____ 7-13 oz.	_____ 24 + oz.	_____ 7-13 oz.	_____ 24 + oz.
_____ 9-11 oz.	_____ 28-40 oz.	_____ 9-11 oz.	_____ 28-40 oz.
_____ 9-16 oz.	_____ 32 + oz.	_____ 9-16 oz.	_____ 32 + oz.
_____ 11-13 oz.		_____ 11-13 oz.	

3.4 Please estimate the annual percentage of sales (value) for the following box sizes:

<u>ALL FISH</u>		<u>TILAPIA</u>	
_____ %	10 lb.	_____ %	10 lb.
_____ %	15 lb.	_____ %	15 lb.
_____ %	30 lb.	_____ %	30 lb.
_____ %	50 lb.	_____ %	50 lb.
_____ %	6 x 10 lb.	_____ %	6 x 10 lb.
_____ %	12 x 5 lb.	_____ %	12 x 5 lb.
_____ %	8 x 10 lb.	_____ %	8 x 10 lb.

4. TILAPIA MARKET

4.1 Please estimate your total sales volume from tilapia last year?

_____ < \$10,000	_____ \$500,000 - \$749,000
_____ \$11,000 - \$49,000	_____ \$750,000 - \$999,999
_____ \$50,000 - \$99,000	_____ > \$1,000,000
_____ \$100,000 - \$249,999	
_____ \$250,000 - \$499,999	

4.2 Please estimate how frequently you purchased tilapia last year and average size of purchase.

Frequency of Purchase	Indicate with X	Avg. Purchase Amount (lb.
Daily		
Once/week		
Once/month		
nce/year		
Never		

4.3 Please estimate prices paid for the following tilapia products last year.

Product Form	Fresh \$/lb	Frozen \$/lb
Whole, gutted		
Fillets, boneless, skin-on		
Fillets, boneless, skinless		
Fillets, deep-skinned		
Fillets, IQF		
ed dressed		
Smoked, dressed		

4.4 Over the next 2 years, do you expect your tilapia sales to (circle one) increase/decrease/stay the same. By what percentage? _____%.

4.5 Over the next 5 years, do you expect your tilapia sales to (circle one) increase/decrease/stay the same. By what percentage?_____%.

4.6 Based on your own experience, would you expect tilapia sales to increase if:

catfish price increased _____yes _____no

cod price increased _____yes _____no

yes, if (name the fish that you would think would have an effect on tilapia sales) _____.

5.0 CONSTRAINTS TO TILAPIA SALES

5.1 Please list the 3 most important fish sales events during the year for your business? (1) being most important, (2) most important, and so on...

- (1) _____
- (2) _____
- (3) _____

5.2 What advice would you give to tilapia producers about the best approach to ensure continued market growth of farm-raised tilapia?

5.3 Please indicate the (5) main reasons for not handling tilapia, where (1) is the most important to you:

- (1) _____
- (2) _____
- (3) _____
- (4) _____
- (5) _____

5.4 Do you expect to begin to handle tilapia:

- _____ within the next year _____ quantity
- _____ within the next 2 years _____ quantity
- _____ within the next 5 years _____ quantity
- _____ not at all

5.5 What would be the most important incentives or changes that would cause you to begin to handle tilapia?

6.0 GENERAL INFORMATION:

6.1 What category best describes your establishment?

- | | |
|--------------------------------------|---|
| <input type="checkbox"/> importer | <input type="checkbox"/> food service distributor |
| <input type="checkbox"/> broker | <input type="checkbox"/> fish farmer |
| <input type="checkbox"/> trader | <input type="checkbox"/> processor |
| <input type="checkbox"/> wholesaler | <input type="checkbox"/> other, specify: _____ |
| <input type="checkbox"/> distributor | _____ |

6.2 From what sources do you get new product and marketing ideas? (check all that apply):

- | | |
|--|--|
| <input type="checkbox"/> trade press | <input type="checkbox"/> suppliers |
| <input type="checkbox"/> newspaper/magazines | <input type="checkbox"/> distributor sales reps. |
| <input type="checkbox"/> retail customers | <input type="checkbox"/> staff |
| <input type="checkbox"/> other seafood companies | <input type="checkbox"/> other, specify: _____ |
| | _____ |

6.3 What is your annual sales volume (value)?
_____ \$/year

ADDITIONAL COMMENTS:

ADDITIONAL COMMENTS:

Appendix 5
Sensory Evaluation at North Dakota
State University, Fargo, ND and
Brainerd, Minnesota

Sensory Testing of White Fish

Name _____

Date _____

We have prepared 5 kinds of white fish including tilapia for you to sample. Each has been prepared in the oven with a minimum of additional ingredients (lemon juice and butter) to enable the characteristics of the fish to come through. To enable each person to get a representative sample of fish, we have broken up the fillets somewhat and mixed the pieces.

You have before you five samples of these white fish identified by 3-digit numbers. Please indicate how much you like the appearance, flavor, and mouthfeel of each sample, and give your opinion of the overall acceptability of each fish by placing the number from the following scale in the appropriate box to indicate your opinion:

- 9 = Like extremely
- 8 = Like very much
- 7 = Like moderately
- 6 = Like slightly
- 5 = Neither like nor dislike
- 4 = Dislike slightly
- 3 = Dislike moderately
- 2 = Dislike very much
- 1 = Dislike extremely

Sample #	Appearance	Flavor	Mouthfeel	Overall
768				
092				
874				
455				
131				

We welcome your comments (positive or negative) about these fish. Use the back of this sheet if you need more space to write your comments.

Comments:

Thank you for participating in this taste test.