



Potential for Restaurant Markets for Tilapia in Nicaragua

Ivano Neira and Carole Engle
Aquaculture/Fisheries Center
University of Arkansas at Pine Bluff
Pine Bluff, Arkansas, USA

Abstract

Domestic markets for farm-raised tilapia could diversify marketing opportunities for Nicaraguan tilapia growers. The availability of alternatives to the US export market could reduce market-related risks. Three surveys were conducted in Nicaragua from August through September 2000. While the study includes surveys of supermarkets and fish market vendors, this report will focus on the restaurant market survey. A random sample of restaurants in all major urban and rural areas resulted in 118 completed restaurant questionnaires. Data were collected on aspects such as supply characteristics, supply channels, demand characteristics, preferences, and consumption patterns. Results indicated increasing potential sales of tilapia but also revealed problems such as negative perceptions by consumers of tilapia off-flavor, contaminated wild-caught fish, and inconsistency of supply. Tilapia is well known in Nicaragua. It was considered the fourth most important finfish sold, but restaurants were reluctant to admit selling tilapia due to off-flavor and consumer fears related to wild-caught tilapia from Lake Managua. Broad-based consumer education and labeling programs may be necessary to overcome perceptions of contamination. Tilapia farms and processors would need to guarantee and ensure the flavor, quality, and safety of their product. Promotional efforts that emphasize these attributes will be essential.

Introduction

Tilapia were first introduced into Nicaragua in 1969. The first species introduced was *Oreochromis mossambicus* from El Salvador; it was used to stock the reservoirs of Moyúa and Apanás in the northern part of the country. In 1977 *O. aureus* was introduced for research purposes and reservoir stocking. In 1982 *O. niloticus* was imported from Panama by the Universidad Centroamericana (UCA) for experimental purposes. Las Canoas reservoir, stocked with 600,000 tilapia fingerlings in 1986, is connected with the Malacatoya River which occasionally floods into Lake Nicaragua. During Hurricane Juana, in 1988, the gates of Las Canoas reservoir were opened to discharge water. Tilapia escaped to the Malacatoya River and, subsequently, into Lake Nicaragua. Red tilapia were introduced in 1997 but were judged to exhibit inadequate growth (Saavedra, 2000).

Commercial aquaculture has developed slowly

in Nicaragua. Currently there are 2,407 ha of reservoirs utilized for tilapia production. However, low technology and poor management have resulted in inconsistent harvests; a restocking program maintains fish populations for villagers' subsistence (Durand, 1997).

Most of the tilapia farms in Nicaragua are small, approximately 0.01 ha, and are used primarily to produce fish extensively in low volumes for subsistence. Nicaragua is a country with ample resources to develop a farm-raised tilapia culture industry in ponds or in cages in lakes and reservoirs.

No marketing studies have been done on the potential to develop a domestic market for farm-raised tilapia in Nicaragua. Domestic markets would provide stability by offering additional market alternatives that reduce risks associated with one target market. Development of a domestic market would also provide broader economic benefits such as new sources of employment and additional protein



Figure 1. Principal urban centers and small towns in Nicaragua.

sources for Nicaraguans. The purpose of this research is to develop qualitative analyses of restaurant buyers.

Methodology

A comprehensive study was conducted of restaurants in Nicaragua. The restaurant survey instrument designed for Honduras by Engle et al. (2001) was used as a basis for these studies. Interviews were conducted throughout the populated region of Nicaragua in August and September 2000. The Atlantic Coast was not considered because of its low population density and dense rainforest with difficult access. The sampling universe consisted of full-service restaurants registered with the Nicaraguan Institute of Tourism and those listed in the telephone directory. Fast food eating establishments, roast chicken specialty stores, catering shops, and pizza stores were excluded from the sampling universe for the survey. Tables of random numbers were used to select each restaurant in the survey sample. The sample size for the restaurant survey was estimated based on Kinnear and Taylor (1983). Given the similarity in socioeconomic and demo-

graphic characteristics between Honduras and Nicaragua, data from the Honduran surveys conducted in 1999 by Engle et al. (2001) were used to estimate sample standard deviations used to estimate sample size. The interviews were conducted in 62 restaurants in Managua, 5 in Los Pueblos, 7 in Masaya, 5 in Granada, 4 in Boaco, 3 in Jinotega, 4 in Matagalpa, 8 in Estelí, 6 in Chinandega, 8 in León, and 6 in Rivas (Table 1). Thus, 118 restaurant owners were interviewed in Nicaragua. Of these, 82% were located in the South-Central region and 21% in the Northwest region. The greater percentage in the South-Central region corresponds to the higher population density and higher standards of living compared to the Northwest region.

All data were entered into a computer using Survey Pro® software (Apian Software, Inc., Seattle, Washington). The data were cross-tabulated by two regions. The South-Central region comprised the capital, Managua, and the main cities of Rivas, Granada, Masaya, Boaco, Estelí, and Los Pueblos, and the Northwest region comprised Matagalpa, Jinotega, León, and Chinandega (Figure 1). Data were cross-tabulated by locales that sold and did not sell tilapia and by the regional origin of the fish.

Table 1. Location of supermarkets interviewed. Restaurant survey, Nicaragua, 2000.

^a This row indicates the number of respondents who answered this question and the percent these represent of the total number of respondents.

Location	Region of Country			
	South-Central		Northwest	
	N	%	N	%
Managua	62	64	0	0
Masaya	7	7	0	0
Granada	5	5	0	0
Boaco	4	4	0	0
Estelí	8	8	0	0
Los Pueblos	5	5	0	0
Rivas	6	6	0	0
Jinotega	0	0	3	14
Matagalpa	0	0	4	19
Chinandega	0	0	6	29
León	0	0	8	38
Total Respondents ^a	97	82	21	18

Table 2. Number and percent of restaurants that sold fish and seafood. Restaurant survey, Nicaragua, 2000.

^a This row indicates the number of respondents who answered this question and the percent these represent of the total number of respondents.

Category	Region of Country					
	South-Central		Northwest		Total	
	N	%	N	%	N	%
Sold Fish and Seafood	90	93	19	90	109	92
Did Not Sell Fish	7	7	2	10	9	8
Total Respondents ^a	97	82	21	18	118	100

Table 3. Number and percent of restaurants, by years in business. Restaurant survey, Nicaragua, 2000.

^a This row indicates the number of respondents who answered this question and the percent these represent of the total number of respondents.

Years in Business	Region of Country				Total	
	South-Central		Northwest		N	%
	N	%	N	%		
1–10	52	54	10	48	62	52
11–20	15	15	4	19	19	16
21–30	23	24	2	9	25	21
> 30	7	7	5	24	12	10
Total Respondents ^a	97	82	21	18	118	100

Results

Characteristics of Nicaraguan Full-Service Restaurants

The majority (92%) of restaurants in Nicaragua sold fish and seafood (Table 2). Only a small percentage (8%) of the restaurants in the survey did not sell fish. The majority (52%) of restaurants interviewed were new (less than ten years in business) (Table 3). This is likely due to the economic recovery that is occurring following the economic devastation of the war and Hurricane Mitch.

Overall, the majority (69%) of restaurant managers classified their establishment as independent (owned by an individual), 25% reported it to be a family-owned business, and only a few reported it to

Table 4. Number and percent of restaurants, by type of business and by region. Restaurant survey, Nicaragua, 2000.

^a This row indicates the number of respondents who answered this question and the percent these represent of the total number of respondents.

Type of Cuisine	Region of Country					
	South-Central		Northwest		Total	
	N	%	N	%	N	%
Variety	36	37	10	48	46	39
Steak	18	19	5	24	23	19
Chinese	11	11	3	14	14	12
Seafood	9	9	3	14	12	10
Typical	6	6	0	0	6	5
International	6	6	0	0	6	5
Chicken	3	3	0	0	3	2
Italian	2	2	0	0	2	2
French	2	2	0	0	2	2
Spanish	2	2	0	0	2	2
Mexican	2	2	0	0	2	2
Total Respondents ^a	97	82	21	18	118	100

Table 5. Number and percent of restaurants, by type of cuisine and by region. Restaurant survey, Nicaragua, 2000.

^a This row indicates the number of respondents who answered this question and the percent these represent of the total number of respondents.

Type of Cuisine	Region of Country					
	South-Central		Northwest		Total	
	N	%	N	%	N	%
Variety	36	37	10	48	46	39
Steak	18	19	5	24	23	19
Chinese	11	11	3	14	14	12
Seafood	9	9	3	14	12	10
Typical	6	6	0	0	6	5
International	6	6	0	0	6	5
Chicken	3	3	0	0	3	2
Italian	2	2	0	0	2	2
French	2	2	0	0	2	2
Spanish	2	2	0	0	2	2
Mexican	2	2	0	0	2	2
Total Respondents ^a	97	82	21	18	118	100

be an international, national, or regional chain business (Table 4). However, there were apparent regional differences. There were no chains in the

Table 6. Number and percent of restaurants surveyed, by income clientele group and by region. Restaurant survey, Nicaragua, 2000.

^a This row indicates the number of respondents who answered this question and the percent these represent of the total number of respondents.

Income Clientele Group	Region of Country					
	South-Central		Northwest		Total	
	N	%	N	%	N	%
Low	9	9	1	5	10	8
Low-High	2	2	1	5	3	2
Middle-Low	11	11	2	9	13	11
Middle	33	34	10	48	43	36
Middle-High	31	32	5	24	36	30
High	8	8	1	5	9	8
International	3	3	1	5	4	3
Total Respondents ^a	97	82	21	18	118	100

Table 7. Number and percent of restaurants, by seating capacity and by region. Restaurant survey, Nicaragua, 2000.

^a This row indicates the number of respondents who answered this question and the percent these represent of the total number of respondents.

Seating Capacity	Region of Country					
	South-Central		Northwest		Total	
	N	%	N	%	N	%
0–40	13	13	4	19	17	14
41–80	47	48	7	33	54	46
81–120	14	14	8	38	22	19
> 120	23	24	2	9	25	21
Total Respondents ^a	97	82	21	18	118	100

Northwest region. All restaurants that belonged to a chain were located in the South-Central region. The South-Central region also had a higher percentage of family-owned restaurants than did the Northwest region. The majority of the restaurants represented in the survey were locally owned.

Restaurants in the survey included a variety of types of cuisine. Thirty-nine percent of the respondents indicated that they served a variety of types of cuisine, 19% were primarily steak restaurants, 12% served primarily Chinese food, and another 10% of respondents served seafood (Table 5). A few additional restaurants listed international, chicken, Italian, French, Spanish, and Mexican food as their

principal type of cuisine. All of these were located in the South-Central region. Relatively more restaurants in the Northwest region tended to serve a variety of food—steak, Chinese, and seafood—as principal cuisine types than in the South-Central region.

Restaurants included in the survey represented a wide range of income levels of patrons (Table 6). Overall, middle-income patrons were the clientele group most frequently mentioned (36%), and this was followed by upper-middle income patrons (30%). There were no major differences between the two regions.

Seating capacity in the restaurants surveyed ranged from fewer than 40 to more than 120 seats (Table 7). Overall, 46% of respondents reported seating capacities from 41 to 80 seats. This was followed by 21% of respondents who reported having more than 120 seats. There were differences between regions. Restaurants in the South-Central region tended to be smaller. The greatest number of restaurants in the South-Central region had a capacity of 41 to 80 seats while the highest percentage of Northwest restaurants had more than 80 seats.

Weekly sales volumes of restaurants surveyed ranged from less than US\$391 wk⁻¹ (original amounts were converted from Nicaraguan córdobas to US dollars at the prevailing rate of 12.65 córdobas = US\$1) to over \$4,687 wk⁻¹ (Table 8). Sample restaurants represented relatively similar percentages (8 to 17%) of this range of weekly sales volumes, overall. However, there was a proportionally greater percentage of smaller restaurants in the Northwest region

Table 8. Number and percent of restaurants, by overall weekly sales (US\$) and by region. Restaurant survey, Nicaragua, 2000.

^a This row indicates the number of respondents who answered this question and the percent these represent of the total number of respondents.

Overall Weekly Sales (US\$)	Region of Country					
	South-Central		Northwest		Total	
	N	%	N	%	N	%
0-391	13	13	6	29	19	16
392-781	16	16	4	19	20	17
782-1,172	14	14	4	19	18	15
1,173-1,562	9	9	2	10	11	9
1,563-3,125	13	13	2	10	15	13
3,126-4,687	10	10	0	0	10	8
> 4,687	19	20	1	5	20	17
No Answer	3	3	2	10	5	4
Total Respondents ^a	97	82	21	18	118	100

Table 9. Number and percent of restaurants, by percentage of total sales from fish and seafood and by region. Restaurant survey, Nicaragua, 2000.

^a This row indicates the number of respondents who answered this question and the percent these represent of the total number of respondents

Percentage of Total Sales (%)	Region of Country					
	South-Central		Northwest		Total	
	N	%	N	%	N	%
1-10	17	19	5	26	22	20
11-20	14	16	3	16	17	16
21-30	18	20	4	21	22	20
31-40	9	10	4	21	13	12
41-50	8	9	1	5	9	8
51-75	13	14	0	0	13	12
76-100	11	12	2	10	13	12
Total Respondents ^a	90	83	19	17	109	100

than in the South-Central. Conversely, South-Central restaurants tended to be larger than those in the Northwest region. International chains seemed to be larger, with overall weekly sales of \$3,126.

The restaurants surveyed included a wide range of percentages of total sales obtained from fish and seafood (Table 9). Overall, 24% of respondents reported fish and seafood sales that composed more than 50% of their total sales, 20% of respondents reported having fish and seafood sales that comprised 31 to 50% of sales, and over half of the respondents (56%) had fish and seafood sales that com-

prised 1 to 30% of their total sales. There were apparent differences between regions. In the South-Central region, 26% of restaurants had more than 50% of their total sales from fish and seafood when compared to the Northwest region (10%). The Northwest region had a higher percentage (26%) of restaurants that had only 1 to 10% of their total sales from fish and seafood than the Central-South region (19%).

Restaurant managers who never sold any type of fish may have negative attitudes toward specific attributes of fish and seafood. Attitudes toward the

Table 10. Weighted mean ratings of various statements by restaurants that never sold fish, by region. Restaurant survey, Nicaragua, 2000.

^a N = number of respondents.

Attributes	Restaurants that Never Sold Fish				
	South-Central		Northwest		Total
	Mean	N ^a	Mean	N	Mean
Likelihood of Adding Fish to the Menu	3.57	7	5.50	2	4.00
Lack of Equipment and Space	9.00	7	7.50	2	8.67
Difficulty of Adding Fish	6.00	7	5.50	2	5.89
Fish Is Difficult to Prepare	2.43	7	1.50	2	2.22
Fish Can Cause Storage Problems	8.43	7	8.50	2	8.44
Fish Give an Undesirable Odor	5.86	7	5.50	2	5.78
Unreliable Quality Supply	5.83	6	4.50	2	5.50
Fish Is Not Always Available	8.57	7	2.00	2	7.11
Customers Do Not Eat Fish Frequently	7.60	5	9.00	2	8.00
Price Is Too High	5.17	6	6.00	2	5.38
Size Is Too Small	2.29	7	2.50	2	2.33
Tilapia Is Similar to Guapote	3.00	6	9.00	2	4.50
Marine Fish Is Better	6.86	7	9.00	2	7.33
Customers Will Like the Variety that Fish Adds	8.29	7	6.00	2	7.78
Will You Consider Adding Fish the Next Year?	6.29	7	6.50	2	6.33

Table 11. Ranking of top fish and seafood species on the menu, by region. Restaurant survey, Nicaragua, 2000. (A score of 4 means the most important; 1 represents the fourth most important).

^a *Cichlasoma managuense*, a freshwater cichlid native to Nicaragua that is a popular finfish.

Fish or Seafood	Region of Country		
	South-Central	Northwest	Total
Shrimp	2.5	3.2	2.6
Drum	1.9	1.6	1.9
Red Snapper	1.5	2.3	1.6
Black Mussels	0.6	0.9	0.6
Guapote ^a	0.6	0.3	0.6
Tilapia	0.6	0.1	0.5
Lobster	0.3	0.1	0.3
Mahi-mahi	0.3	0.0	0.3
Squid	0.2	0.0	0.2
Snook	0.1	0.5	0.2
Crab	0.1	0.3	0.1
Octopus	0.2	0.0	0.1
Turtle Eggs	0.1	0.3	0.1
Prawn	0.2	0.0	0.1
Shark	0.1	0.1	0.1
Clams	0.1	0.0	0.1
White Snapper	0.1	0.2	0.1
Grouper	0.1	0.0	0.1

likelihood of adding fish to the menu, preparation, storage, odor, supply, availability, customer preference, price, size, and variety of fish and seafood in general were elicited by asking respondents who never sold fish to assign a value from 1 to 10 in response to statements about fish (Table 10). A score of 1 represented complete disagreement with the statement and a score of 10 represented complete agreement, with 5 being a neutral score. The higher the score, the stronger the agreement was with the statement. The highest rating overall was for lack of equipment and space (8.67). This was followed in descending order by negative ratings on the following statements: storage problems (8.44), customers do not eat fish frequently (8), lack of supply (7.11), and likelihood of adding fish to the menu (4). However, there were positive ratings on the statement that customers will like the variety that fish adds (7.78) and disagreement that fish is difficult to prepare (2.22). There were some regional differences. Respondents in the Northwest region rated fish and seafood much lower (2.00 as compared to 8.57) on lack of fish availability than did those in the South-Central region. They also rated it higher (9 compared to 3) on tilapia being similar to guapote. In general, respondents in the Northwest region who did not sell fish

Table 12. The top fish and seafood dishes and appetizers in terms of sales, by region. Restaurant survey, Nicaragua, 2000.

^a This row indicates the number of respondents who answered this question and the percent these represent of the total number of respondents.

Fish and Seafood	Region of Country					
	South-Central		Northwest		Total	
	N	%	N	%	N	%
Breaded Shrimp	13	14	4	21	17	16
Fried Fish	8	9	3	16	11	10
Shrimp Cocktail	7	8	0	0	7	6
Breaded Fish	5	6	2	10	7	6
Shellfish Soup	6	7	1	5	7	6
Garlic Fish	6	7	0	0	6	6
Grilled Fish	5	6	0	0	5	5
Garlic Shrimp	4	4	1	5	5	5
Fish Fingers	3	3	1	5	4	4
Tipitapa-style Fish	4	4	0	0	4	4
Fish Cocktail	3	3	0	0	3	3
Black Mussels	2	2	1	5	3	3
Special Chop Suey	3	3	0	0	3	3
Shrimp Shop Suey	1	1	2	10	3	3
Special Chop Mein	3	3	0	0	3	3
Paella a la Valenciana	3	3	0	0	3	3
Other	14	16	4	21	18	17
Total Respondents ^a	90	83	19	17	109	100

Table 13. Fish and seafood dishes with fastest sales growth in last year, by region. Restaurant survey, Nicaragua, 2000.

^a This row indicates the number of respondents who answered this question and the percent these represent of the total number of respondents.

Fish and Seafood	Region of Country					
	South-Central		Northwest		Total	
	N	%	N	%	N	%
Breaded Shrimp	13	14	5	26	18	16
Fried Fish	7	8	1	5	8	7
Breaded Fish	5	6	2	10	7	6
Grilled Fish	7	8	0	0	7	6
Garlic Fish	6	7	0	0	6	6
Garlic Shrimp	6	7	0	0	6	6
Shellfish Soup	6	7	0	0	6	6
Shrimp Cocktail	4	4	1	5	5	5
Fish Fingers	3	3	1	5	4	4
Fish Cocktail	3	3	0	0	3	3
Black Mussels	2	2	1	5	3	3
Special Chop Suey	3	3	0	0	3	3
Shrimp Chop Suey	1	1	2	10	3	3
Special Chop Mein	3	3	0	0	3	3
Paella a la Valenciana	3	3	0	0	3	3
Tipitapa-style Fish	3	3	0	0	3	3
Other	14	16	5	26	19	17
No Answer	1	1	1	5	2	2
Total Respondents ^a	90	83	19	17	109	100

and seafood tended to have more positive attitudes toward the fish statements than respondents in the South-Central region.

Characteristics of Nicaraguan Fish and Seafood Offered in Restaurants

Restaurant managers were asked to rank the four most popular fish and seafood items in terms of sales in descending order. Weighted averages were calculated in which a score of 4 means the most popular, and 1 represents the least popular (Table 11).

The most popular type of fish and seafood in restaurants was drum (3.5). This was followed by shrimp (3.4), red snapper (2.9), black mussels (1.6), guapote (1.2), and tilapia (1.0). Shrimp and drum were most popular in the South-Central region. In the Northwest region, shrimp and red snapper were the most popular.

Top fish and seafood dishes prepared in restau-

rants were breaded shrimp (16%), fried shrimp (10%), shrimp cocktail (6%), breaded fish (6%), shellfish soup (6%), garlic fish (6%), grilled fish (5%), garlic shrimp (5%), fish fingers (4%), and tipitapa-style fish (4%) (Table 12).

The dishes mentioned most often that exhibited fastest sales growth in the last year were breaded shrimp and fried fish (Table 13). These were followed by breaded fish, grilled fish, garlic fish, garlic shrimp, shellfish soup, shrimp cocktail, fish fingers, and a variety of specialty dishes.

The peak demand period was indicated to be the Easter season, during March and April, by 58% of the respondents (Table 14). Many Nicaraguans and other Latinos traditionally consume fish during the Lenten season. Interestingly, another 27% responded that there was no one peak demand period, and another 13% said that the peak demand period was around Christmas, in December. There were some regional

Table 14. Peak demand season for fish and seafood, by region. Restaurant survey, Nicaragua, 2000.

^a This row indicates the number of respondents who answered this question and the percent these represent of the total number of respondents.

Season	Region of Country					
	South-Central		Northwest		Total	
	N	%	N	%	N	%
March–April (Easter)	50	56	13	68	63	58
No Special Time	27	30	3	16	30	27
December (Christmas)	12	13	2	10	14	13
September–November	0	0	1	5	1	1
Do Not Know	1	1	0	0	1	1
Total Respondents ^a	90	83	19	17	109	100

differences. A higher percentage of restaurants in the Northwest region (68%) indicated that the period of Lent was the peak demand season. Fewer restaurants indicated that there was no particular peak demand period.

Characteristics of Restaurants Selling Tilapia

More than half (52%) of the restaurants in the South-Central region that were selling tilapia had been in business for more than ten years, while 48% had been in business less than ten years (Table 15).

A few (4%) restaurants began to include tilapia on their menus in the late 1980s, but the highest percentage (40%) began to sell tilapia in 1996–1997 (three to four years prior to the survey in 2000). Another 32% of respondents began selling in 1998–1999, while 24% of the respondents had been including tilapia on their menu for five to ten years. Only two restaurants in the Northwest region had begun to include tilapia in the last two years. Both of these were relatively new restaurants. Restaurants that used to sell tilapia exhibited patterns in terms of age of the business similar to those of restaurants that sold and did not sell tilapia.

The survey elicited information on the reasons restaurant managers either stopped selling or never sold tilapia (Table 16). Overall, the most frequently mentioned reason (31% of respondents) for either not selling or having stopped selling tilapia was off-flavor (tastes like earth). Off-flavor was followed in importance by lack of awareness. Twenty-one percent of respondents overall had not heard of tilapia. This reason was followed by mention of the contamination of the lake and lack of supply. Other reasons mentioned included lack of demand, selling only marine fish, negative consumer attitudes, poor consistency after frying, bony, patrons do not like to eat tilapia, size, gas flavor, price too high, and only selling fillets. There were regional differences among those who used to sell tilapia. All the restaurants in

Table 15. Number of years tilapia has been included on the menu, by years restaurant has been in business. Restaurant survey, Nicaragua, 2000.

Years in Business	Number of Years Tilapia Has Been on the Menu									
	> 10		5–10		3–4		1–2		Total	
	N	%	N	%	N	%	N	%	N	%
SOUTH-CENTRAL										
1–10	0	0	3	27	4	36	4	36	11	48
11–20	0	0	1	17	4	67	1	17	6	26
21–30	0	0	2	50	1	25	1	25	4	17
> 30	1	50	0	0	1	50	0	0	2	9
Subtotal	1	4	6	26	10	44	6	26	23	100
NORTHWEST										
1–10	0	0	0	0	0	0	1	50	1	50
11–20	0	0	0	0	0	0	1	50	1	50
21–30	0	0	0	0	0	0	0	0	0	0
> 30	0	0	0	0	0	0	0	0	0	0
Subtotal	0	0	0	0	0	0	2	100	2	100
TOTAL RESPONDENTS	1	4	6	24	10	40	8	32	25	100

Table 16. Reasons why restaurant managers stopped selling or never sold tilapia, by region. Restaurant survey, Nicaragua, 2000.

^a Responses represent individual answers, not respondents. Multiple answers (responses) can result in percentage totals over 100%.

Reasons for Not Selling Tilapia	Region of Country													
	South-Central						Northwest						Total	
	Used to Sell		Never Sold		Subtotal		Used to Sell		Never Sold		Subtotal			
	N	% ^a	N	%	N	%	N	%	N	%	N	%	N	%
Tastes Like Earth	8	50	13	25	21	31	3	100	2	14	5	29	26	31
Have Not Heard of It	0	0	9	18	9	13	0	0	9	64	9	53	18	21
Contamination of Lake	1	6	10	20	11	16	1	33	2	14	3	18	14	17
Lack of Supply	2	12	9	18	11	16	0	0	3	21	3	18	14	17
Lack of Demand	0	0	7	14	7	10	0	0	2	14	2	12	9	11
Only Sell Marine Fish	1	6	4	8	5	7	0	0	4	29	4	24	9	11
Negative Consumer Attitudes	2	12	3	6	5	7	1	33	0	0	1	6	6	7
Poor Texture after Frying	3	19	1	2	4	6	0	0	0	0	0	0	4	5
Bony	1	6	2	4	3	4	0	0	0	0	0	0	3	4
Patrons Do Not Like to Eat It	1	6	2	4	3	4	0	0	0	0	0	0	3	4
Fish Is Too Small	0	0	2	4	2	3	0	0	0	0	0	0	2	2
Tastes Like Gas	0	0	1	2	1	1	0	0	0	0	0	0	1	1
Price Is Too High	0	0	1	2	1	1	0	0	0	0	0	0	1	1
Only Work with Fillets	0	0	1	2	1	1	0	0	0	0	0	0	1	1

Table 17. Likelihood to begin selling tilapia the next year, by the type of business and by region. Restaurant survey, Nicaragua, 2000.

^a This row indicates the number of respondents who answered this question and the percent these represent of the total number of respondents.

^b Percentage rounded.

Region of Country	Type of Business											
	Independent		Family-Owned		International Chain		National Chain		Regional Chain		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
SOUTH-CENTRAL												
Very Likely	27	61	13	76	3	75	1	100	1	100	45	67
Somewhat Likely	9	20	2	12	1	25	0	0	0	0	12	18
Somewhat Unlikely	2	4	1	6	0	0	0	0	0	0	3	4
Very Unlikely	6	14	1	6	0	0	0	0	0	0	7	10
Subtotal ^a	44	99 ^b	17	100	4	100	1	100	1	100	67	99 ^b
NORTHWEST												
Very Likely	7	50	2	67	0	0	0	0	0	0	9	53
Somewhat Likely	5	36	1	33	0	0	0	0	0	0	6	35
Somewhat Unlikely	1	7	0	0	0	0	0	0	0	0	1	6
Do Not Know	1	7	0	0	0	0	0	0	0	0	1	6
Subtotal ^a	14	100	3	100	0	0	0	0	0	0	17	100
TOTAL NUMBER OF RESPONSES ^a	58	69	24	20	4	5	1	1	1	1	84	100

the Northwest who used to sell tilapia stated that off-flavor was the reason they stopped, while only half of the responses were off-flavor for restaurants in the South-Central region. In the South-Central region,

poor texture after frying, lack of supply, and negative consumer attitudes were also important. Of those who never sold tilapia in the Northwest, the majority of responses (64%) were that they had not heard of

Table 18. Number and percent of restaurants, by type of business and by region. Restaurant survey, Nicaragua, 2000.

Region of Country	Type of Business											
	Independent		Family-Owned		International Chain		National Chain		Regional Chain		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
SOUTH-CENTRAL												
Sold Tilapia	15	65	6	26	0	0	1	4	1	4	23	24
Used to Sell Tilapia	10	62	5	31	0	0	0	0	1	6	16	16
Never Sold Tilapia	34	67	12	23	4	8	1	2	0	0	51	53
Did Not Sell Fish	5	71	2	29	0	0	0	0	0	0	7	7
Subtotal	64	66	25	26	4	4	2	2	2	2	97	82
NORTHWEST												
Sold Tilapia	2	100	0	0	0	0	0	0	0	0	2	9
Used to Sell Tilapia	3	100	0	0	0	0	0	0	0	0	3	14
Never Sold Tilapia	11	79	3	21	0	0	0	0	0	0	14	67
Did Not Sell Fish	1	50	1	50	0	0	0	0	0	0	2	9
Subtotal	17	81	4	19	0	0	0	0	0	0	21	18
TOTAL	81	69	29	25	4	3	2	2	2	2	118	100

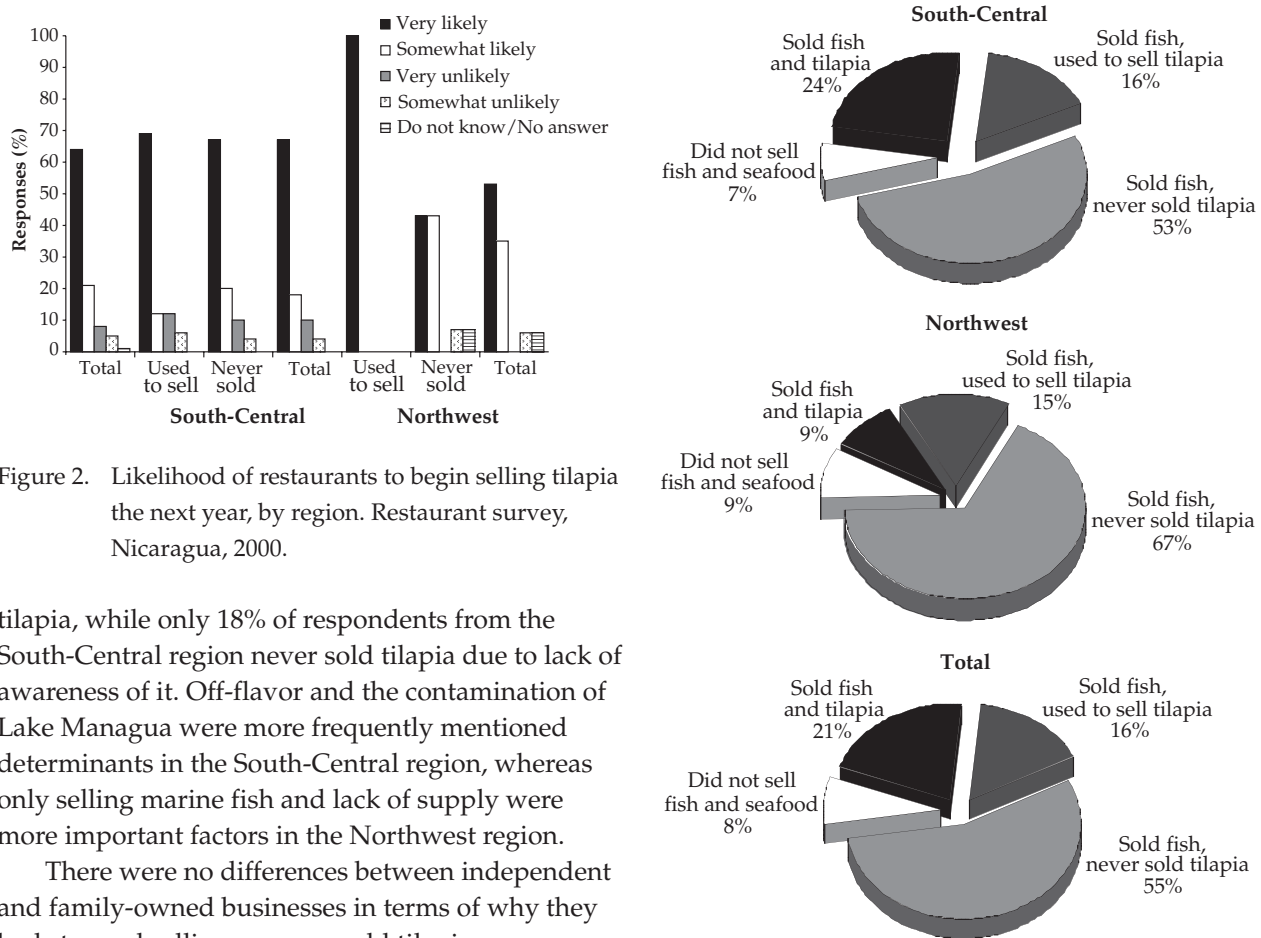


Figure 2. Likelihood of restaurants to begin selling tilapia the next year, by region. Restaurant survey, Nicaragua, 2000.

tilapia, while only 18% of respondents from the South-Central region never sold tilapia due to lack of awareness of it. Off-flavor and the contamination of Lake Managua were more frequently mentioned determinants in the South-Central region, whereas only selling marine fish and lack of supply were more important factors in the Northwest region.

There were no differences between independent and family-owned businesses in terms of why they had stopped selling or never sold tilapia.

Overall, 64% of the respondents were very likely and 21% somewhat likely to begin selling tilapia the next year if they had a consistent tilapia supply and could get a farm-raised tilapia product differentiated

Figure 3. Percentages of restaurants that sold fish and seafood, sold tilapia, used to sell tilapia, and never sold tilapia, by region. Restaurant survey, Nicaragua, 2000.

Table 19. Number and percent of restaurants, by kind of food served and by region. Restaurant survey, Nicaragua, 2000.

^a N = number of respondents.

Region of Country	Type of Cuisine												Total N										
	Variety		Steak		Chinese		Seafood		Typical		International			Chicken		Italian		French		Spanish		Mexican	
	N	%	N	%	N	%	N	%	N	%	N	%		N	%	N	%	N	%	N	%	N	%
SOUTH-CENTRAL																							
Sold Tilapia	8	35	5	22	5	22	2	9	2	9	1	4	0	0	0	0	0	0	0	0	0	0	23
Used to Sell Tilapia	7	44	3	19	1	6	1	6	1	6	2	12	0	0	0	0	0	0	1	6	0	0	16
Never Sold Tilapia	19	37	8	16	5	10	6	12	2	4	3	6	2	4	2	4	2	4	1	2	1	2	51
Did Not Sell Fish	2	29	2	29	0	0	0	0	1	14	0	0	1	14	0	0	0	0	1	14	0	0	7
Subtotal	36	37	18	19	11	11	9	9	6	6	6	6	3	3	2	2	2	2	2	2	2	2	97
NORTHWEST																							
Sold Tilapia	1	50	1	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Used to Sell Tilapia	1	33	1	33	1	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Never Sold Tilapia	7	50	2	14	2	14	3	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
Did Not Sell Fish	1	50	1	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Subtotal	10	48	5	24	3	14	3	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21
TOTAL	46	39	23	19	14	12	12	10	6	5	6	5	3	2	2	2	2	2	2	2	2	2	118

Table 20. Number and percent of restaurants, by income clientele group and by region. Restaurant survey, Nicaragua, 2000.

^a N = number of respondents.

Region of Country	Type of Business										Total N %					
	Low		Low-High		Middle-Low		Middle		Middle-High				High		International	
	N ^a	%	N	%	N	%	N	%	N	%			N	%	N	%
SOUTH-CENTRAL																
Sold Tilapia	1	4	1	4	4	17	10	43	4	17	1	4	2	9	23	24
Used to Sell Tilapia	1	6	0	0	3	19	4	25	7	44	1	6	0	0	16	16
Never Sold Tilapia	6	12	1	2	4	8	17	33	16	31	6	12	1	2	51	53
Did Not Sell Fish	1	14	0	0	0	0	2	29	4	57	0	0	0	0	7	7
Subtotal	9	9	2	2	11	11	33	34	31	32	8	8	3	3	97	82
NORTHWEST																
Sold Tilapia	0	0	0	0	0	0	1	50	1	50	0	0	0	0	2	9
Used to Sell Tilapia	0	0	0	0	0	0	2	67	1	33	0	0	0	0	3	14
Never Sold Tilapia	0	0	1	7	2	14	6	43	3	21	1	7	1	7	14	67
Did Not Sell Fish	1	50	0	0	0	0	1	50	0	0	0	0	0	0	2	9
Subtotal	1	5	1	5	2	9	10	48	5	24	1	5	1	5	21	18
TOTAL	10	8	3	2	13	11	43	36	36	30	9	8	4	3	118	100

from wild-caught tilapia (Figure 2). An additional 8% of the restaurants were very unlikely, and 5% somewhat unlikely, to begin selling tilapia the next year. More respondents in the South-Central region (67%) were very likely to sell tilapia the next year compared to the Northwest region (53%), but more Northwest respondents (35%) selected somewhat likely as their response than did respondents in the South-Central region (18%). There were no apparent differences in the likelihood of selling tilapia the next year between respondents in the South-Central region that used to sell and never sold tilapia. However, restaurants in the Northwest that had never sold tilapia rated their

likelihood of selling tilapia as less likely than those who used to sell tilapia.

Independent and family-owned restaurants were more likely to start selling tilapia the next year in the South-Central region than in the Northwest region (Table 17). All chains (international, national, and regional) indicated that they were either very or somewhat likely to add tilapia the next year.

Tilapia Sales

Only 21% of the restaurants sold tilapia (Figure 3). Sixteen percent used to sell tilapia, and 8% did not

Table 21. Number and percent of restaurants, by seating capacity and by region. Restaurant survey, Nicaragua, 2000.

Region of Country	Seating Capacity								
	0-40		41-80		81-120		120-800		Weighted Average
	N	%	N	%	N	%	N	%	
SOUTH-CENTRAL									
Sold Tilapia	6	26	9	39	1	4	7	30	173
Used to Sell Tilapia	0	0	11	69	2	12	3	19	140
Never Sold Tilapia	6	12	24	47	9	18	12	23	156
Did Not Sell Fish	1	14	3	43	2	29	1	14	123
Subtotal	13	13	47	48	14	14	23	24	155
NORTHWEST									
Sold Tilapia	0	0	1	50	1	50	0	0	80
Used to Sell Tilapia	1	33	1	33	1	33	0	0	60
Never Sold Tilapia	3	21	5	36	5	36	1	7	94
Did Not Sell Fish	0	0	0	0	1	50	1	50	280
Subtotal	4	19	7	33	8	38	2	9	106
TOTAL	17	14	54	46	22	19	25	21	146

Table 22. Number and percent of restaurants, by overall weekly sales (US\$) and by region. Restaurant survey, Nicaragua, 2000.

^a N = number of respondents.

Region of Country	Overall Weekly Sales (US\$)												No Answer	Weighted Average			
	0-391		392-781		782-1,172		1,173-1,562		1,563-3,125		3,126-4,687				4,688-39,000		
	N ^a	%	N	%	N	%	N	%	N	%	N	%			N	%	
SOUTH-CENTRAL																	
Sold Tilapia	4	17	3	13	1	4	1	4	3	13	3	13	6	26	2	9	7,367
Used to Sell Tilapia	1	6	4	25	2	12	3	19	2	12	1	6	2	12	1	6	4,059
Never Sold Tilapia	7	14	8	16	10	20	4	8	8	16	5	10	9	18	0	0	5,023
Did Not Sell Fish	1	14	1	14	1	14	1	14	0	0	1	14	2	29	0	0	7,246
Subtotal	13	13	16	16	14	14	9	9	13	13	10	10	19	20	3	3	5,558
NORTHWEST																	
Sold Tilapia	1	50	1	50	0	0	0	0	0	0	0	0	0	0	0	0	391
Used to Sell Tilapia	1	33	0	0	1	33	0	0	0	0	0	0	0	0	1	33	587
Never Sold Tilapia	3	21	3	21	3	21	1	7	2	14	0	0	1	7	1	7	2,552
Did Not Sell Fish	1	50	0	0	0	0	1	50	0	0	0	0	0	0	0	0	782
Subtotal	6	29	4	19	4	19	2	10	2	10	0	0	1	5	2	10	1,931
TOTAL	19	16	20	17	18	15	11	9	15	13	10	8	20	17	5	4	4,948

sell fish or seafood of any kind. A higher percentage (24%) of respondents in the South-Central region sold tilapia as compared to only 9% of respondents in the Northwest region. There were fewer restaurants that had never sold tilapia (53%) in the South-Central region as compared to 67% in the Northwest. There were similar percentages of restaurants that used to sell tilapia in the two regions. There were no appar-

ent differences between and within regions for restaurants located in town and out of town in terms of selling, used to sell, never sold tilapia, and never sold fish.

There were no apparent differences by type of ownership between restaurants that sold, used to sell, never sold tilapia, and never sold fish in the South-Central region (Table 18). The only restaurants

Table 23. Number and percent of restaurants, by percentage of total sales from fish and seafood and by region. Restaurant survey, Nicaragua, 2000.

^a N = number of respondents

Region of Country	Percentage of Total Sales (%)											Weighted Average			
	1-10		11-20		21-30		31-40		41-50		51-75		76-100		
	N ^a	%	N	%	N	%	N	%	N	%	N		%	N	%
SOUTH-CENTRAL															
Sold Tilapia	3	13	3	13	7	30	2	9	2	9	2	9	4	17	39
Used to Sell Tilapia	3	19	3	19	1	6	0	0	0	0	7	44	2	12	44
Never Sold Tilapia	11	22	8	16	10	20	7	14	6	12	4	8	5	10	33
Subtotal	17	19	14	16	18	20	9	10	8	9	13	14	11	12	36
NORTHWEST															
Sold Tilapia	0	0	1	50	1	50	0	0	0	0	0	0	0	0	21
Used to Sell Tilapia	0	0	1	33	1	33	0	0	1	33	0	0	0	0	29
Never Sold Tilapia	5	36	1	7	2	14	4	29	0	0	0	0	2	14	30
Subtotal	5	26	3	16	4	21	4	21	1	5	0	0	2	10	29
TOTAL	22	20	17	16	22	20	13	12	9	8	13	12	13	12	35

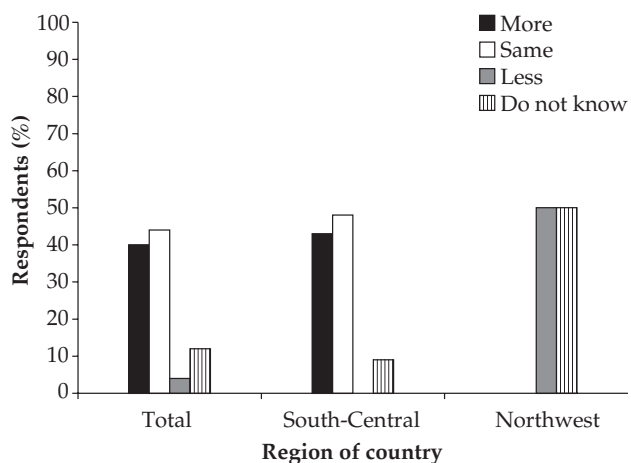


Figure 4. Current sales of tilapia compared to the previous year, by region. Restaurant survey, Nicaragua, 2000.

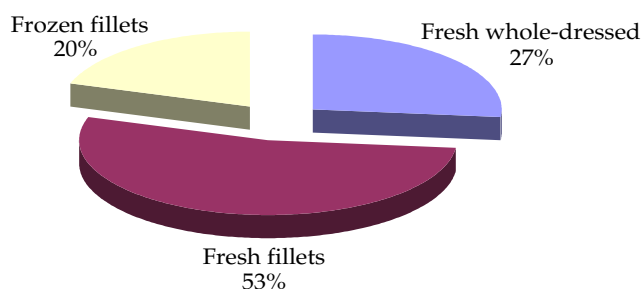


Figure 5. Preferred tilapia product forms by restaurant managers. Restaurant survey, Nicaragua, 2000.

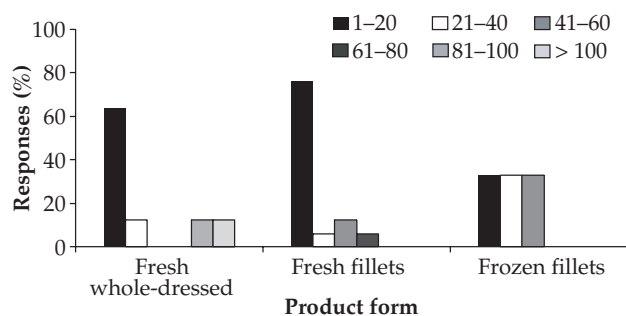


Figure 6. Volume sold (lb wk⁻¹) in Nicaragua, by tilapia form. Restaurant survey, Nicaragua, 2000.

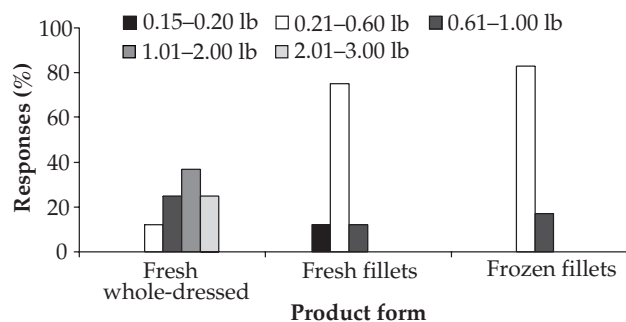


Figure 7. Size (lb) of tilapia purchased in Nicaragua, by product form. Restaurant survey, Nicaragua, 2000.

Table 24. Forms of preparation of tilapia, by region. Restaurant survey, Nicaragua, 2000.

^a Responses represent individual answers, not respondents. Multiple answers (responses) can result in percentage totals over 100%.

Forms of Preparation	Region of Country					
	South-Central		Northwest		Total	
	N	% ^a	N	%	N	%
Breaded	12	52	2	100	14	56
Grilled	11	48	1	50	12	48
Ceviche (marinated fish with lime)	8	35	0	0	8	32
Fried	6	26	1	50	7	28
Garlic	5	22	1	50	6	24
Boiled	5	22	0	0	5	20
Soup	4	17	0	0	4	16
Baked	2	9	0	0	2	8
Blackened	2	9	0	0	2	8
Boneless	2	9	0	0	2	8
Onion	2	9	0	0	2	8
Prepared to Order	2	9	0	0	2	8
Sauce	1	4	1	50	2	8

Table 25. Ways to serve tilapia, by region. Restaurant survey, Nicaragua, 2000.

^a Responses represent individual answers, not respondents. Multiple answers (responses) can result in percentage totals over 100%.

Ways to Serve Tilapia	Region of Country					
	South-Central		Northwest		Total	
	N	% ^a	N	%	N	%
Entrée	18	64	2	100	20	80
Appetizer	9	32	0	0	9	36
Soup	1	14	0	0	1	4

in the Northwest region that sold tilapia were independently owned, whereas independents, family-owned, and national and regional chains sold tilapia in the South-Central region. However, none of the international chain restaurants had ever sold tilapia. A higher percentage of independent restaurants appeared to be selling tilapia than chains.

Restaurants that sold tilapia in South-Central Nicaragua tended to be local restaurants having as primary sales characteristic Nicaraguan food, such as variety foods, steaks, Chinese, seafood, and typical Nicaraguan (Table 19). In the Northwest region, primary sales were of local foods and steak.

Restaurants that used to sell and sold tilapia in the Northwest region characterized their customers

Table 26. Tilapia prices and size, by product form. Restaurant survey, Nicaragua, 2000.

Product Size (lb)	Price (US\$ lb ⁻¹)	
	Average	Range
FRESH WHOLE-DRESSED		
0.40	0.63	0.47–0.80
0.80	0.87	0.47–1.20
1.50	0.78	0.47–1.20
2.50	0.58	0.47–0.80
FRESH FILLETS		
0.18	1.17	0.81–1.20
0.40	1.44	0.47–2.40
0.80	1.60	1.21–2.00
FROZEN FILLETS		
0.40	1.59	0.81–2.00
0.80	1.72	1.61–2.00

as middle and upper-middle income only (Table 20). Restaurants that sold tilapia in both regions tended to have more seating capacity than restaurants that used to sell and never sold tilapia (Table 21).

Restaurants that sold tilapia in the South-Central region tended to have more sales per week than restaurants that used to sell and never sold tilapia (Table 22). There were some differences within regions. Forty-four percent of the restaurants that sold tilapia in the South-Central region mentioned

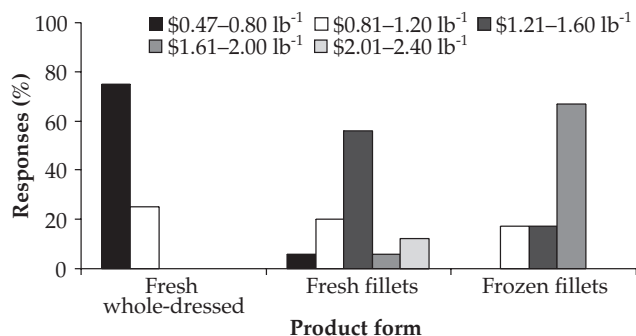


Figure 8. Supplier price of tilapia (US\$ lb⁻¹) in Nicaragua, by product form. Restaurant survey, Nicaragua, 2000.

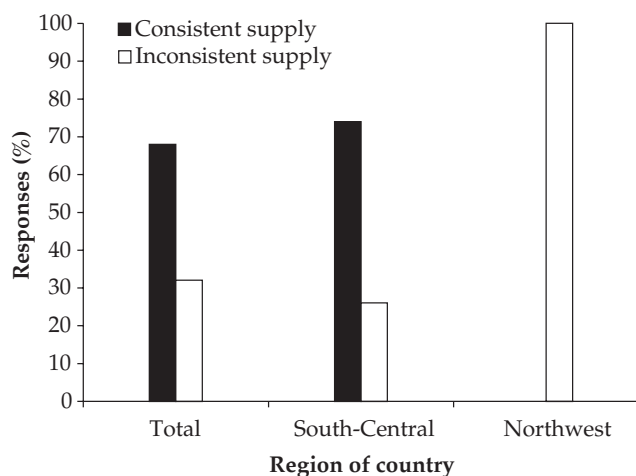


Figure 9. Consistency of tilapia supply, by region. Restaurant survey, Nicaragua, 2000.

that they had fish and seafood sales greater than 30% of their total sales, while in the Northwest, restaurants that sold tilapia had seafood sales that composed 11 to 30% of their total sales (Table 23).

Restaurant managers were asked whether their sales of tilapia were greater, lower, or the same as compared to the previous year (Figure 4). The most frequent response (44%) was that sales had remained stable. Forty percent of the respondents indicated that they were selling more tilapia compared to one year ago, and only 4% said they were selling less.

The most popular tilapia product form reported by the respondents was fresh tilapia fillets (53%), followed by fresh whole-dressed tilapia (27%) and frozen tilapia fillets (20%) (Figure 5). There was little difference by region.

Volumes of tilapia sold were generally low

(Figure 6). Of the restaurants that purchased fresh tilapia fillets, three-quarters (75%) sold 1 to 20 lb wk⁻¹, 12% reported that they sold 41 to 60 lb wk⁻¹, 6% reported selling 61 to 80 lb wk⁻¹ and another 6% mentioned sales of 21 to 40 lb wk⁻¹. Of the respondents that purchased fresh whole-dressed tilapia, 63% of respondents purchased 1 to 20 lb wk⁻¹, while a few others purchased volumes that ranged from 21 to over 100 lb wk⁻¹. Of the restaurants that purchased frozen tilapia fillets, one-third (33%) each required 1 to 20 lb wk⁻¹, 21 to 40 lb wk⁻¹, and 41 to 60 lb wk⁻¹.

The most frequently mentioned size (75%) of fresh tilapia fillets was between 0.21 and 0.60 lb fillet⁻¹ (Figure 7). This was followed by 0.15 to 0.20 lb fillet⁻¹ (12%), and 0.61 to 1.00 lb fillet⁻¹ (12% of the restaurants interviewed). Of the respondents who purchased fresh whole-dressed tilapia, 37% of respondents purchased product of 1.01 to 2.00 lb, 25% purchased 0.61 to 1.00 lb product, 25% purchased 2.01 to 3.00 lb product, and another 12% of respondents purchased small whole-dressed tilapia of 0.21 to 0.40 lb. Eighty-three percent of the restaurant managers who purchased frozen tilapia fillets purchased 0.21 to 0.60 lb fillets and 17% reported purchases of 0.61 to 1.00 lb fillets.

More than half of the respondents (56%) prepared breaded tilapia to serve in the restaurants (Table 24). This was followed by grilled (48%), ceviche (32%), fried (28%), garlic (24%), boiled (20%), and soup (16%). Less frequently mentioned forms of preparation included baked, blackened, boneless, onion, and prepared to order of the customer. Breaded, grilled, fried, and garlic were the only forms of tilapia preparation used in the Northwest region.

Eighty percent of the respondents served tilapia as the main dish and 36% of respondents served tilapia as an appetizer (Table 25). An additional 4% also served it as soup. In the Northwest region it was served only as a main dish.

Supply of Tilapia

The most frequently reported price range was between \$1.21 and 1.60 lb⁻¹ (40% of respondents) (Figure 8). Of the restaurants that purchased fresh tilapia fillets, more than half of the respondents (56%) paid between \$1.21 and 1.60 lb⁻¹, while another 19%

Table 27. Problems indicated with the supply of tilapia, by region. Restaurant survey, Nicaragua, 2000.

^a Responses represent individual answers, not respondents. Multiple answers (responses) can result in percentage totals over 100%.

Supply Problems	Region of Country					
	South-Central		Northwest		Total	
	N	% ^a	N	%	N	%
Availability of Preferred Sizes	5	83	0	0	5	62
Insufficient Quantity	2	33	1	50	3	38
Unavailable at Certain Times of the Year	1	17	0	0	1	12
Unreliable Quality of Product	0	0	1	50	1	12
Inconveniently-Sized Purchase Lots	1	17	0	0	1	12

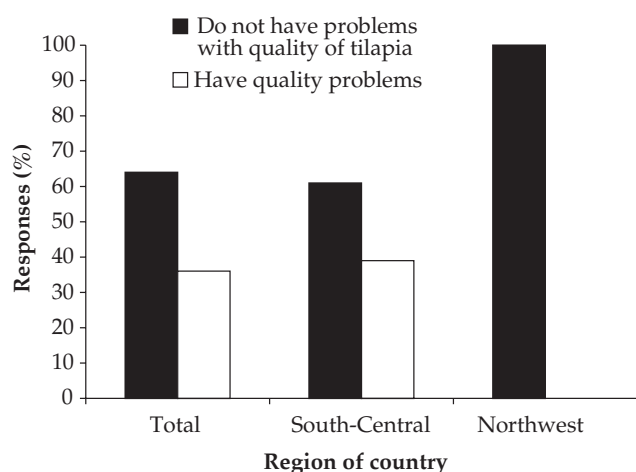


Figure 10. Problems with quality of tilapia, by region. Restaurant survey, Nicaragua, 2000.

paid \$0.81 to 1.20 lb⁻¹. The most frequently reported (75%) price of fresh whole-dressed tilapia was between \$0.47 and 0.80 lb⁻¹, while that of frozen tilapia fillets (67%) was \$1.61 to 2.00 lb⁻¹.

Product size is apparently correlated with the price of tilapia (Table 26). When the size of the whole fish increased, the price per pound decreased. When the size of the fresh or frozen fillet increased, the price per pound increased.

More than two-thirds of the respondents (68%) indicated that their supply of tilapia has been consistent (Figure 9). However, while only one-fourth of respondents (24%) in the South-Central region reported inconsistent tilapia supplies, all respondents in the Northwest region reported problems with the consistency of tilapia supply.

The most commonly mentioned problems with the supply of tilapia were the availability of preferred

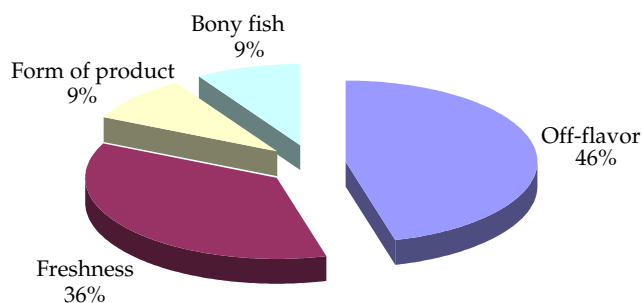


Figure 11. Problems indicated with the quality of tilapia by the South-Central region. Restaurant survey, Nicaragua, 2000.

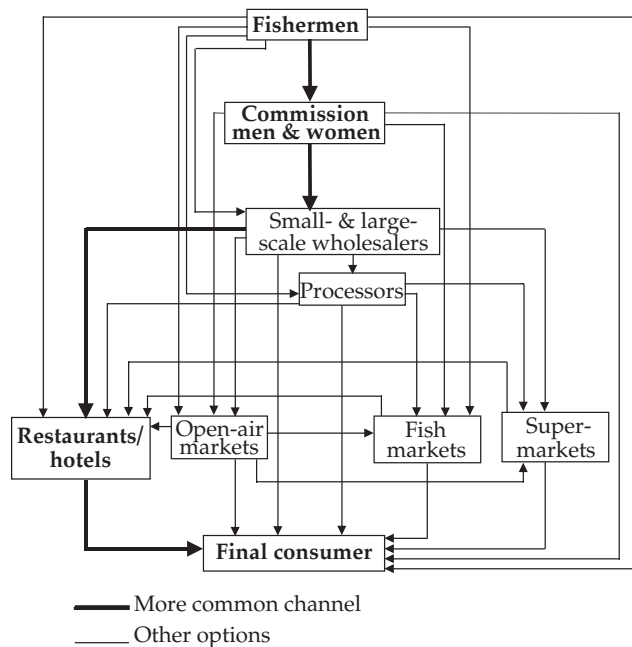


Figure 12. Market channels for wild-caught tilapia in Nicaragua. Restaurant survey, Nicaragua, 2000.

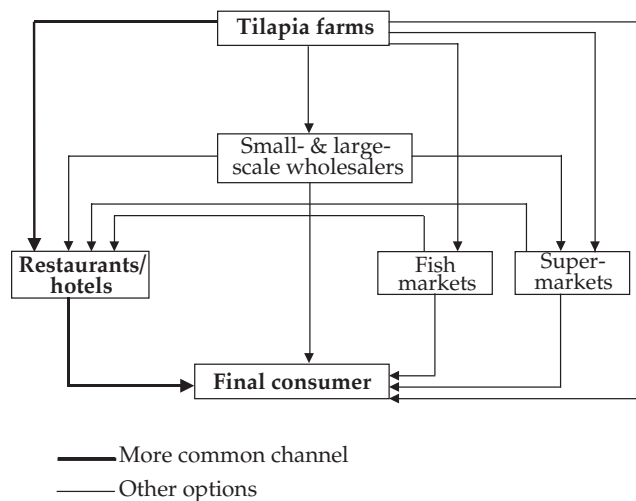


Figure 13. Market channels for farm-raised tilapia in Nicaragua. Restaurant survey, Nicaragua, 2000.

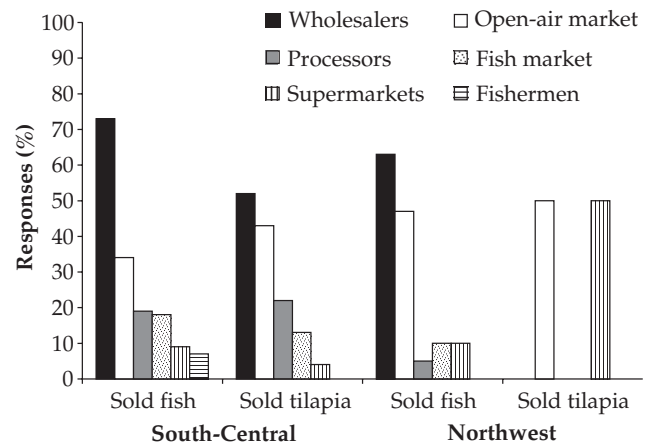


Figure 14. Type of fish and seafood suppliers in Nicaragua, by region. Restaurant survey, Nicaragua, 2000.

Table 28. City of origin of fish and seafood suppliers, by region. Restaurant survey, Nicaragua, 2000.

^a Responses represent individual answers, not respondents. Restaurants utilized a variety of different suppliers. Multiple answers (responses) can result in percentage totals over 100%.

Origin of Suppliers	Region of Country					
	South-Central		Northwest		Total	
	N	% ^a	N	%	N	%
Managua	60	67	1	5	61	56
Chinandega	23	26	15	79	38	35
Rivas	23	26	1	5	24	22
Atlantic Coast	22	24	1	5	23	21
León	8	9	8	42	16	15
Masaya	13	14	0	0	13	12
Granada	7	8	0	0	7	6
Pacífico	5	6	1	5	6	5
Carazo	6	7	0	0	6	5
Rio San Juan	4	4	0	0	4	4
Boaco	3	3	0	0	3	3
Estelí	1	1	0	0	1	1
Jinotega	0	0	1	5	1	1
No Answer	1	1	0	0	1	1

sizes (62%) and insufficient quantity (38%) (Table 27). These responses were followed in descending order of importance by availability at certain times of the year (12%), unreliable quality (12%), and inconveniently sized purchase lots (12%). In the Northwest

region, the restaurant managers' only reported problems were related to insufficient quantities and the unreliable quality of the product.

Sixty-four percent of the respondents indicated that they did not have problems with the quality of tilapia purchased, and 36% said they did experience problems with the quality of tilapia purchased (Figure 10). The restaurants that mentioned quality problems were located in the South-Central region, and the most frequently cited problems were off-flavor (earthy flavor) and lack of freshness (Figure 11). Other problems such as the form of the product and boniness were mentioned.

None of the respondents used any type of promotion to sell tilapia. Many restaurants listed fish fillets on the menu without specifying the species of fish sold. Only the highest-quality restaurants typically included species of fish. Even these restaurants were known to substitute other fish available in the market for that listed on the menu.

Market Channels for Tilapia

Marketing channels for wild-caught tilapia in Nicaragua are complex but represent the network linking the fisherman to the final consumer (Figure 12). Marketing channels for all species follow similar movements as the fish pass from producer to consumer. Some fishermen are able to integrate vertically by selling harvested fish to small- and large-scale wholesalers, to processors, to restaurants, to

Table 29. Number of tilapia suppliers, by region. Restaurant survey, Nicaragua, 2000.

^a Responses represent individual answers, not respondents. Restaurants utilized a variety of different suppliers. Multiple answers (responses) can result in percentage totals over 100%.

Origin of Suppliers	Region of Country										
	South-Central					Northwest				Total	
	1 or 2 Suppliers		> 3 Suppliers		Total		1 or 2 Suppliers		N	%	
N	% ^a	N	%	N	%	N	%				
Managua	12	71	5	29	17	61	0	0	17	68	
Masaya	3	60	2	40	5	18	0	0	5	20	
León	1	6	0	0	1	4	1	50	2	8	
Granada	1	6	1	14	2	7	0	0	2	8	
Rio San Juan	0	0	1	14	1	4	0	0	1	4	
Carazo	1	6	0	0	1	4	0	0	1	4	
Boaco	0	0	1	14	1	4	0	0	1	4	
Jinotega	0	0	0	0	0	0	1	50	1	4	

Table 30. Means of transporting fish and seafood to restaurants, by cost and by region. Restaurant survey, Nicaragua, 2000.

Cost (US\$ per trip)	Means of Transport									
	Own Car		Delivered by Supplier		Taxi		Contracted Transport		Total	
	N	%	N	%	N	%	N	%	N	%
ALL FISH AND SEAFOOD										
<i>South-Central</i>										
None/Cost Included in Price	20	31	47	69	0	0	0	0	67	74
0.47–1.56	7	88	0	0	1	13	0	0	8	9
1.64–6.25	7	78	0	0	1	11	1	11	9	10
6.33–23.44	3	100	0	0	0	0	0	0	3	3
23.52–46.88	3	100	0	0	0	0	0	0	3	3
Subtotal	40	44	47	52	2	2	1	1	90	83
<i>Northwest</i>										
None/Cost Included in Price	5	36	9	64	0	0	0	0	14	74
0.47–1.56	2	67	0	0	1	33	0	0	3	16
1.64–6.25	1	100	0	0	0	0	0	0	1	5
6.33–23.44	1	100	0	0	0	0	0	0	1	5
23.52–46.88	0	0	0	0	0	0	0	0	0	0
Subtotal	9	47	9	47	1	5	0	0	19	17
Total	49	45	56	51	3	3	1	1	109	100
TILAPIA										
<i>South-Central</i>										
None/Cost Included in Price	7	37	13	63	0	0	0	0	19	83
0.47–1.56	2	100	0	0	0	0	0	0	2	9
1.64–6.25	2	100	0	0	0	0	0	0	2	9
Subtotal	11	52	12	48	0	0	0	0	23	92
<i>Northwest</i>										
None/Cost Included in Price	1	100	0	0	0	0	0	0	1	50
0.47–1.56	0	0	0	0	1	100	0	0	1	50
Subtotal	1	50	0	0	1	50	0	0	2	8
Total	12	48	12	48	1	4	0	0	25	100

Table 31. Weighted mean ratings of various attributes of tilapia, by region. Restaurant survey, Nicaragua, 2000.

^a N = number of respondents.

Attributes	Sold Tilapia					Used to Sell Tilapia					Never Sold Tilapia					Total
	South-Central		Northwest		Total	South-Central		Northwest		Total	South-Central		Northwest		Total	Mean
	Mean	N ^a	Mean	N	Mean	Mean	N	Mean	N	Mean	Mean	N	Mean	N	Mean	
Reliable Supply	8.14	21	5.50	2	7.91	6.89	9	10.00	2	7.46	6.69	26	5.50	4	6.53	7.19
Available	8.74	23	5.50	2	8.48	7.09	11	10.00	2	7.54	6.33	30	4.50	8	5.95	7.05
Consumers Like to Eat	8.09	23	10.00	2	8.24	3.62	13	2.00	3	3.31	2.88	17	4.00	3	3.05	5.25
High Quality Fish	8.91	23	10.00	2	9.00	7.33	15	6.00	3	7.11	6.76	34	6.29	7	6.68	7.46
Little Fishy Odor	8.05	22	5.50	2	7.83	6.93	14	9.00	2	7.19	6.78	27	6.67	3	6.77	7.23
Tastes Like Earth	5.04	23	4.50	2	5.00	7.64	14	7.00	3	7.53	6.48	33	5.60	5	6.37	6.18
Nice Fresh Flavor	8.73	22	9.50	2	8.79	7.46	13	7.67	3	7.50	6.61	31	5.40	5	6.44	7.41
Easy to Prepare	9.43	23	10.00	2	9.48	8.88	16	7.00	3	8.58	8.94	47	8.14	0	8.75	9.01
Price Is Too High	3.86	22	2.50	2	3.75	3.23	13	1.00	2	2.93	3.59	32	3.15	13	3.47	3.45
Tilapia Is Similar to Guapote	5.29	17	6.00	2	5.37	4.42	12	4.67	3	4.47	4.90	39	8.00	8	5.43	5.24
Marine Fish Is Better	6.50	20	5.00	2	6.36	7.75	16	8.33	3	7.84	6.17	48	8.10	10	6.50	6.73
Size Is Too Small	4.05	20	2.00	2	3.86	4.38	13	1.33	3	3.81	3.62	37	3.17	12	3.51	3.65
Patrons Like Variety	8.55	20	9.50	2	8.64	7.92	13	8.67	3	8.06	7.37	35	6.44	9	7.18	7.74

stand vendors in open-air markets, to fish markets (specialized stores located in towns that sell only fish and seafood), and to the final consumers.

The quantity of fish might be so small that the transaction does not necessitate an intermediary, but the majority of fishermen need a commissioner to sell their fish. The most common form is for commissioners to auction fish to the small- and large-scale wholesalers. Some commissioners integrate vertically and sell fish to stand vendors in open-air markets and to fish markets. Usually small-scale wholesalers were individuals who sell fish they have purchased to small restaurants, to stand vendors in open-air markets, and to final consumers. Large-scale wholesalers most often sell fish they have purchased to processors, to large restaurants, to large stand vendors in open-air markets, to fish markets, and to supermarkets. Typically processors sell their fish to restaurants, to fish markets, to supermarkets, and to the final consumer. Sometimes open-air market vendors sell their fish to restaurants, to fish markets, and to supermarkets. The most common channel used by restaurants is to buy fish from wholesalers.

Marketing channels for farm-raised tilapia in Nicaragua are less complex. Tilapia farmers tend to bypass intermediaries (Figure 13). The majority of tilapia farmers sell directly to restaurants and to fish markets; some of them sell to wholesalers, and fewer sell directly to the final consumer.

The most common suppliers of fish and seafood were wholesalers (Figure 14). This was followed by stands in open-air markets, processors, and fish

markets. A few respondents purchased directly from supermarkets, fishermen, and only one from a scuba diver. There were no apparent differences between regions with restaurants that sold fish and seafood. In contrast to suppliers of general seafood, there were some regional differences for restaurants that sold tilapia. Restaurants in the Northwest region purchased tilapia either from stands in open-air markets or from a supermarket.

The most frequently mentioned suppliers of fish and seafood were from the area of Managua (56%), followed by Chinandega (35%), Rivas (22%), the Atlantic Coast (21%), and León (15%) (Table 28). Restaurants in the Northwest region purchased seafood more frequently from suppliers in Chinandega than Managua. This can be attributed to the proximity of the ports in the Gulf of Fonseca to the city of Chinandega and its accessibility to restaurants in the Northwest region.

Overall, 68% of the restaurant managers purchased tilapia from Managua primarily from one or two suppliers (Table 29). Twenty percent of the restaurant managers mentioned tilapia purchases from Masaya. Other origins of supply for the South-Central region were León, Granada, Rio San Juan, Carazo, and Boaco. Restaurant managers in the Northwest region indicated that tilapia was purchased in León and Jinotega.

Overall, 74% of the respondents did not incur expense to transport fish and seafood products to their restaurants (Table 30). In some cases, restaurant managers used their own cars to transport fish from

Table 32. Weighted mean ratings of various attributes of tilapia, by origin of tilapia supply. Restaurant survey, Nicaragua, 2000.

^a N = number of respondents.

Attributes	Supply Origin of Sold Tilapia															
	<i>Managua</i>		<i>Masaya</i>		<i>Rio San Juan</i>		<i>León</i>		<i>Granada</i>		<i>Carazo</i>		<i>Boaco</i>		<i>Jinotega</i>	
	Mean	N ^a	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
Reliable Supply	8.27	15	9.20	5	9.00	1	5.50	2	8.00	2	10.00	1	5.00	1	10.00	1
Available	8.82	17	8.00	5	4.00	1	5.50	2	10.00	2	10.00	1	8.00	1	10.00	1
Consumers Like to Eat	7.88	17	9.00	5	9.00	1	10.00	2	9.00	2	10.00	1	8.00	1	10.00	1
High Quality Fish	8.88	17	9.20	5	10.00	1	10.00	2	7.00	2	10.00	1	9.00	1	10.00	1
Little Fishy Odor	8.56	16	7.00	5	4.00	1	9.50	2	6.50	2	10.00	1	7.00	1	2.00	1
Tastes Like Earth	4.76	17	5.80	5	6.00	1	5.50	2	8.50	2	10.00	1	1.00	1	8.00	1
Nice Fresh Flavor	8.56	16	9.20	5	10.00	1	10.00	2	9.00	2	10.00	1	10.00	1	9.00	1
Easy to Prepare	9.35	17	9.60	5	10.00	1	10.00	2	10.00	2	10.00	1	10.00	1	10.00	1
Price Is Too High	4.12	16	2.80	5	10.00	1	1.50	2	1.50	2	1.00	1	4.00	1	3.00	1
Tilapia Is Similar to Guapote	6.18	11	4.20	5	5.00	1	6.50	2	9.00	2	1.00	1	1.00	1	9.00	1
Marine Fish Is Better	6.29	14	8.20	5	10.00	1	9.50	2	1.00	2	10.00	1	1.00	1	1.00	1
Size Is Too Small	4.21	14	3.20	5	1.00	1	3.00	2	1.50	2	1.00	1	5.00	1	1.00	1
Patrons Like Variety	8.36	14	9.00	5	8.00	1	10.00	2	10.00	2	10.00	1	9.00	1	9.00	1

Table 33. Weighted mean ratings of various attributes of restaurants that sold tilapia, by type of business. Restaurant survey, Nicaragua, 2000.

^a N = number of respondents.

Attributes	Type of Business				
	<i>Independent</i>		<i>Family-Owned</i>		<i>Total</i>
	Mean	N ^a	Mean	N	Mean
Reliable Supply	7.60	15	8.67	6	7.91
Available	8.41	17	8.50	6	8.43
Consumers Like to Eat	8.59	17	8.33	6	8.52
High Quality Fish	9.00	17	9.00	6	9.00
Little Fishy Odor	7.75	16	7.67	6	7.73
Tastes Like Earth	5.35	17	4.83	6	5.21
Nice Fresh Flavor	8.75	16	8.83	6	8.77
Easy to Prepare	9.35	17	10.00	6	9.52
Price Is Too High	2.94	16	5.33	6	3.59
Tilapia Is Similar to Guapote	4.62	13	6.60	5	5.17
Marine Fish Is Better	7.21	14	4.33	6	6.35
Size Is Too Small	4.67	15	1.20	5	3.80
Patrons Like Variety	8.75	16	9.40	5	8.90

stands in open-air markets, processors, or fish markets to their establishments. These purchases were frequently combined with other purchases. Fish and seafood were delivered to the restaurant and transportation costs were included in the purchase price. For those who did pay to transport fish and seafood, costs ranged from \$0.47 to 47.00 per trip. Very few (13%) purchased ice to transport fish to

their restaurants using their own car. Results were similar for tilapia products supplied; transportation cost was included in the price for the majority of respondents. In the South-Central region, 83% did not have any transportation expenses. Of those restaurant managers who used their own cars, 9% spent \$0.47 to 1.56 per trip and another 9% spent \$1.64 to 6.25 per trip. In the Northwest region, 50%

Table 34. Weighted mean ratings of various attributes of restaurants that never sold tilapia, by type of business. Restaurant survey, Nicaragua, 2000.

^a N = number of respondents.

Attributes	Type of Business							
	Independent		Family-Owned		International Chain		Total	
	Mean	N ^a	Mean	N	Mean	N	Mean	
Reliable Supply	6.00	20	7.57	7	9.00	2	6.59	
Available	5.64	25	6.67	9	7.33	3	6.03	
Consumers Like to Eat	2.36	11	4.00	7	2.00	1	2.95	
High Quality Fish	6.52	29	6.71	7	9.25	4	6.83	
Little Fishy Odor	7.25	20	6.33	6	5.00	3	6.83	
Tastes Like Earth	6.00	26	7.14	7	6.50	4	6.27	
Nice Fresh Flavor	6.56	25	7.00	6	6.25	4	6.60	
Easy to Prepare	8.71	41	9.20	15	8.50	4	8.82	
Price Is Too High	3.76	33	2.67	12	0.00	0	3.47	
Tilapia Is Similar to Guapote	5.69	35	5.25	8	4.33	3	5.52	
Marine Fish Is Better	6.33	39	8.29	14	3.25	4	6.60	
Size Is Too Small	3.57	35	3.18	11	4.00	3	3.51	
Patrons Like Variety	7.07	28	7.67	12	5.33	3	7.12	

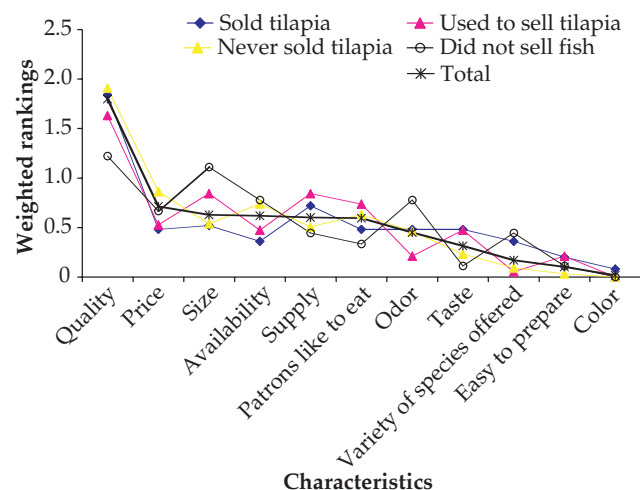


Figure 15. Rank order of the most important characteristics that influenced choice of fish products for restaurant managers that sold, used to sell, and never sold tilapia. Restaurant survey, Nicaragua, 2000. (A score of 3 represents the most important characteristic that influenced choice of fish products; 1 represents the least important characteristic).

used their own cars without cost, and 50% used a taxi, spending between \$0.47 and 1.56 per trip. Only one respondent purchased ice to transport tilapia to his restaurant using his own car.

Restaurant Manager Attitudes toward Tilapia Attributes

Attitudes toward specific attributes of tilapia—such as flavor, odor, size, price, nutritional value, quality, customer preference, reliable supply, availability, variety, and preparation—were elicited by asking respondents to assign a value from 1 to 10 in response to statements concerning each attribute. A score of 1 represented complete disagreement with the statement, and a score of 10 represented complete agreement, with 5 being a neutral score. The higher the score, the stronger the agreement with the statement. The highest rating overall was for ease of preparation (9.01) (Table 31). This was followed in descending order by positive ratings on the following attributes: adding variety to the menu (7.74), high-quality fish (7.46), nice fresh flavor (7.41), little fishy odor (7.23), reliable supply (7.18), availability (7.05), consumers like to eat (5.25), and tilapia is similar to guapote (5.24). Low ratings for price being too high and the size being too small indicated that respondents viewed both the size and the price of tilapia as appropriate. Respondents, however, also agreed that marine fish is better than tilapia. Furthermore, respondents indicated that tilapia tastes like earth or has off-flavor.

Responses to attributes were disaggregated so as to compare restaurants that sold tilapia, those that

used to sell tilapia, and those that never sold tilapia. Respondents who sold tilapia rated it more favorably on all attributes. Ratings by those who sold tilapia on the off-flavor attribute (tastes like earth) were more neutral (5) than those by restaurants that never sold tilapia (6.37). Restaurants that sold tilapia rated consumer preferences for tilapia (consumers like to eat) much higher (8.24) than restaurants that never sold tilapia (3.05).

Respondents in the Northwest who sold tilapia rated it much lower on reliable supply (5.50 compared to 8.14) and on availability (5.50 compared to 8.74) when compared to restaurants in the South-Central region. Furthermore, Northwest respondents that sold tilapia rated it much higher on consumer preference (10 compared to 8.09) than those in the South-Central region. Northwest respondents were more neutral (5 as compared to 6.5) with regard to the statement "marine fish is better" than South-Central respondents.

Respondents who used to sell tilapia, overall, rated tilapia much lower (3.31 as compared to 8.24) on consumer preferences ("consumer likes to eat") than those who sold tilapia. They also rated it higher (7.53 compared to 5) on off-flavor ("tastes like earth") and indicated positive responses on ease of preparation, variety on menu, fresh flavor, reliable supply, odor, quality, and size. Restaurants that used to sell tilapia rated preference for marine fish higher and were less likely to consider tilapia similar to guapote than those that sold tilapia. Other responses were similar. There were few regional differences in the trends and patterns of responses to attitudes of restaurants that used to sell tilapia.

During the course of the survey, it was observed that restaurants that used to sell or never sold tilapia were hesitant to admit that they were aware of tilapia. Even restaurants that sold tilapia were reluctant to admit knowledge of tilapia. For example, there were cases in which the manager interviewed denied selling tilapia, but the chef admitted that tilapia was sold and showed tilapia to the interviewers. Lists of buyers from fish suppliers also included restaurants whose managers had denied selling tilapia. Given the prevalence of tilapia in Nicaraguan fish markets, it is likely that most managers indeed were familiar with it. There is widespread and commonplace concern among many Nicaraguan citizens that fish from Lake Managua are contami-

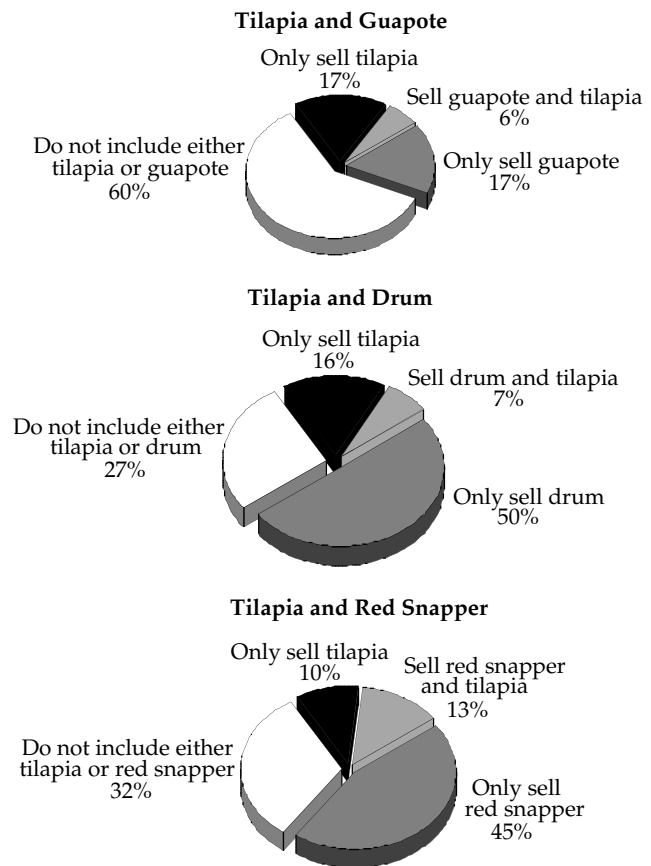


Figure 16. Comparison of percentage of sales for the most important species of fish with tilapia. Restaurant survey, Nicaragua, 2000.

nated. This concern affects the consumption of all freshwater fish and particularly very common species like tilapia. The likeliest explanation for the apparent discrepancies noted is that restaurant managers feared declining patronage if they admitted selling or having sold tilapia.

Responses to attributes were disaggregated to compare restaurants that sold tilapia by supply origin (Table 32). Those who bought tilapia from León and Boaco were more neutral on reliable supply. Those who bought tilapia from Rio San Juan and León rated it lower on availability. Those who bought from Managua disagreed that it tasted like earth. Those who bought from Masaya, Rio San Juan, Carazo, and Boaco rated it negatively compared to other regions. Those who bought from Granada and Boaco rated it lower on marine fish is better.

Responses to attributes were disaggregated to compare restaurants that sold tilapia by type of business (Table 33). Independent restaurants rated

Table 35. Reasons why restaurant managers did not sell guapote, by region. Restaurant survey, Nicaragua, 2000.

^a Responses represent individual answers, not respondents. Multiple answers (responses) can result in percent age totals over 100%.

Reasons for Not Selling Guapote	Region of Country					
	South-Central		Northwest		Total	
	N	% ^a	N	%	N	%
Contamination of Lake	18	27	6	35	24	30
Only Work with Fillets	16	24	0	0	16	20
Lack of Demand	10	15	4	23	14	17
No Supply	6	9	6	35	12	14
Tastes Like Earth	7	11	1	6	8	10
Only Sell Marine Fish	5	8	1	6	6	7
Negative Consumer Attitudes	4	6	1	6	5	6
Does Not Like It	3	4	0	0	3	4
Quality	2	3	1	6	3	4
Have Not Heard of It	1	1	1	6	2	2
Storage Problems	2	3	0	0	2	2
Bones	1	1	1	6	2	2
Flavor	2	3	0	0	2	2
Fragile	2	3	0	0	2	2
Not Fresh	0	0	1	6	1	1

Table 36. Consistency of guapote supply, by region. Restaurant survey, Nicaragua, 2000.

^a This row indicates the number of respondents who answered this question and the percent these represent of the total number of respondents.

Consistency	Region of Country					
	South-Central		Northwest		Total	
	N	%	N	%	N	%
Consistent Supply	11	46	1	50	12	46
Inconsistent Supply	13	54	1	50	14	54
Total Number of Responses ^a	24	92	2	100	26	100

tilapia much lower (2.94 as compared to 5.33) on price too high and on similarity to guapote (4.62 as compared to 6.60) than those restaurants that are family-owned. They also rated it lower, showing their disagreement, on “marine fish is better than freshwater fish” (4.33 compared to 7) and on “price is too high” (1.20 compared to 4.67).

Disaggregated responses were used to compare attribute ratings of restaurants that never sold tilapia by type of business (Table 34). International chains rated tilapia very favorably on reliable supply (9) and quality (9.25). Also they rated it higher on availability (7.33) and showed their disagreement with the preference of marine fish over freshwater fish (3.25) and similarity with guapote (4.33).

Preferences

Restaurant managers were asked to mention the three most important characteristics that influenced their choice of fish products. Responses were ranked and a weighted mean calculated. The most important fish attribute mentioned by restaurant managers was quality (Figure 15). Supply and size were mentioned as the second and third most important characteristics that influenced restaurants that sold and used to sell. For restaurants that never sold tilapia, price was the second most important, while size was the second most important characteristic for restaurants that did not sell fish. Of those restaurants that never sold tilapia and never sold fish, availability was the

Table 37. Problems indicated with the supply of guapote, by region. Restaurant survey, Nicaragua, 2000.

^a Responses represent individual answers, not respondents. Multiple answers (responses) can result in percent age totals over 100%.

^b This row indicates the number of respondents who answered this question and the percent these represent of the total number of respondents.

Supply Problems	Region of Country					
	South-Central		Northwest		Total	
	N	% ^a	N	%	N	%
Insufficient Quantity	12	92	1	100	13	93
Unavailable at Certain Times of the Year	3	23	0	0	3	21
Total Number of Responses ^b	13	93	1	7	14	100

Table 38. Mean (weighted) rating of various attributes of tilapia, by restaurants that sold tilapia only, drum only, guapote only, red snapper only, drum and tilapia, both guapote and tilapia, or both red snapper and tilapia. Restaurant survey, Nicaragua, 2000.

Attributes	Tilapia and Drum			Tilapia and Guapote			Tilapia and Red Snapper		
	Only Tilapia	Tilapia and Drum	Only Drum	Only Tilapia	Tilapia and Guapote	Only Guapote	Only Tilapia	Tilapia and Snapper	Only Snapper
Reliable Supply	8.20	7.38	6.43	7.75	8.29	7.90	8.60	7.38	6.89
Available	8.76	7.88	6.48	8.06	9.57	7.64	8.91	8.14	6.29
Consumers Like to Eat	8.24	8.25	3.58	7.94	9.00	2.50	9.27	7.43	3.63
High Quality Fish	8.76	9.50	7.10	9.50	7.71	5.90	8.73	9.21	6.83
Little Fishy Odor	7.94	7.57	6.87	8.24	6.86	6.67	8.36	7.38	6.74
Taste Like Earth	4.82	5.38	6.42	4.06	7.43	7.20	6.09	4.14	5.97
Nice Fresh Flavor	8.65	9.14	6.84	9.18	7.86	6.67	8.36	9.15	6.42
Easy to Prepare	9.82	8.75	8.58	9.39	9.71	9.15	9.91	9.14	8.72
Price Is Too High	3.35	4.71	3.08	4.53	1.86	2.22	2.64	4.69	4.00
Tilapia Is Similar to Guapote	4.55	6.50	5.38	4.75	6.43	5.92	5.57	5.25	5.24
Marine Fish Is Better	6.57	6.00	6.72	7.67	3.57	5.86	4.25	7.57	7.73
Size Is Too Small	4.38	2.50	4.00	4.50	2.17	3.18	2.73	5.00	3.94
Patrons Like Variety	8.80	8.29	7.95	8.44	9.17	8.25	9.80	7.67	7.28

third most important characteristic. Restaurants that sold tilapia also mentioned price, preference of their patrons, odor, and taste. Restaurants that never sold tilapia mentioned preference, size, and supply.

Substitutes for Tilapia

Equal numbers of restaurants that sold fish were selling tilapia or guapote only, and few sold both (6%) (Figure 16). Some of the respondents indicated that tilapia and guapote might be good substitutes. Nevertheless, over half of the respondents did not sell either. Respondents had difficulty distinguishing physical differences between guapote and tilapia. Additionally, when pictures of tilapia (*Oreochromis*

sp.) were shown during the interview, most of the respondents confused tilapia with guapote.

The survey elicited information on the reasons why restaurant managers never sold guapote (Table 35). Overall, the most frequently mentioned reason (30% of respondents) was fear of contamination of Lake Managua. Contamination was followed in importance by “only work with fillets” (20%), due to the fact that guapote is used only as a whole-dressed product for a typical dish. This reason was followed by mention of lack of demand and supply. Other reasons mentioned included off-flavor (tastes like earth), selling only marine fish, negative consumer attitudes, preferences, poor quality, lack of awareness, storage problems, bony, flavor, fragile, and lack

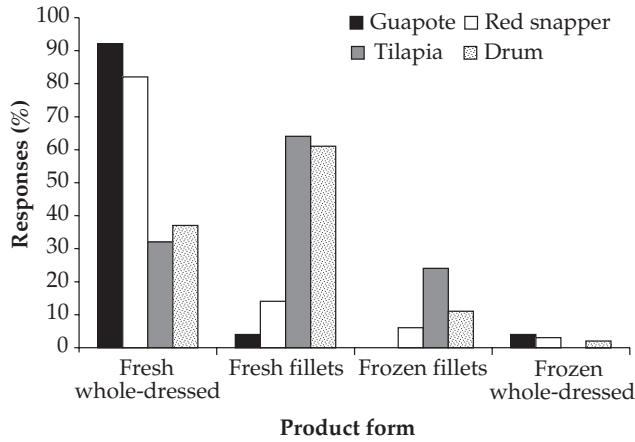


Figure 17. Product forms purchased, by most popular fish. Restaurant survey, Nicaragua, 2000.

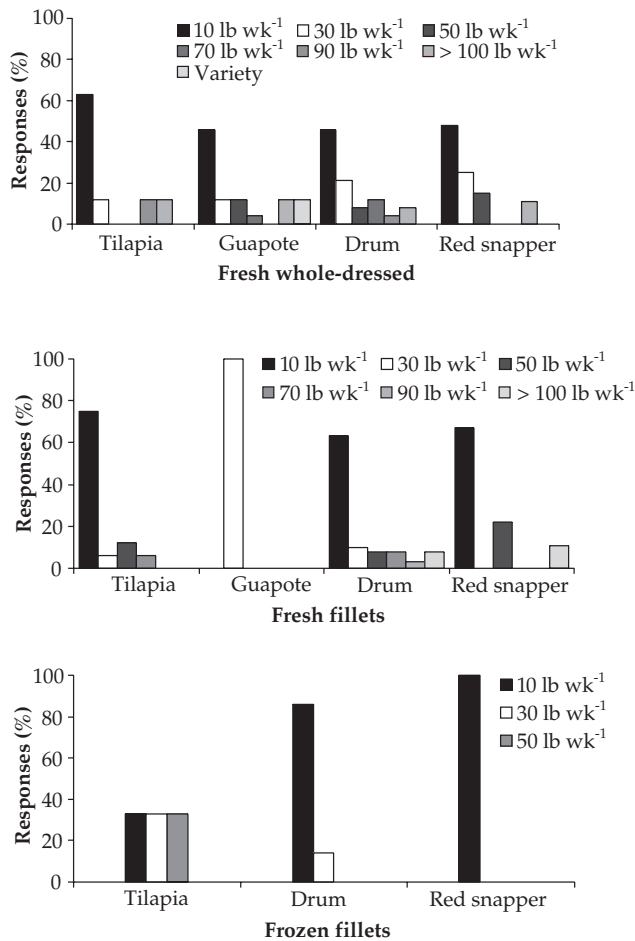


Figure 18. Volume sold in Nicaragua (lb wk⁻¹), by most popular fish form. Restaurant survey, Nicaragua, 2000.

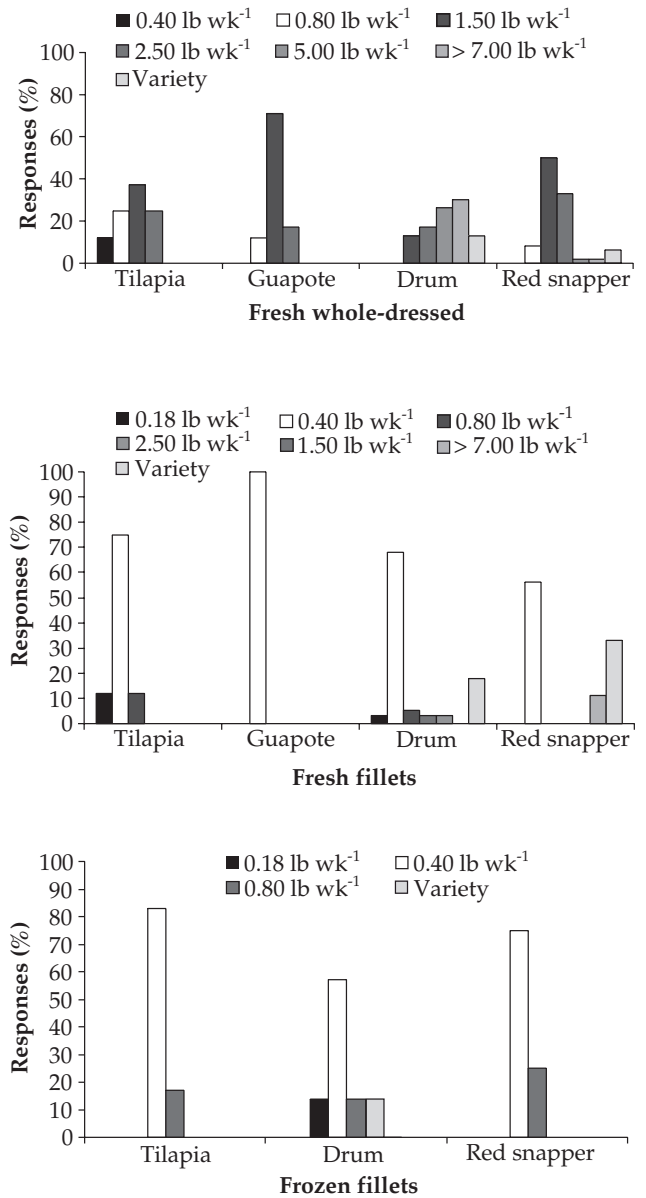


Figure 19. Product size of tilapia (lb fish⁻¹), by most popular type of fish. Restaurant survey, Nicaragua, 2000.

of freshness. There were some regional differences. For respondents in the Northwest region, lack of supply and fear of contamination were the main reasons, followed by lack of demand, while in the South-Central region fear of contamination, preference to work with fillets, and lack of demand were mentioned as the main reasons.

Less than half of the restaurants (46%) that sold guapote had consistent supply (Table 36). There was no apparent regional difference. Ninety-three percent of the respondents mentioned insufficient quantity as

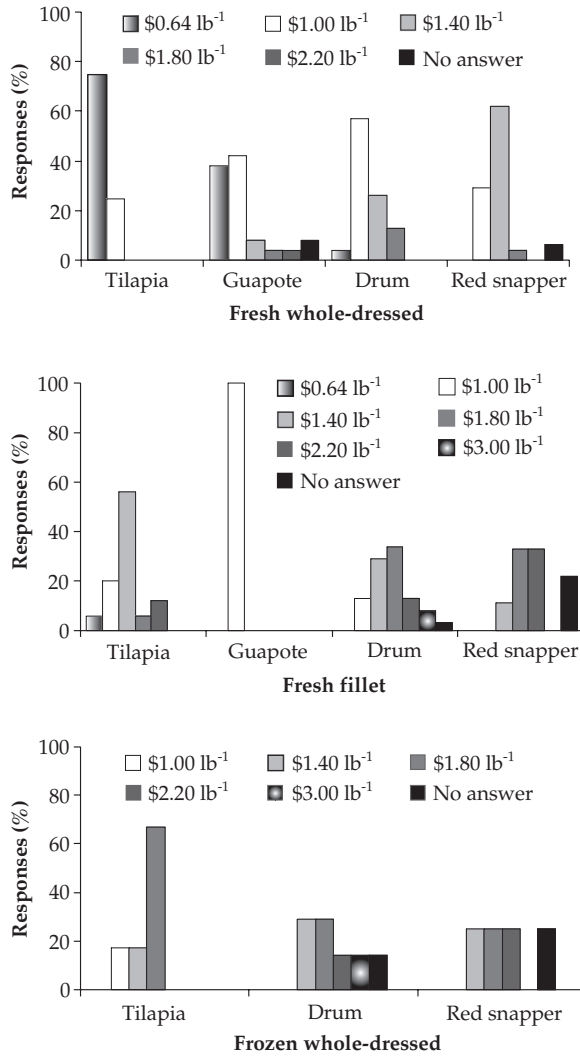


Figure 20. Supplier price of fish (US\$ lb⁻¹), by most popular product form. Restaurant survey, Nicaragua, 2000.

the main problem (Table 37).

Half of the respondents (50%) that sold fish were selling only drum, and 16% of the respondents sold only tilapia. Few sold both (7%) (Figure 16). Some of the respondents indicated that tilapia was a good substitute for drum. Only 27% of the respondents sold neither drum nor tilapia. Fewer than half of the restaurants (45%) that sold fish were selling only red snapper, while only 10% were selling only tilapia. Few sold both (13%). Only 32% of respondents sold neither tilapia nor red snapper.

Most common product forms were compared for the most important species of fish sold (Figure 17). Restaurants selling guapote purchased fresh whole-dressed guapote (92%). Red snapper likewise was

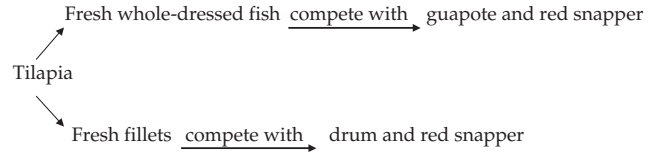


Figure 21. Possible alternatives that tilapia farmers could use to compete with other species and product forms. Restaurant survey, Nicaragua, 2000.

purchased most often (82% of restaurants) as a fresh whole-dressed product. The most common form for restaurants that sold tilapia was fresh fillets (64%), and 61% of the restaurants that sold drum purchased it as fresh fillets.

Average weekly sales volume of the most important species of fish sold were compared by product form (Figure 18). The most common volume of fresh whole-dressed fish purchased was small quantities, 10 and 30 lb wk⁻¹ average, of the most common species. Restaurants that sold tilapia more commonly purchased 10 lb wk⁻¹. Fresh and frozen fillet quantities purchased were also small (10 lb wk⁻¹). There was only one respondent who sold 30 lb per week of fresh guapote fillets.

Product size of the most important fish species sold was compared by product form (Figure 19). The most common sizes of fresh whole-dressed fish purchased were 1.5 and 2.5 lb fish⁻¹. Most guapote purchased were 1.5 lb fish⁻¹. Fresh fillets of 0.40 lb unit⁻¹ were most common and were used by 75% of the respondents that sold tilapia, 68% of the respondents that sold drum, 56% of the respondents that sold red snapper, and only one buyer of guapote. Also, 0.40 lb unit⁻¹ of frozen fillet product was the most common size; this product size was used by 83% of the respondents who sold tilapia, 75% of the respondents who sold red snapper, and 57% of the respondents who sold drum.

Tilapia prices were low compared to prices of other fish (Figure 20). Average prices paid by restaurants and by product form were compared between the most important species of fish sold. The most common price of fresh whole-dressed fish purchased was \$1.00 lb⁻¹. Drum was commonly purchased for this price. A price of \$0.64 lb⁻¹ of fresh whole-dressed fish was paid by 78% of the respondents who sold tilapia, 38% of the respondents who sold guapote, and 4% of the respondents that sold red snapper. The price of \$1.40 lb⁻¹ for fresh fillets was paid by

56% of the respondents who sold tilapia, 29% of the respondents who sold drum, and 11% of the respondents who sold red snapper. A price of \$1.80 lb⁻¹ for frozen fillets was paid by 67% of the respondents who sold tilapia, 29% of the respondents who sold drum, and 25% of the respondents who sold red snapper.

Possible alternatives that tilapia farmers could use to compete with other species in terms of product form, volume, size, and price were postulated (Figure 21). Tilapia could be positioned to compete with whole-dressed guapote and red snapper or, alternatively, to compete with drum and red snapper fresh fillets.

Responses to attributes of tilapia were disaggregated so as to compare restaurants that sold tilapia with those that sold drum, guapote, and red snapper (Table 38). This comparison appears to show that restaurants that sold only drum did so not because they think marine fish is better, but because they think tilapia is a cheap fish lacking the quality their patrons want and because of off-flavor and the fear of contamination. Restaurants that sold only guapote rated patrons' preference for tilapia low, indicated a preference for marine fish, and viewed tilapia as a cheap fish. Restaurants that sold red snapper agreed with reliable supply and availability of tilapia. They rated tilapia very low on their patrons' preferences and also said that tilapia was available in all sizes.

Conclusions

Tilapia was well known in Nicaragua. It was considered the fourth most important finfish species sold, but restaurants were reluctant to admit selling tilapia because of off-flavor and fear of public confusion about wild-caught tilapia, which they view as possibly contaminated. More than half of all respondents indicated they were very likely to add tilapia to their menu within the next year if they had a consistent tilapia supply and could get a farm-raised tilapia product differentiated from wild-caught tilapia.

The size of the product form of the fish was apparently correlated with the price of tilapia. The most commonly mentioned problems with the supply of tilapia were the availability of preferred sizes and insufficient quantities. Wholesalers were cited as the principal suppliers of tilapia and seafood

for restaurants. That statement demonstrates the importance of marketing agents in Nicaraguan markets. The most frequently mentioned suppliers of fish and seafood were from the area of Managua. Most of the restaurants did not incur expense to transport fish and seafood products to their restaurant.

Managers who had never sold or who had stopped selling tilapia had positive attitudes towards it but did not sell primarily due to lack of availability and preference of their patrons (belief that tilapia comes from contaminated sources).

Restaurants indicated that the most important reason they did not sell guapote (a native fish species used in a typical dish in Nicaragua) was out of fear of lake contamination. Tilapia price was low compared to other fish. Nevertheless, tilapia marketing strategies might be developed to compete with whole-dressed guapote and red snapper and with drum and red snapper fillets.

It may be important for tilapia growers to differentiate farm-raised from wild-caught tilapia. According to the managers interviewed, consumers perceive tilapia as a freshwater fish caught in a polluted lake, and they are unaware of the advantages of a high-quality farm-raised fish. Another negative perception of consumers is that wild-caught tilapia from the lakes, rivers, and reservoirs have off-flavors.

Tilapia farms and processors in Nicaragua will need to guarantee and ensure the flavor, quality, and safety of their product and promote these attributes. Broad-based consumer education and labeling programs may be needed to assist consumers to differentiate between farm-raised and wild-caught tilapia.

Literature Cited

- Durand, A.V., 1997. *Explotación Sostenida de los Embalses en Nicaragua*. Mimeo. Universidad Centroamericana, Managua, Nicaragua.
- Engle, C., I. Neira, and D. Valderrama, 2001. Development of Central American markets for tilapia produced in the region. In: A. Gupta, K. McElwee, D. Burke, J. Burright, X. Cummings, and H. Egna (Editors), *Eighteenth Annual Technical Report. Pond Dynamics/Aquaculture CRSP*, Oregon State University, Corvallis, Oregon, pp. 107–118.
- Kinnear, T.C. and J.R. Taylor, 1983. *Marketing Research: An Applied Approach*, Second Edition. McGraw-Hill, Inc.,

New York, 698 pp.
Saavedra, M.A., 2000. El Cultivo de Tilapia en Nicaragua.
Mimeo. Universidad Nacional Agraria de Nicaragua,
Managua, Nicaragua.

Aquaculture CRSP
Oregon State University
418 Snell Hall
Corvallis OR 97331-1643 USA
<pdacrsp.orst.edu>

Program Director: Dr. Hillary S. Egna

CRSP Research Reports are published as occasional papers and are available free of charge from the Information Management and Networking Component of the Aquaculture Collaborative Research Support Program (A CRSP). CRSP Research Reports present technical papers of research supported by the A CRSP. The A CRSP is funded in part by the US Agency for International Development under CRSP Grant No. LAG-G-00-96-90015-00 and by participating US and host country institutions. The opinions expressed herein are those of the authors and do not necessarily reflect the views of the US Agency of International Development.



*Oregon State University is committed to
affirmative action and equal opportunity in
employment and education.*



AQUACULTURE COLLABORATIVE RESEARCH SUPPORT PROGRAM

RESEARCH REPORTS

SUSTAINABLE AQUACULTURE FOR A SECURE FUTURE