



## Potential for Open-Air Fish Market Outlets for Tilapia in Nicaragua

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

### Abstract

Nicaraguan tilapia farmers face considerable market risk in attempting to develop export markets for their products. Domestic markets would provide stability by offering additional market alternatives, thereby reducing risks associated with having only one target market. The goal of this project was to assess the domestic market as an alternative tilapia outlet. A complete census of open-air markets was conducted in the major urban and rural population centers. The survey results indicated that tilapia was a common product in Nicaragua, with over 65% of fish market vendors selling tilapia. On average, vendors had been selling tilapia for more than ten years. Tilapia were sold most commonly by vendors with larger stands and those with slightly higher education levels. Inconsistent supplies and insufficient quantities of tilapia have resulted in decreasing sales of tilapia. Sales of freshwater fish in Nicaragua are hampered by fears on the part of consumers over contamination of Lake Managua and the safety of fish supplies as a result. Fear of contamination was the major reason why vendors had either stopped selling or never sold tilapia. Wholesale prices paid by vendors for tilapia are likely to be lower than the price levels that will be necessary to cover production costs of farm-raised tilapia.

### Introduction

Tilapia have been raised in Nicaragua for many years on a small scale. Yet the farm-raised tilapia industry in Nicaragua has not grown and developed as rapidly as it has in other Central American countries. Development of an export market for tilapia produced in Central America requires the establishment of a marketing company located in the United States. Development of a domestic market for tilapia in Nicaragua could provide a less costly market to target. Domestic sales could also reduce the risks associated with the export marketing of a crop like tilapia.

A wild fishery for tilapia has developed over time. A reservoir-stocking program resulted in established tilapia populations in a number of reservoirs across the country. Flooding episodes resulted in the unintended introduction of tilapias into Lake Nicaragua. The fishery that developed from these introductions has generated a supply of tilapia for local markets.

Nevertheless, no marketing studies have been

done on the potential to sell farm-raised tilapia in local markets. Development of a domestic market could enable a tilapia industry to develop, as has happened in other Central American countries. This could provide broader economic benefits such as new sources of employment.

Three surveys were conducted in Nicaragua in 2000 to examine the potential for development of the domestic market in Nicaragua for farm-raised tilapia. Restaurant, supermarket, and fish market surveys were conducted. This report summarizes the results and findings from the survey of open-air fish market vendors in Nicaragua.

### Methodology

A comprehensive study was conducted of open-air fish market vendors in Nicaragua. The open-air market survey instrument designed in Honduras by Engle et al. (2001) was used as a basis for this survey. Interviews were conducted throughout the populated region of Nicaragua in August and September 2000. The Atlantic Coast was not considered due to its low

Table 1. Number and percent of stands in open-air markets, by region. Open-air fish market survey, Nicaragua, 2000.

<sup>a</sup> This row indicates the number of respondents who answered this question and the percent these represent of the total number of respondents.

Name of Open-Air Market	Region of Country					
	South-Central		Northwest		Total	
	N	%	N	%	N	%
Oriental (Managua)	23	31	0	0	23	21
Boehr (Managua)	12	16	0	0	12	11
Roberto Huembes (Managua)	6	8	0	0	6	6
Ivan Montenegro (Managua)	4	5	0	0	4	4
Municipal de Jinotepe (Jinotepe)	2	3	0	0	2	2
Ernesto Fernández (Masaya)	14	19	0	0	14	13
Municipal de Granada (Granada)	10	13	0	0	10	9
Municipal de Rivas (Rivas)	4	5	0	0	2	2
Municipal de Chinandega (Chinandega)	0	0	16	48	16	15
Felix Pedro Carrillo (León)	0	0	6	18	6	6
Raúl Cabezas Lacayo (León)	0	0	4	12	4	4
Santos Barcenas (León)	0	0	4	12	4	4
Matagalpa Norte (Matagalpa)	0	0	1	3	1	1
Matagalpa Sur (Matagalpa)	0	0	1	3	1	1
Municipal de Jinotega (Jinotega)	0	0	1	3	1	1
Total Respondents <sup>a</sup>	75	69	33	31	108	100

population density and dense rainforest with difficult access.

A complete census of open-air markets was conducted in the major urban and rural population centers. Only fish market vendors with a stand in the open-air market areas were interviewed. The interviews were conducted in four open-air markets in Managua: 23 stands in the Oriental, 13 stands in the Bohr (Israel Lewites), 6 stands in the Central (Roberto Huembes), and 4 stands in the Ivan Montenegro (Table 1). There were approximately 2 stands in Jinotepe, 14 in Masaya, 10 in Granada, 4 in Rivas, 16 in Chinandega, 14 in León, 2 in Matagalpa, and 1 in Jinotega. The towns of Estelí and Boaco did not have a fish section in the open-air market. Thus, 108 fish vendors were interviewed in Nicaragua. Of these, 69% were located in the South-Central and 31% in the Northwest region. The higher concentration in the South-Central region is correlated with the higher population density and higher standards of living compared to the Northwest region.

The survey instruments were designed to obtain descriptive information about fish sections in the open-air markets. The fish vendors were asked 109 potential questions of the survey. Each interview lasted approximately 30 minutes. The survey in-

cluded questions on tilapia and other types of fish and seafood sold, prices, most frequently sold fish products, marketing channels, and information on suppliers. Awareness and availability of tilapia were addressed through questions related to the owners' familiarity with tilapia as well as questions related to its supply. Information on fish market vendors' attitudes towards attributes such as flavor, odor, supply, quality, ease of preparation, size, and price were elicited by asking respondents to assign a value of 1 to 3 in response to statements concerning each attribute. A score of 1 represented complete disagreement with the statement, and a score of 3 represented complete agreement.

Characteristics related to the fish vendors interviewed in the open-air markets were necessary to interpret responses to the survey. Questions were asked about the size of the stand, age, location, and years in business.

The response rate was very high (100%). This is likely due to the novelty of market surveys in Nicaragua. People were surprised to be asked to participate but were extremely cooperative.

All data were entered into a computer using Survey Pro<sup>®</sup> software. The data were cross-tabulated by region. The South-Central region contained the

capital, Managua, and the main cities of Rivas, Granada, Masaya, Boaco, Estelí, and Jinotepe (Figure 1). The Northwest region was comprised of Matagalpa, Jinotega, León, and Chinandega. Data were cross-tabulated by locales that sold and did not sell tilapia and by the origin of the fish supply.

## Results

### Characteristics of Nicaraguan Open-Air Fish Markets

There was a wide range of ages of the fish market businesses in Nicaragua (Table 2). Length of time in business ranged from 1 to 80 years with roughly equal percentages of respondents who had been in business from 1 to 5, 6 to 10, 11 to 20, and 21 to 30 years. The average number of years in business was 16, and there was no difference between the two regions.

The majority of fish market vendors were female (Figure 2). This was true in both regions. There were no male vendors in the Northwest region, and only 10% of the vendors in the South-Central region were male.



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

Table 2. Number and percent of open-air fish market vendors, by years in business and by region. Open-air fish market survey, Nicaragua, 2000.

Years in Business	Region of Country					
	South-Central		Northwest		Total	
	N	%	N	%	N	%
1–5	19	25	7	21	26	24
6–10	14	19	10	30	24	22
11–20	22	29	5	15	27	25
21–30	12	16	10	30	22	20
31–80	5	7	1	3	6	6
Do Not Know	3	4	0	0	3	3
Weighted Average	15		15		16	

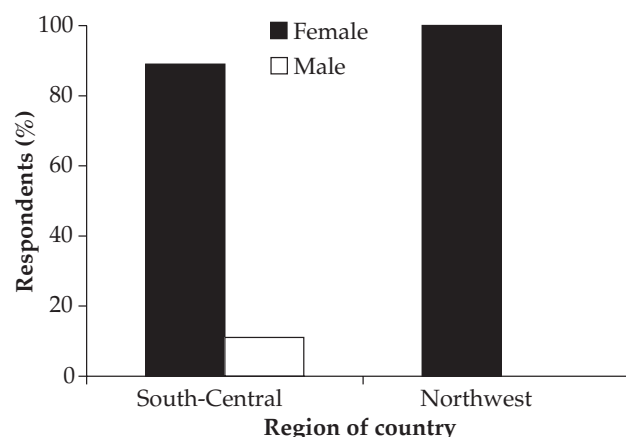


Figure 2. Percentage of open-air fish market vendors, by gender of owner and by region. Open-air market survey, Nicaragua, 2000.

Table 3. Number and percent of open-air fish market vendors, by age of owner and by region. Open-air fish market survey, Nicaragua, 2000.

Age of Owner (yr)	Region of Country					
	South-Central		Northwest		Total	
	N	%	N	%	N	%
15–20	1	1	1	3	2	2
21–30	10	13	3	9	13	12
31–40	21	28	10	30	31	29
41–50	27	36	12	36	39	36
51–60	9	12	4	12	13	12
61–80	7	9	3	9	10	9
Weighted Average	43		43		43	

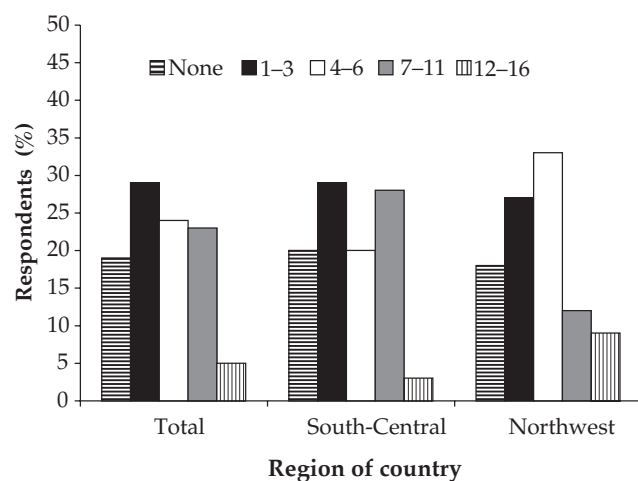


Figure 3. Percentage of open-air fish market vendors, by years of education and by region. Open-air fish market survey, Nicaragua, 2000.

Table 4. Number and percent of open-air fish market vendors, by stand area (m<sup>2</sup>) and by region. Open-air fish market survey, Nicaragua, 2000.

Area (m <sup>2</sup> )	Region of Country					
	South-Central		Northwest		Total	
	N	%	N	%	N	%
0.50–2.00	12	16	27	82	39	36
2.01–4.00	11	15	1	3	12	11
4.01–6.00	21	28	0	0	21	19
6.01–8.00	12	16	1	3	13	12
8.01–10.00	7	9	4	12	11	10
10.01–12.00	8	11	0	0	8	7
12.01–40.00	4	5	0	0	4	4
Weighted average	6.56		2.42		5.30	

The average age of fish market vendors was 43 years (Table 3). The greatest number of respondents was in the 41 to 50 year age group. This was followed closely by the 31 to 40 year age group. There were no differences due to region in terms of the age of the fish market vendors.

Fish market vendors did not have a great deal of education (Figure 3). The greatest number of respondents had one to three years of education. This was followed by four to six years of education. More fish market vendors in the Northwest region had slightly higher levels of education than did fish market vendors in the South-Central region.

Table 5. Number and percentage of open-air fish market vendors, by counter area (m<sup>2</sup>) and by region. Open-air fish market survey, Nicaragua, 2000.

Counter Area (m <sup>2</sup> )	Region of Country					
	South-Central		Northwest		Total	
	N	%	N	%	N	%
No Counter	3	4	10	30	13	12
0.50–2.00	39	52	22	67	61	56
2.01–4.00	25	33	1	3	26	24
4.01–6.00	6	8	0	0	6	6
6.01–8.00	1	1	0	0	1	1
10.01–12.00	1	1	0	0	1	1
Weighted Average	2.29		0.92		1.87	

Table 6. Number and percent of open-air fish market vendors, by rent paid (US\$) per week and by region. Open-air fish market survey, Nicaragua, 2000.

Rent Paid (US\$ wk <sup>-1</sup> )	Region of Country					
	South-Central		Northwest		Total	
	N	%	N	%	N	%
Zero	1	1	0	0	1	1
0.78–1.56	9	12	4	12	13	12
1.57–2.34	29	39	21	64	50	46
2.35–3.12	18	24	1	3	19	18
3.13–6.25	14	19	6	18	20	18
6.26–8.59	3	4	1	3	4	4
9.39–10.16	1	1	0	0	1	1
Weighted Average	2.86		2.55		2.76	

Table 7. Number and percent of open-air fish market vendors, by ice usage in dollars spent per day and by region. Open-air fish market survey, Nicaragua, 2000.

Ice Expenditures (US\$ d <sup>-1</sup> )	Region of Country					
	South-Central		Northwest		Total	
	N	%	N	%	N	%
Zero	20	27	6	18	26	24
0.16–0.78	21	28	9	27	30	28
0.79–1.56	19	25	10	30	29	27
1.57–3.12	8	11	5	15	13	12
3.13–4.69	5	7	3	9	8	7
6.26–7.81	2	3	0	0	2	2
Weighted Average	1.13		1.20		1.15	

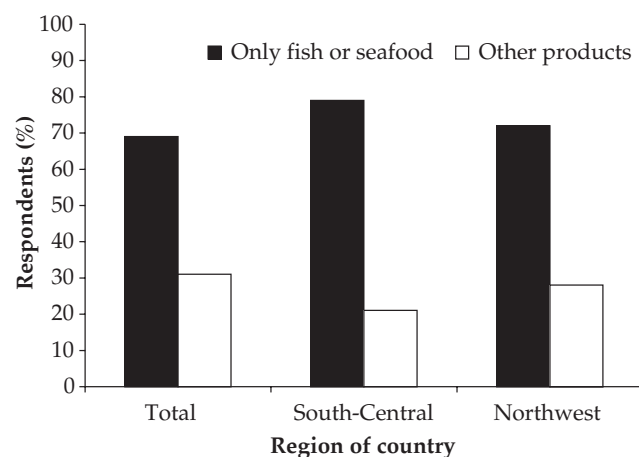


Figure 4. Percentage of open-air fish market vendors who sold products other than fish and seafood, by region. Open-air fish market survey, Nicaragua, 2000.

Table 8. Number and percent of open-air fish market vendors selling products other than fish and seafood, by region. Open-air fish market survey, Nicaragua, 2000.

Products	Region of Country					
	South-Central		Northwest		Total	
	N	%	N	%	N	%
Iguana	12	52	6	86	18	60
Turtle Eggs	13	56	3	43	16	53
Wild Meat	3	13	1	14	4	13
Beef	1	4	0	0	1	3
Pork	1	4	0	0	1	3
Chicken	1	4	0	0	1	3
Vegetables	2	9	0	0	2	7
Fruit	1	4	0	0	1	3

Fish market stands were relatively small (Table 4). The greatest number of respondents indicated that the area of their stand was between 0.5 and 2.00 m<sup>2</sup>. However, some fish markets were substantially larger with stand areas as large as 40 m<sup>2</sup>. Relatively equal percentages of respondents had stand areas of 2 to 10 m<sup>2</sup>.

Counter area ranged from respondents with no counter at all to counters of 12 m<sup>2</sup> (Table 5). The average counter area was 1.87 m<sup>2</sup>, and the greatest number of respondents had counter areas of 0.5 to 2.00 m<sup>2</sup>.

Fish market vendors paid US\$2.76 wk<sup>-1</sup> (original

Table 9. Scale ranking of the most important types of fish and seafood in terms of sales in the open-air fish market, by region. Open-air fish market survey, Nicaragua, 2000. (A score of 4 means the most important; 1 represents the fourth most important.)

Fish and Seafood	Region of Country		
	South-Central	Northwest	Total
Red Snapper	1.6	2.2	1.8
Tilapia	1.5	0.7	1.3
Guapote	1.4	0.3	1.1
Drum	0.9	1.0	0.9
Mojarra	1.2	0.2	0.9
Mackerel	0.9	0.1	0.7
Catfish	0.1	1.4	0.5
Shark	0.5	0.4	0.4
White Snapper	0.0	1.0	0.3
Mullet	0.0	1.0	0.3
Snook	0.0	0.8	0.3
Shrimp	0.2	0.2	0.2
Guavina	0.3	0.0	0.2
Black Mussels	0.2	0.1	0.2
Crab	0.1	0.2	0.2
Vela	0.2	0.0	0.1
Greville Jack	0.1	0.2	0.1
Prawn	0.1	0.0	0.1
Sawfish	0.1	0.0	0.1
Milkfish	0.1	0.0	0.1

amounts were converted from Nicaraguan córdobas to US dollars at the prevailing rate of 12.65 córdobas = US\$1) rent on average (Table 6). The range of rents paid per week varied from one respondent who did not pay rent to one who paid \$10.16 wk<sup>-1</sup>. Ice expenditures averaged \$1.15 d<sup>-1</sup> (Table 7).

The majority of fish market vendors sold only fish and seafood (Figure 4). Only 30% of respondents sold products other than fish and seafood. This was true in both regions. Of those who did sell other products, the most common product sold was iguana and turtle eggs (Table 8). A few sold other protein sources such as wild meat, beef, pork, and chicken. A very small number of other vendors also sold some vegetables and fruit.

Of the fish and seafood products sold, the most important was red snapper (Table 9). This was followed in descending order of importance by tilapia, guapote (*Cichlasoma managuense*), drum, mojarra (a native cichlid fish in Central America), mackerel, catfish, shark, white snapper, mullet, and snook. Other types of seafood mentioned included

Table 10. Scale ranking of the most important types of fish and seafood with the fastest sales growth in the last year in the open-air fish market, by region. Open-air fish market survey, Nicaragua, 2000. (A score of 3 represents the product with the fastest sales growth; 1 represents the third fastest sales growth.)

Fish and Seafood	Region of Country		
	South-Central	Northwest	Total
Red Snapper	1.1	1.2	1.1
Tilapia	1.2	0.5	1.0
Guapote	0.9	0.2	0.7
Mojarra	0.7	0.1	0.5
Drum	0.5	0.4	0.5
Mackerel	0.5	0.1	0.4
Shark	0.3	0.4	0.3
Catfish	0.0	0.9	0.3
Shrimp	0.1	0.4	0.2
White Snapper	0.0	0.6	0.2
Mullet	0.0	0.6	0.2
Snook	0.1	0.3	0.1
Prawn	0.1	0.0	0.1
Black Mussels	0.1	0.0	0.1
Guavina	0.1	0.0	0.1
Crab	0.1	0.0	0.1
Sawfish	0.1	0.0	0.0

shrimp, guavina, black mussels, crab, vela, jack, prawn, sawfish, and milkfish.

Fish and seafood items with the fastest sales growth were similar (Table 10). The fastest sales growth mentioned was red snapper. This was followed by tilapia, guapote, mojarra, drum, mackerel, shark, and catfish. The other types of seafood

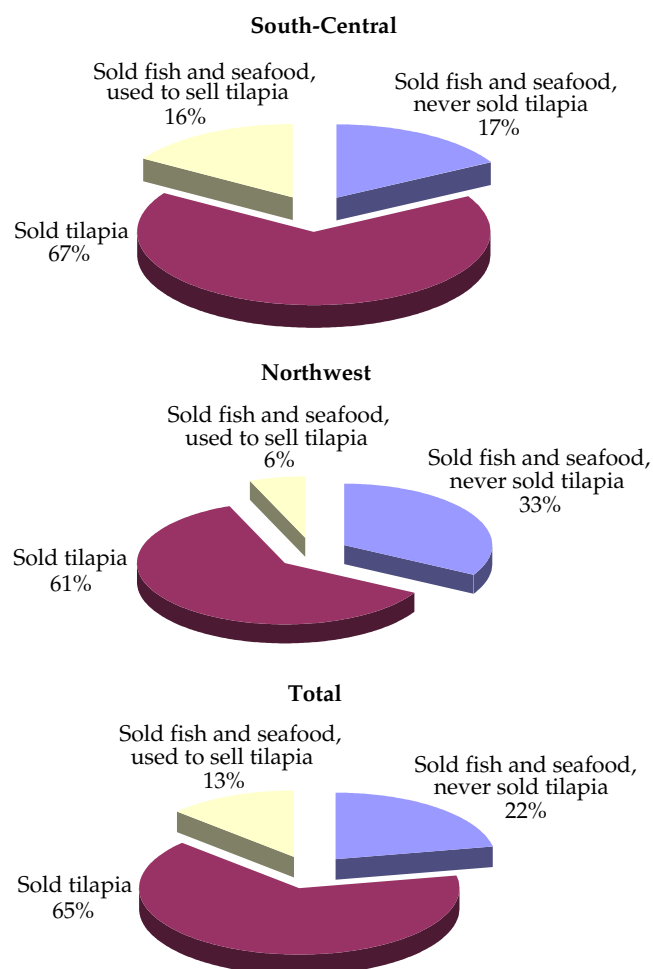


Figure 5. Number and percent of open-air fish market vendors that sold, used to sell, or never sold tilapia, by region. Open-air fish market survey, Nicaragua, 2000.

Table 11. Number of years tilapia has been sold, by years in business and by region. Open-air fish market survey, Nicaragua, 2000.

Years in Business	Number of Years Tilapia Has Been Sold																
	1-4		5-9		10-14		15-19		20-24		25-30		42		Weighted Average	Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%			
1-5	6	38	5	31	3	19	0	0	2	12	0	0	0	0	8	16	23
6-10	6	33	10	56	0	0	1	6	0	0	1	6	0	0	7	18	26
11-20	2	12	2	12	5	29	3	18	5	29	0	0	0	0	14	17	24
21-30	5	38	1	7	2	15	2	15	0	0	2	15	1	7	13	13	19
31-80	0	0	1	25	0	0	0	0	3	75	0	0	0	0	18	4	6
No Answer	1	50	0	0	1	50	0	0	0	0	0	0	0	0	7	2	3
Total	20	29	19	27	11	16	6	9	10	14	3	4	1	1	10	70	100



Table 12. Number and percent of open-air fish market vendors, by age of owner and by region. Open-air fish market survey, Nicaragua, 2000.

Region of Country	Age of Owner (yr)														
	15–20		21–30		31–40		41–50		51–60		61–80		Weighted Average	Total	
	N	%	N	%	N	%	N	%	N	%	N	%			
SOUTH-CENTRAL															
Sold Tilapia	0	0	5	10	17	34	20	40	4	8	4	8	43	50	67
Used to Sell Tilapia	0	0	2	17	0	0	4	33	3	25	3	25	53	12	16
Never Sold Tilapia	1	7	3	23	4	31	3	23	2	15	0	0	37	13	17
Subtotal	1	1	10	13	21	28	27	36	9	12	7	9	43	75	69
NORTHWEST															
Sold Tilapia	0	0	0	0	5	25	8	40	4	20	3	15	49	20	61
Used to Sell Tilapia	0	0	1	50	0	0	1	50	0	0	0	0	36	2	6
Never Sold Tilapia	1	9	2	18	5	46	3	27	0	0	0	0	35	11	33
Subtotal	1	3	3	9	10	30	12	36	4	12	3	9	43	33	31
TOTAL	2	2	13	12	31	29	39	36	13	12	10	9	43	108	100

mentioned as being most important were also mentioned as having the fastest sales growth.

### Tilapia Sales

Overall, 65% of the fish market vendors sold tilapia (Figure 5). Another 22% sold fish and seafood but never sold tilapia, while another 13% used to sell tilapia but stopped doing so. There was a slightly higher percentage of fish market vendors in the South-Central region that sold tilapia (67%) compared to the Northwest region (61%). However, the South-Central region did have a higher percentage (16%) of vendors who used to sell tilapia than did the Northwest region (6%).

Tilapia had been sold by fish market vendors for 10 years on average (Table 11). One respondent indicated that tilapia had been sold for 42 years in Nicaragua. Tilapia appeared to be sold equally frequently by vendors who had been in business a long time and by those who had been in business only a few years.

There appeared to be little difference of age between those who sold and those who did not sell tilapia (Table 12). However, vendors who sold tilapia in the Northwest appeared to be slightly older than those who sold tilapia in the South-Central region. There were more older vendors in the South-Central who had given up selling tilapia.

Of those vendors who sold tilapia in the South-

Central region, the greatest number had a relatively high amount of education (7 to 11 years) as compared to those who never sold tilapia or used to sell tilapia (Table 13). The greater numbers of the latter respondents had only one to three years of education. Nevertheless, as a weighted average, there was little difference.

Vendors with larger stand areas tended to be those who sold tilapia, particularly in the South-Central region (Table 14). The weighted average stand area of vendors who sold tilapia was 6.99 m<sup>2</sup> compared to 5.61 and 5.81 m<sup>2</sup>, respectively, for those who used to sell tilapia and those who never sold tilapia. Counter areas are likely related to the area of the market stands. Those vendors with more counter area also tended to be those that sold tilapia (Table 15).

The vast majority of the clientele groups of fish market vendors were low-income clients (Table 16). There appeared to be a slightly higher percentage of low-income clients of vendors who sold tilapia. More of those who never sold tilapia indicated that they had middle-income clients.

Fish market vendors sold an average of 57 lb of fish and seafood d<sup>-1</sup> (Table 17). Vendors who sold tilapia tended to have lower daily sales volumes of fish and seafood. Those who used to sell tilapia in the South-Central region tended to have much higher daily sales volumes than those who sold or who had never sold tilapia.

Table 13. Number and percent of open-air fish market vendors, by years of education and by region. Open-air fish market survey, Nicaragua, 2000.

Region of Country	Years of Education													
	None		1-3		4-6		7-11		12-16		Weighted Average		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
SOUTH-CENTRAL														
Sold Tilapia	9	18	13	26	12	24	15	30	1	2	5	50	67	
Used to Sell Tilapia	3	25	5	42	0	0	4	33	0	0	4	12	16	
Never Sold Tilapia	3	23	4	31	3	23	2	15	1	7	4	13	17	
Subtotal	15	20	22	29	15	20	21	28	2	3	4	75	69	
NORTHWEST														
Sold Tilapia	6	30	6	30	6	30	2	10	0	0	3	20	61	
Used to Sell Tilapia	0	0	0	0	1	50	0	0	1	50	10	2	6	
Never Sold Tilapia	0	0	3	27	4	36	2	18	2	18	7	11	33	
Subtotal	6	18	9	27	11	33	4	12	3	9	5	33	31	
TOTAL	21	19	31	29	26	24	25	23	5	5	5	108	100	

Table 14. Number and percent of open-air fish market vendors, by stand area (m<sup>2</sup>) and by region. Open-air fish market survey, Nicaragua, 2000.

Region of Country	Stand Area (m <sup>2</sup> )																
	0.5-2.00		2.01-4.00		4.01-6.00		6.01-8.00		8.01-10.00		10.01-12.00		12.01-40.00		Weighted Average	Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%			
SOUTH-CENTRAL																	
Sold Tilapia	5	10	9	18	18	35	5	10	6	12	3	6	4	8	6.99	50	67
Used to Sell Tilapia	5	42	0	0	1	8	2	17	1	8	3	25	0	0	5.61	12	16
Never Sold Tilapia	2	15	2	15	2	15	5	38	0	0	2	15	0	0	5.81	13	17
Subtotal	12	16	11	15	21	28	12	16	7	9	8	11	4	5	6.56	75	69
NORTHWEST																	
Sold Tilapia	17	85	1	5	0	0	0	0	2	10	0	0	0	0	2.11	20	61
Used to Sell Tilapia	2	100	0	0	0	0	0	0	0	0	0	0	0	0	1.25	2	6
Never Sold Tilapia	8	73	0	0	0	0	1	9	2	18	0	0	0	0	3.18	11	33
Subtotal	27	82	1	3	0	0	1	3	4	12	0	0	0	0	2.42	33	31
TOTAL	39	36	12	11	21	19	13	12	11	10	8	7	4	4	5.30	108	100



Table 15. Number and percent of open-air fish market vendors, by counter area (m<sup>2</sup>) and by region. Open-air fish market survey, Nicaragua, 2000.

Region of Country	Counter Area (m <sup>2</sup> )														
	0.5–2.00		2.01–4.00		4.01–6.00		6.01–8.00		10.01–12.00		No Counter		Weighted Average	Total	
	N	%	N	%	N	%	N	%	N	%	N	%			
SOUTH-CENTRAL															
Sold Tilapia	24	48	18	36	4	8	1	2	1	2	2	4	2.44	50	67
Used to Sell Tilapia	8	67	1	8	2	17	0	0	0	0	1	8	1.92	12	16
Never Sold Tilapia	7	54	6	46	0	0	0	0	0	0	0	0	2.06	13	17
Subtotal	39	52	25	33	6	8	1	1	1	1	3	4	2.29	75	69
NORTHWEST															
Sold Tilapia	16	80	1	5	0	0	0	0	0	0	3	15	1.15	20	61
Used to Sell Tilapia	2	100	0	0	0	0	0	0	0	0	0	0	1.25	2	6
Never Sold Tilapia	4	36	0	0	0	0	0	0	0	0	7	64	0.45	11	33
Subtotal	22	67	1	3	0	0	0	0	0	0	10	30	0.92	33	31
TOTAL	61	56	26	24	6	6	1	1	1	1	13	12	1.87	108	100

Table 16. Number and percent of open-air fish market vendors, by income clientele group and by region. Open-air fish market survey, Nicaragua, 2000.

Region of Country	Income Clientele Group							
	Low-Income		Middle-Income		High-Income		Total	
	N	%	N	%	N	%		
SOUTH-CENTRAL								
Sold Tilapia	45	90	5	10	0	0	50	67
Used to Sell Tilapia	10	83	1	8	1	8	12	16
Never Sold Tilapia	8	62	5	38	0	0	13	17
Subtotal	63	84	11	15	1	1	75	69
NORTHWEST								
Sold Tilapia	19	95	1	5	0	0	20	61
Used to Sell Tilapia	2	100	0	0	0	0	2	6
Never Sold Tilapia	9	82	2	18	0	0	11	33
Subtotal	30	91	3	9	0	0	33	31
TOTAL	93	86	14	13	1	1	108	100

Table 17. Number and percent of open-air fish market vendors, by volume of fish and seafood sold (lb d<sup>-1</sup>) and by region. Open-air fish market survey, Nicaragua, 2000.

Region of Country	Volume of Fish and Seafood Sold (lb d <sup>-1</sup> )														
	3–20		21–40		41–80		81–200		261–320		441–500		Weighted Average	Total	
	N	%	N	%	N	%	N	%	N	%	N	%		N	%
South-Central															
Sold Tilapia	17	34	15	30	9	18	8	16	0	0	1	2	55.84	50	67
Used to Sell Tilapia	3	25	4	33	3	25	1	8	0	0	1	8	79.08	12	16
Never Sold Tilapia	4	31	3	23	4	31	1	8	1	8	0	0	62.35	13	17
Subtotal	24	32	22	29	16	21	10	13	1	1	2	3	60.69	75	69
Northwest															
Sold Tilapia	3	15	8	40	8	40	1	5	0	0	0	0	45.15	20	61
Used to Sell Tilapia	0	0	1	50	1	50	0	0	0	0	0	0	45.50	2	6
Never Sold Tilapia	2	18	5	46	2	18	2	18	0	0	0	0	52.50	11	33
Subtotal	5	15	14	42	11	33	3	9	0	0	0	0	47.62	33	31
Total	29	27	36	33	27	25	13	12	1	1	2	2	56.69	108	100

Table 18. Volume sold (lb wk<sup>-1</sup>) of tilapia, by product form. Open-air fish market survey, Nicaragua, 2000.

<sup>a</sup> Responses represent individual answers, not respondents. Multiple answers (responses) can result in totals over 100%.

Volume of Tilapia Sold (lb wk <sup>-1</sup> )	Product Form			
	Fresh Whole-dressed		Fresh Fillets	
	N	% <sup>a</sup>	N	%
5–20	4	7	6	15
21–60	19	32	10	24
61–100	11	19	2	5
101–200	8	14	5	12
201–300	10	17	2	5
301–600	4	7	1	2
601–900	1	2	0	0
901–1,200	2	3	0	0
No Answer	0	0	15	37
Weighted Average	184		90	

Vendors who sold tilapia sold, on average, 184 lb wk<sup>-1</sup> of fresh whole-dressed tilapia and 90 lb wk<sup>-1</sup> of fresh fillets (Table 18). However, the most frequently mentioned weekly sales volume was 21 to 60 lb wk<sup>-1</sup> for both fresh whole-dressed tilapia and fresh fillets.

The average size of tilapia sold was 1.00 lb for fresh whole-dressed tilapia and 0.32 lb for fresh fillets

(Table 19). However, the majority of respondents indicated that they sold tilapia in the range of 0.61 to 1.00 lb. There were a few who indicated they were selling tilapia larger than 2.00 lb and a few others who sold small tilapia of 0.21 to 0.60 lb. For fresh fillets the most common size was 0.10 to 0.20 lb. This was followed closely by 0.21 to 0.60 lb, with only a few respondents selling larger fillets.

Wholesale prices averaged \$0.41 lb<sup>-1</sup> for fresh whole-dressed tilapia (Table 20). These prices ranged from \$0.15 lb to \$1.30 lb<sup>-1</sup>. Fresh fillet wholesale prices averaged \$0.91 lb<sup>-1</sup> and ranged from \$0.46 to \$1.30 lb<sup>-1</sup>.

Retail prices averaged \$0.56 lb<sup>-1</sup> for fresh whole-dressed tilapia (Table 21). Retail prices ranged from \$0.15 to \$1.30 lb<sup>-1</sup>. Fresh fillet retail prices averaged \$1.20 lb<sup>-1</sup> and ranged from \$0.71 to \$1.70 lb<sup>-1</sup>.

The majority of fish market vendors indicated that they were selling less tilapia than they sold in the previous year (Figure 6). This was especially evident in the Northwest region. Only small percentages said that they were selling the same amount of tilapia or more than in the previous year.

Respondents indicated that the most preferred product form of tilapia was as a fresh fillet (Figure 7). However, in the South-Central region, fresh whole-dressed fish were indicated to be the most preferred product form.

## Tilapia Supply and Marketing Channels

Fish market vendors purchased fish and seafood primarily from small-scale wholesalers and from fishermen (Figure 8). This was true in both regions of Nicaragua, but there were fewer purchases from fishermen in the South-Central region. Tilapia supplies were purchased more frequently from small-scale wholesalers than from fishermen.

Table 19. Size of tilapia sold (lb), by product form. Open-air fish market survey, Nicaragua, 2000.

<sup>a</sup> Responses represent individual answers, not respondents. Multiple answers (responses) can result in totals over 100%.

Size of Tilapia Sold (lb)	Product Form			
	Fresh Whole-dressed		Fresh Fillets	
	N	% <sup>a</sup>	N	%
0.10–0.20	0	0	13	32
0.21–0.60	5	8	10	24
0.61–1.00	31	52	1	2
1.01–1.40	11	19	1	2
1.41–1.80	8	14	0	0
1.81–2.20	2	3	0	0
Variety	2	3	1	2
No Answer	0	0	15	37
Weighted Average	1.00		0.32	

Table 20. Wholesale price of tilapia, by product form. Open-air fish market survey, Nicaragua, 2000.

<sup>a</sup> Responses represent individual answers, not respondents. Multiple answers (responses) can result in totals over 100%.

Wholesale Price (US\$ lb <sup>-1</sup> )	Product Form			
	Fresh Whole-dressed		Fresh Fillets	
	N	% <sup>a</sup>	N	%
0.15–0.25	10	17	0	0
0.26–0.35	17	29	0	0
0.36–0.45	20	34	0	0
0.46–0.55	8	14	2	5
0.56–0.70	3	5	1	2
0.71–1.10	1	2	11	27
1.11–1.30	3	4	4	10
No Answer	0	0	23	56
Weighted Average	0.41		0.91	

Figure 9 presents the most common market channels for wild-caught tilapia sold in fish markets in Nicaragua. Tilapia are caught by fishermen and sold to commission men and women. These individuals sell fish for the fishermen on a commission basis. These are sold primarily to small-scale wholesalers, who then resell tilapia to open-air fish market vendors who resell to the final consumer.

Farm-raised tilapia in Nicaragua are sold directly from tilapia farms to the fish market vendors (Figure 10). These are then resold to the final consumers.

Table 21. Retail price of tilapia, by product form. Open-air fish market survey, Nicaragua, 2000.

<sup>a</sup> Responses represent individual answers, not respondents. Multiple answers (responses) can result in totals over 100%.

Retail Price (US\$ lb <sup>-1</sup> )	Product Form			
	Fresh Whole-dressed		Fresh Fillets	
	N	% <sup>a</sup>	N	%
0.15–0.25	1	2	0	0
0.26–0.35	8	14	0	0
0.36–0.45	6	10	0	0
0.46–0.55	11	19	0	0
0.56–0.70	11	19	0	0
0.71–1.10	8	14	5	12
1.11–1.30	1	2	30	73
1.31–1.70	0	0	5	12
No Answer	13	22	1	2
Weighted Average	0.56		1.20	

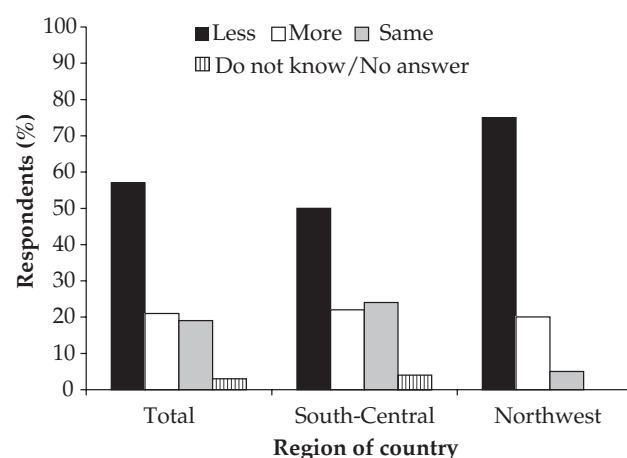


Figure 6. Current sales of tilapia compared to the previous year, by region. Open-air fish market survey, Nicaragua, 2000.

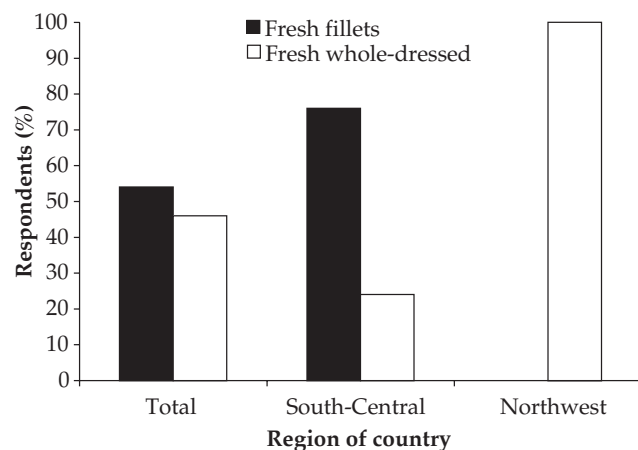


Figure 7. Most preferred tilapia product forms, by region. Open-air fish market survey, Nicaragua, 2000.

A majority of respondents indicated that their supply of tilapia was not consistent (Figure 11). This was true in both regions. Only about 30% of the fish market vendors indicated that their supply of tilapia was consistent.

The most frequently mentioned problem with tilapia was an insufficient quantity (Table 22). This was mentioned in 84% of the responses. An additional 20% of respondents indicated that lack of availability at certain times of the year was a prob-

lem. Other problems mentioned were off-flavor, too expensive, lack of availability of certain product forms, unreliable quality of the product, inconveniently sized purchase lots, and fish being too small.

### Most Important Characteristics that Influenced the Choice of Fish Products for Open-Air Fish Market Vendors

All vendors, with the exception of those who never sold tilapia, indicated that quality was the most important characteristic that influenced the choice of fish products (Figure 12). Size of fish and price were the next two most important characteristics across all types of vendors. For those vendors who never sold tilapia, supply and odor were the most important characteristics. Price was the second most important characteristic (after quality) for those vendors who used to sell tilapia.

Respondents rated tilapia highest on attributes such as the ability to prepare many dishes with tilapia, easy to prepare, nice fresh flavor, tilapia is a good fish, consumers like to eat tilapia, and supply is reliable (Table 23). However, respondents thought that marine fish tasted better. Overall, respondents were neutral on the size and price of tilapia as well as

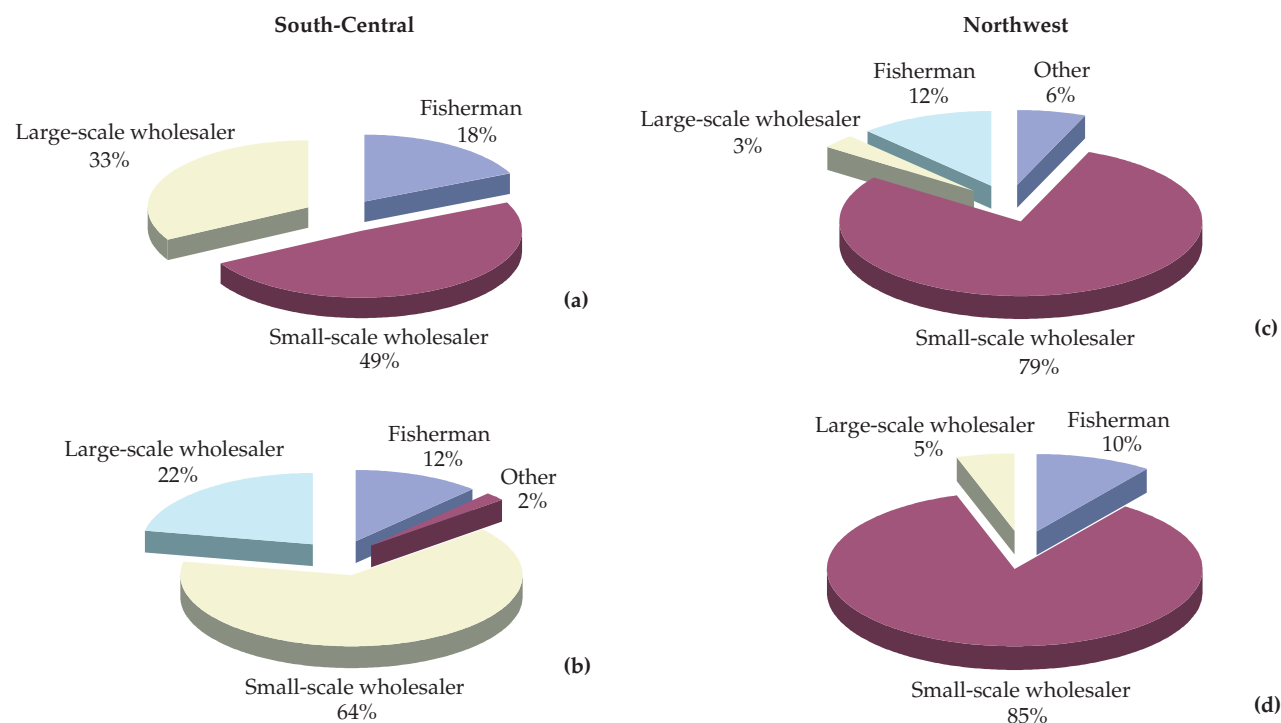


Figure 8. Type of fish [(a) and (c)] and tilapia [(b) and (d)] suppliers, by region. Open-air fish market survey, Nicaragua, 2000.

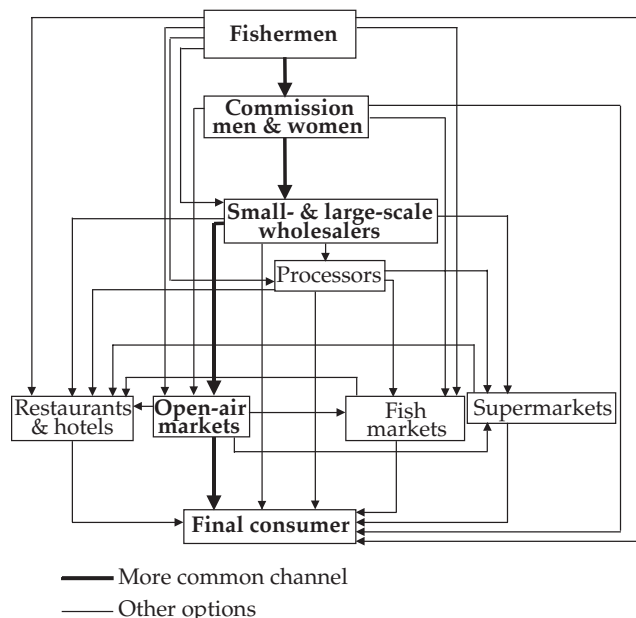


Figure 9. Market channels for wild-caught tilapia in Nicaragua.

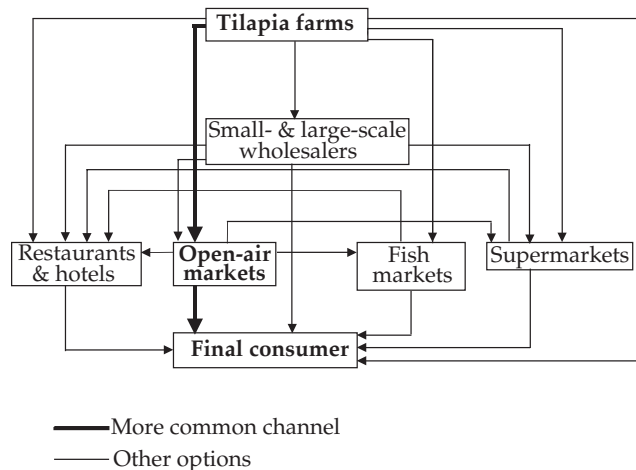


Figure 10. Market channels for farm-raised tilapia in Nicaragua.

tilapia having a fishy odor.

Those who never sold tilapia rated it much lower on reliable supply, consumers like to eat, price, size, flavor, and odor (Table 23). These vendors were also much more in agreement that marine fish tastes better than freshwater fish.

Vendors who used to sell tilapia rated it lower on consumers like to eat than did vendors who sold tilapia, but they rated it similarly on flavor and odor questions (Table 23). They tended to agree more that price was too high and that it was bony.

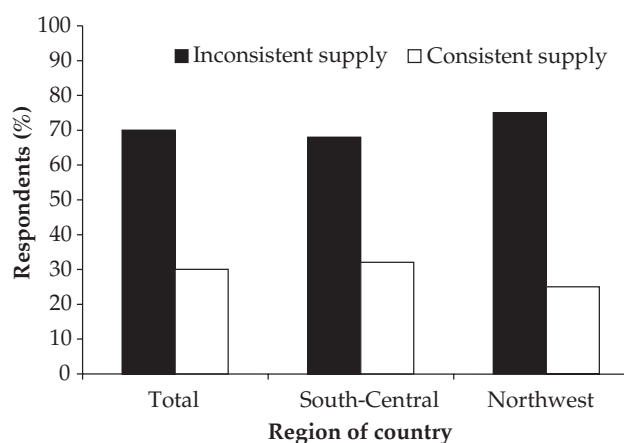


Figure 11. Consistency of tilapia supply, by region. Open-air fish market survey, Nicaragua, 2000.

The primary reason why open-air fish market vendors stopped selling or never sold tilapia was the contamination of the lake (Table 24). This was followed by lack of supply, price being too high, negative consumer attitudes, and lack of demand. Other responses mentioned were tastes like earth, people only eat marine fish, do not sell fish, tastes like gas, and storage problems. A higher percentage of respondents in the Northwest indicated contamination of the lake as the primary reason, whereas in the South-Central region price being too high and lack of supply were mentioned more frequently. Among those who never sold tilapia, contamination of the lake and price being too high were the most frequently mentioned reasons.

In spite of the frequent comments about supply problems, over half (53%) of the respondents said that they were very likely to begin to sell tilapia the next year (Table 25). Another 13% indicated that they were somewhat likely and 29% were very unlikely to begin selling tilapia the next year. Higher percentages of those who used to sell tilapia were very likely to begin selling the next year. This reinforces the idea that lack of supply was one of the primary constraints. Those who had never sold tilapia appeared to be less likely to begin selling tilapia the next year.

### Substitutes for Tilapia

Half of the respondents to the survey sold guapote (Table 26). In all, 44% sold both guapote and tilapia. Another 21% sold only tilapia and no guapote, and 32% did not sell either tilapia or

Table 22. Problems indicated with the supply of tilapia, by region. Open-air market survey, Nicaragua, 2000.

<sup>a</sup> Responses represent individual answers, not respondents. Multiple answers (responses) can result in totals over 100%.

Supply Problems	Region of Country					
	South-Central		Northwest		Total	
	N	% <sup>a</sup>	N	%	N	%
Insufficient Quantity	27	79	14	93	41	84
Unavailable at Certain Times of the Year	8	24	2	13	10	20
Off-Flavor (Tastes Like Earth)	2	6	1	7	3	6
Too Expensive	2	6	1	7	3	6
Certain Product Forms Are Not Available	1	3	1	7	2	4
Unreliable Quality of Product	1	3	1	7	2	4
Inconveniently-Sized Purchase Lots	2	6	0	0	2	4
Fish Is Too Small	0	0	1	7	1	2

Table 23. Weighted mean ratings of various attributes of tilapia, by region. Open-air fish market survey, Nicaragua, 2000.

<sup>a</sup> The number of respondents that rated the statement from 1 to 3.

Attributes	Sold Tilapia					Used to Sell Tilapia					Never Sold Tilapia					Total
	South-Central		Northwest		Total	South-Central		Northwest		Total	South-Central		Northwest		Total	
	Mean	N <sup>a</sup>	Mean	N	Mean	Mean	N	Mean	N	Mean	Mean	N	Mean	N	Mean	Mean
Reliable Supply	2.34	50	2.75	20	2.46	2.58	12	2.00	2	2.50	2.17	12	1.33	6	1.89	2.36
Consumers Like to Eat	2.82	49	2.95	20	2.86	2.27	11	3.00	2	2.38	2.38	8	1.40	5	2.00	2.67
Tilapia Is a Good Fish	2.86	49	2.61	18	2.79	2.90	10	3.00	2	2.92	2.42	12	1.62	8	2.10	2.67
Fishy Odor	1.35	49	1.70	20	1.45	1.64	11	2.00	2	1.69	1.73	11	1.29	7	1.56	1.50
Nice Fresh Flavor	2.91	47	3.00	13	2.93	3.00	8	3.00	2	3.00	2.62	8	2.50	2	2.60	2.90
Easy to Prepare	3.00	50	2.90	20	2.97	3.00	10	3.00	2	3.00	2.58	12	2.91	11	2.74	2.92
Price Is Too High	1.74	50	1.10	20	1.56	1.75	12	1.00	2	1.64	1.75	12	1.00	11	1.39	1.53
Size Is Too Small	1.64	50	1.55	20	1.61	1.67	12	1.00	2	1.57	1.50	12	1.36	11	1.43	1.57
Marine Fish Taste Better	1.73	49	2.68	19	2.00	2.00	11	3.00	2	2.15	2.60	10	2.80	10	2.70	2.16
Many Dishes	3.00	46	2.84	19	2.95	3.00	11	3.00	2	3.00	3.00	8	2.67	6	2.86	2.95
Bony	1.20	49	1.80	20	1.38	1.45	11	2.00	2	1.54	1.50	10	1.57	7	1.53	1.42

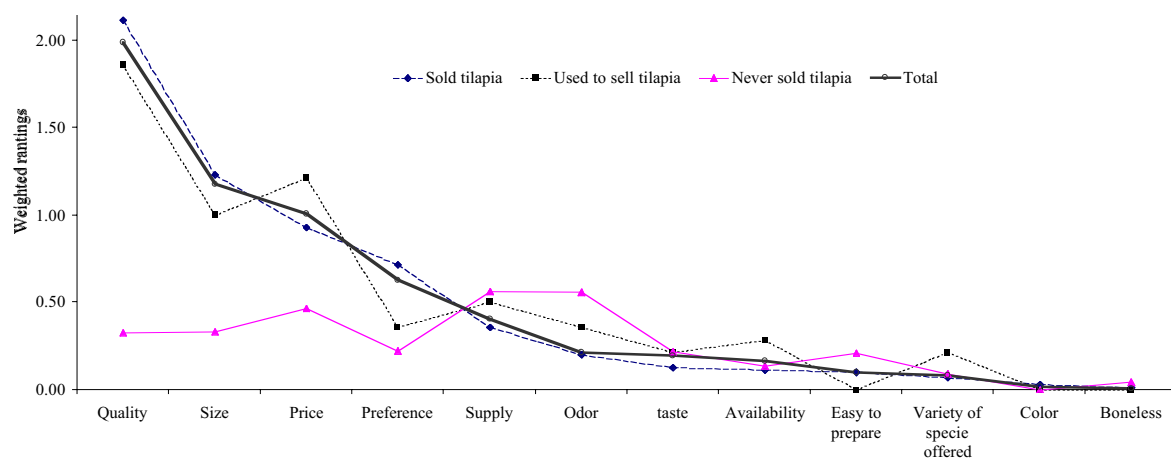


Figure 12. Scale ranking of the most important characteristics that influenced choice of fish products for fish vendors in open-air markets of vendors that sold, used to sell, or never sold tilapia. Open-air market survey, Nicaragua, 2000. (A score of 3 represents the most important characteristics that influenced choice of fish products; 1 represents the third most important characteristic.)



Table 24. Reasons why open-air fish market vendors stopped selling or never sold tilapia, by region. Open-air fish market survey, Nicaragua, 2000.

<sup>a</sup> Responses represent individual answers, not respondents. Multiple answers (responses) can result in totals over 100%.

Attributes	Sold Tilapia			Used to Sell Tilapia			Never Sold Tilapia			Total						
	South-Central		Northwest	Total	South-Central		Northwest	Total	South-Central		Northwest	Total				
	Mean	N <sup>a</sup>	Mean	N	Mean	Mean	N	Mean	Mean	N	Mean	Mean	N	Mean		
Reliable Supply	2.34	50	2.75	20	2.46	2.58	12	2.00	2	2.50	2.17	12	1.33	6	1.89	2.36
Consumers Like to Eat	2.82	49	2.95	20	2.86	2.27	11	3.00	2	2.38	2.38	8	1.40	5	2.00	2.67
Tilapia Is a Good Fish	2.86	49	2.61	18	2.79	2.90	10	3.00	2	2.92	2.42	12	1.62	8	2.10	2.67
Fishy Odor	1.35	49	1.70	20	1.45	1.64	11	2.00	2	1.69	1.73	11	1.29	7	1.56	1.50
Nice Fresh Flavor	2.91	47	3.00	13	2.93	3.00	8	3.00	2	3.00	2.62	8	2.50	2	2.60	2.90
Easy to Prepare	3.00	50	2.90	20	2.97	3.00	10	3.00	2	3.00	2.58	12	2.91	11	2.74	2.92
Price Is Too High	1.74	50	1.10	20	1.56	1.75	12	1.00	2	1.64	1.75	12	1.00	11	1.39	1.53
Size Is Too Small	1.64	50	1.55	20	1.61	1.67	12	1.00	2	1.57	1.50	12	1.36	11	1.43	1.57
Marine Fish Taste Better	1.73	49	2.68	19	2.00	2.00	11	3.00	2	2.15	2.60	10	2.80	10	2.70	2.16
Many Dishes	3.00	46	2.84	19	2.95	3.00	11	3.00	2	3.00	3.00	8	2.67	6	2.86	2.95
Bony	1.20	49	1.80	20	1.38	1.45	11	2.00	2	1.54	1.50	10	1.57	7	1.53	1.42

Table 25. Likelihood of stands in open-air markets to begin selling tilapia the next year, by region. Open-air fish market survey, Nicaragua, 2000.

Likelihood of Beginning to Sell Tilapia the Next Year	Region of Country													
	South-Central						Northwest						Total	
	Used to Sell		Never Sold		Subtotal		Used to Sell		Never Sold		Subtotal			
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Very Likely	9	75	6	46	15	60	2	100	3	27	5	38	20	53
Very Unlikely	1	8	6	46	7	28	0	0	4	36	4	31	11	29
Somewhat Likely	2	17	1	7	3	12	0	0	2	2	15	0	5	13
Somewhat Unlikely	0	0	0	0	0	0	0	0	2	2	15	31	2	5

Table 26. Number and percentage of open-air fish market vendors that sold guapote and tilapia, by region. Open-air fish market survey, Nicaragua, 2000.

<sup>a</sup> This row indicates the number of respondents who answered this question and the percent these represent of the total number of respondents.

Category on Menu	Region of Country					
	<i>South-Central</i>		<i>Northwest</i>		<i>Total</i>	
	N	%	N	%	N	%
Only Sold Tilapia	9	12	14	42	23	21
Sold Guapote and Tilapia	41	55	6	18	47	44
Only Sold Guapote	6	8	1	3	7	6
Did Not Include Guapote or Tilapia	19	25	12	31	35	32
Total Respondents <sup>a</sup>	75	69	33	31	108	100

Table 27. Reasons why fish vendors did not sell guapote, by region. Open-air fish market survey, Nicaragua, 2000.

<sup>a</sup> Responses represent individual answers, not respondents. Multiple answers (responses) can result in totals over 100%.

Reasons for Not Selling Guapote	Region of Country					
	South-Central		Northwest		Total	
	N	% <sup>a</sup>	N	%	N	%
Lack of Supply	9	32	14	54	23	43
Price Is Too High	7	25	2	8	9	17
Contamination of Lake	5	18	3	12	8	15
People Only Eat Marine Fish	3	11	4	15	7	13
Lack of Demand	4	14	2	7	6	11
Negative Consumer Attitudes	2	7	3	12	5	9
Do Not Sell Fish	3	11	0	0	3	6
Lack of Awareness	1	4	1	4	2	4
Storage Problems	1	4	0	0	1	2

Table 28. Consistency of guapote supply, by region. Open-air fish market survey, Nicaragua, 2000.

Region of Country	Consistency of Guapote Supply					
	Consistent		Inconsistent		Total	
	N	%	N	%	N	%
South-Central	16	34	31	66	47	32
Northwest	1	14	6	86	7	68

guapote.

Lack of supply was the most frequent response to questions related to why fish vendors did not sell guapote (Table 27). Other reasons for not selling guapote included price too high, contamination of lake, people only eat marine fish, lack of demand,

negative consumer attitudes, do not sell fish, lack of awareness, and storage problems. Clearly, fear of contamination from the lake is more of a concern with tilapia than with guapote. Lack of supply of guapote was a greater problem in the Northwest than in the South-Central region, but price being too high was less of a problem in the Northwest.

A majority of respondents indicated that supply of guapote was inconsistent (Table 28). A higher percentage of respondents in the Northwest (86%) indicated that inconsistent supply of guapote was a problem.

The overall problem with the supply of guapote was insufficient quantity (Table 29). This was true in both regions, although all of the respondents in the Northwest region indicated that quantities supplied were insufficient. Other problems mentioned included availability of preferred sizes, unavailable at certain

Table 29. Problems indicated with the supply of guapote, by region. Open-air fish market survey, Nicaragua, 2000.

<sup>a</sup> Responses represent individual answers, not respondents. Multiple answers (responses) can result in totals over 100%.

Supply Problems	Region of Country					
	South-Central		Northwest		Total	
	N	% <sup>a</sup>	N	%	N	%
Insufficient Quantity	22	71	6	100	28	76
Availability of Preferred Sizes	7	23	1	17	8	22
Unavailable at Certain Times of the Year	8	26	0	0	8	22
Too Expensive	2	6	1	17	3	8
Certain Product Forms Not Available	1	3	1	17	2	5
Inconveniently-Sized Purchase Lots	2	6	0	0	2	5

Table 30. Size (lb) of fresh whole-dressed tilapia and guapote sold. Open-air fish market survey, Nicaragua, 2000.

<sup>a</sup> Responses represent individual answers, not respondents. Multiple answers (responses) can result in totals over 100%.

Size Sold (lb)	Product Form			
	Tilapia		Guapote	
	N	% <sup>a</sup>	N	%
0.21–0.60	5	8	2	4
0.61–1.00	31	52	27	50
1.01–1.40	11	19	11	20
1.41–1.80	8	14	10	18
1.81–2.20	2	3	1	2
Variety	2	3	1	2
No Answer	0	0	3	6
Weighted Average	1.00		1.05	

Table 31. Volume (lb wk<sup>-1</sup>) fresh whole-dressed tilapia and guapote sold. Open-air fish market survey, Nicaragua, 2000.

<sup>a</sup> Responses represent individual answers, not respondents. Multiple answers (responses) can result in totals over 100%.

Volume Sold (lb wk <sup>-1</sup> )	Product Form			
	Tilapia		Guapote	
	N	% <sup>a</sup>	N	%
5–20	4	7	10	18
21–60	19	32	20	37
61–100	11	19	5	9
101–200	8	14	6	11
201–300	10	17	7	13
301–600	4	7	2	4
601–900	1	2	0	0
901–1,200	2	3	0	0
No Answer	0	0	4	7
Weighted Average	184		97	

times of the year, too expensive, certain product forms not available, and inconveniently sized purchase lots.

Fresh whole-dressed guapote sold in open-air markets in Nicaragua were similar to those sold of tilapia (Table 30). The average size of tilapia sold was 1.00 lb and of guapote, 1.05 lb.

There were higher volumes sold of fresh whole-

Table 32. Wholesale price (US\$ lb<sup>-1</sup>) of fresh whole-dressed tilapia and guapote. Open-air fish market survey, Nicaragua, 2000.

<sup>a</sup> Responses represent individual answers, not respondents. Multiple answers (responses) can result in totals over 100%.

Wholesale Price (US\$ lb <sup>-1</sup> )	Product Form			
	Tilapia		Guapote	
	N	% <sup>a</sup>	N	%
0.15–0.25	10	17	1	2
0.26–0.35	17	29	7	13
0.36–0.45	20	34	19	35
0.46–0.55	8	14	15	28
0.56–0.70	3	5	5	9
0.71–1.10	1	2	3	6
1.11–1.30	3	4	0	0
No Answer	0	0	4	7
Weighted Average	0.41		0.47	

Table 33. Retail price (US\$ lb<sup>-1</sup>) of fresh whole-dressed tilapia and guapote. Open-air fish market survey, Nicaragua, 2000.

<sup>a</sup> Responses represent individual answers, not respondents. Multiple answers (responses) can result in totals over 100%.

Retail Price (US\$ lb <sup>-1</sup> )	Product Form			
	Tilapia		Guapote	
	N	% <sup>a</sup>	N	%
0.15–0.25	1	2	0	0
0.26–0.35	8	14	1	2
0.36–0.45	6	10	3	6
0.46–0.55	11	19	3	6
0.56–0.70	11	19	15	28
0.71–1.10	8	14	15	28
1.11–1.30	1	2	1	2
Variety	0	0	1	2
No Answer	13	22	15	28
Weighted Average	0.56		0.73	

dressed tilapia per week than guapote (Table 31). Average weekly volumes sold were 184 lb wk<sup>-1</sup> for tilapia and 97 lb wk<sup>-1</sup> for guapote. The most frequent response for weekly volume was 21 to 60 lb per week sold of guapote. While this was the same as for tilapia, the next most frequent response for guapote volumes was 5 to 20 lb wk<sup>-1</sup>.

Wholesale prices were similar for fresh whole-dressed guapote and tilapia (Table 32). Average price of guapote was \$0.47 lb<sup>-1</sup> and was \$0.41 lb<sup>-1</sup> for tilapia. There were no responses at the higher prices for guapote as there were for tilapia.

Retail prices differed more (Table 33). Guapote retail prices were higher (\$0.73 lb<sup>-1</sup>) as compared to tilapia (\$0.56 lb<sup>-1</sup>).

### Conclusions

Direct personal interviews were conducted nationwide of open-air fish market vendors to obtain information about markets for Nicaraguan farm-raised and wild-caught tilapia. The study documented market penetration in the open-air fish market outlet segment.

Tilapia was a common product in open-air fish markets in Nicaragua. In all, 65% of the fish market vendors sold tilapia. Furthermore, tilapia have been sold in Nicaragua for about ten years in open-air fish markets. The larger stands owned and operated by vendors with slightly higher educational levels were the ones that tended to sell tilapia.

However, the vendors indicated that they were selling less tilapia than before. Supplies were not consistent, and they could not obtain sufficient quantities of quality tilapia. The vendors who did not sell tilapia indicated that supply and odor problems were the most important reasons why they did not sell

tilapia. These vendors also considered that marine fish was better than freshwater fish.

The fear of contamination of Lake Managua and of fish thought to be caught from the lake was a major factor inhibiting sales of freshwater fish. It was a major reason why vendors either stopped selling or did not sell tilapia. Nevertheless, half of these vendors indicated that they were very likely to begin selling tilapia the next year.

Overall, the wholesale prices paid for tilapia by open-air fish market vendors in Nicaragua were less than wholesale prices paid by open-air fish market vendors in Honduras. In Honduras, the production cost of farm-raised tilapia is too high compared to these wholesale costs. While cost structures in Nicaragua are likely very different than those in Honduras, the even lower wholesale price of tilapia in fish markets in Nicaragua makes it unlikely that open-air fish markets will be viable outlets for farm-raised tilapia.

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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.



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