



FISH MARKETING

in Central Luzon, Philippines

SUMMARY AND CONCLUSIONS

The primary objectives of this study were to determine the consumption statistics of fish by species, the seasonality of demand and supply, the price-size relationship of fish, and the economic impact of rice-fish culture in Central Luzon.

The market study indicated that the quantity and quality of fish available in the region varied widely between provinces. The overall quantity of fish available in 1977 was approximately 81,716 tons (metric), slightly higher than the area's 1976 reported production. Annual per capita consumption was 18.9 kilograms, which approximated previous estimates.

Fish were more readily available in areas close to sources of supply, and these areas had greatest sales. Bulacan and Pampanga provinces, regions with coastal areas and wide fishpond areas, reported the most sales. Both quantity and quality declined noticeably as fish moved inland from the coastal provinces. Fish in the inland provinces of Nueva Ecija and Tarlac were poor in quality, yet the prices were comparable to those in the coastal provinces. If alternatives were available, the quality of marine fish in the inland provinces would be unacceptable.

Interprovincial shipments of fish occurred in Central Luzon. However, substantial quantities of fish were imported from outside the region. Bataan essentially produced all the fish sold in the province. Zambales had near equality between fish production and fish availability. The present study identified an inflow of low quality marine fish into the region and an outflow of high quality marine and freshwater fish to the greater Manila area.

Although supply variations were obvious, it was difficult to determine which species of fish were low or high in supply at different times of the year. Within-month variations in some species appeared to be greater than seasonal variations. Insufficient supply of fish was most noticeable during December, January, and February.

More than 50 percent of the fish sold weighed 100 grams or less, the size range postulated for rice-fish culture. While price differentials existed between species of fish, there was more variation in prices between different sizes of fish of the same type.

Study of the economic feasibility of rice-fish culture in the region indicated that net returns of P2,870.00 (\$283.00) per hectare can be expected. Rice production is the main source of income of farmers in Central Luzon, and there is not a sufficient incentive to shift rice production. Therefore, fish production would be secondary to rice production in a rice-fish culture system. Fish grown simultaneously with rice do not decrease rice yield. Thus, fish will serve as an additional source of income. Nevertheless, the present marketing system will create impediments for the sale of fish from rice paddies.

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PUBLISHED 3/79—1M

COVER PHOTO. Fish vendors in small markets sometimes operate outside of the physical market structure.

Information contained herein is available to all without regard to race, color, or national origin.

Fish Marketing in Central Luzon, Philippines*

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ONE OF THE IMPORTANT problems facing the Philippines is the need for increased food production to meet demands of the country's fast-growing population. Consumption of food exceeds the total annual supply from domestic sources. In terms of per capita consumption, Filipinos eat food at a rate below the standard nutritional requirement (25).

Filipinos are generally rice- and fish-eating people. The government, in efforts to increase domestic food supply, has instituted several programs to boost production in the rice and fish industries. One of these is the Masagana 99 program, which was launched to help the many small rice farmers who dominate the industry. Coupled with this was a massive infrastructure development program that included road building and construction of irrigation facilities. The recently completed Pantabangan Dam is expected to provide year-round irrigation service to 500,000 hectares of rice farms in Central Luzon by 1985 (30).

The government also launched positive measures geared towards the further development and exploitation of its fishery and aquatic resources. Among the measures taken were development of deep-sea fishing, fishpond expansion, technical assistance to fishermen, development of fishery resource-based cottage industries, fish-stocking programs to replenish the stock of depleted lakes and rivers, and a vigorous campaign against illegal fishing, over-exploitation, and pollution (8,14,20).

Renewed interest in freshwater fish production has been generated with the resurrection of an ancient fish culture technique. A method of culturing fish in rice paddies has been developed by researchers at the Central Luzon State University. Field trials have shown that substantial quantities of fish can be produced without significantly reducing rice yield. Initial results show that a fish harvest of 200 to 300 kilograms per hectare can be attained (1,6,9).

This publication is a report of attempts to determine the fish consumption statistics for fish by species, to look into the seasonality of demand and supply, to examine price-size

relationship, and to determine the economic impact of rice-fish culture in Central Luzon. Secondary objectives included determination of seller's perception of price and quantity change over time and size composition of the existing fish supply in the region.

GENERAL BACKGROUND OF STUDY

The Philippine Government has instituted a long-range program to accelerate the integrated development of the fisheries industry. According to the Expanded Fish Production Program of the Bureau of Fisheries and Aquatic Resources, the target for fish production increases is set at a yearly increment of 6.6 percent (27).

One problem that besets Philippine fisheries is the inadequate marketing system of the industry (14). Included in the developmental strategy of the Integrated Fisheries Developmental Plan is the improvement of the marketing and distribution system and development of local and foreign markets (8).

Any attempt to improve the industry must be viewed from a total production-marketing context which calls for an in-depth examination of the present marketing system, its capacity to handle increased volume of production, i.e. its conduct and performance, or, in short, its efficiency (23).

In general, food production in the Philippines is steadily increasing. Domestic production provided most of the food consumed in 1974 (16). However, fish importations still comprise some 12 percent of the total fish consumption (25). Projected demand for fish products is expected to reach about 2 million tons by 1982 (8).

Previous Research

Several studies have been conducted regarding fish marketing in the Philippines in general. Guerrero and Darrah (11) prepared a comprehensive nationwide marketing report on milkfish, including detailed descriptions of producer and middlemen practices and information about marketing channels, margins, and geographic flow. A study on projected milkfish consumption and production was also done (12). Hopkins (13) did a survey on marketing practices and problems of municipal fishermen around Panguil Bay in Mindanao.

Because of the close proximity of Central Luzon to the

*This report is derived from the unpublished master of science thesis (1978) of R. C. Sevilleja, "Fish Marketing in Central Luzon, Philippines," Auburn University, Auburn, Alabama, and presented as a contributing part of Project AID/ea-180.

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greater Manila area, a considerable amount of fish produced in the Central Luzon area moved to the greater Manila area. Medina and Guerrero (19) indicated that 71 percent of the tilapia and 67 percent of the carp sold in Manila came from provinces in Central Luzon. On the other hand, fish were also transported into the region. A study by Navera and Librero (23) of the Navotas Fish Market indicated that about 29 percent of the fish from that market were sold in unspecified northern provinces. A report by the Philippine Fish Marketing Authority (26) also indicated that 20 percent of the port unloadings went outside of metro Manila. Approximately 6.4 percent of the total unloadings went to provinces in Central Luzon. Substantial quantities of smoked and dried fish were also transported into the region (19,20).

Basic Facts About Central Luzon

Central Luzon is composed of six provinces: Bataan, Bulacan, Nueva Ecija, Pampanga, Tarlac, and Zambales. The region has a combined area of about 18,000 square kilometers (5) and an estimated population of 4,321,000, table 1.

TABLE 1. POPULATION IN CENTRAL LUZON, BY PROVINCE, 1977

Province	Population Thousands
Bataan.....	262
Bulacan.....	1,042
Nueva Ecija.....	940
Pampanga.....	1,032
Tarlac.....	634
Zambales.....	411
TOTAL.....	4,321

SOURCE: National Census and Statistics Office.

Immediately to the south of the region is the greater Manila area with a population exceeding that of Central Luzon. To the north is the province of Pangasinan, which has some coastal areas. Northeast of the region is the inland mountainous province of Nueva Vizcaya. To the west is the China Sea, where most of the marine fish are caught, figure 1.

The region derives its fish produce from three principal sources—commercial fishing vessels, municipal (shallow water inshore) fisheries, and inland fisheries. The provinces of Bataan, Pampanga, and Zambales have coastal areas with both commercial and municipal catch. All provinces have some area devoted to fishponds. The region has a total of 52,307 hectares of fishponds, table 2, representing about 30 percent of the national total (4). The largest areas of fishpond culture are found within the provinces of Bulacan and Pampanga. Most of the fish ponds in Nueva Ecija are either non-operational or seasonal (10).

Commercial fishing, fishing done by licensed vessels over 3

TABLE 2. ESTIMATED NUMBER OF FISHERMEN AND AREA OF FISHPONDS IN CENTRAL LUZON, BY PROVINCE, 1976

Province	Number of fishermen	Area of fishponds Hectares
Bulacan.....	4,670	17,256
Nueva Ecija.....	.....	612
Pampanga.....	3,325 ¹	29,545
Tarlac.....	.....	306
Zambales.....	2,361	885
TOTAL.....	19,076	52,307

¹ Partial count.

SOURCE: 1976 Statistical Yearbook, Bureau of Fisheries and Aquatic Resources, Region III.

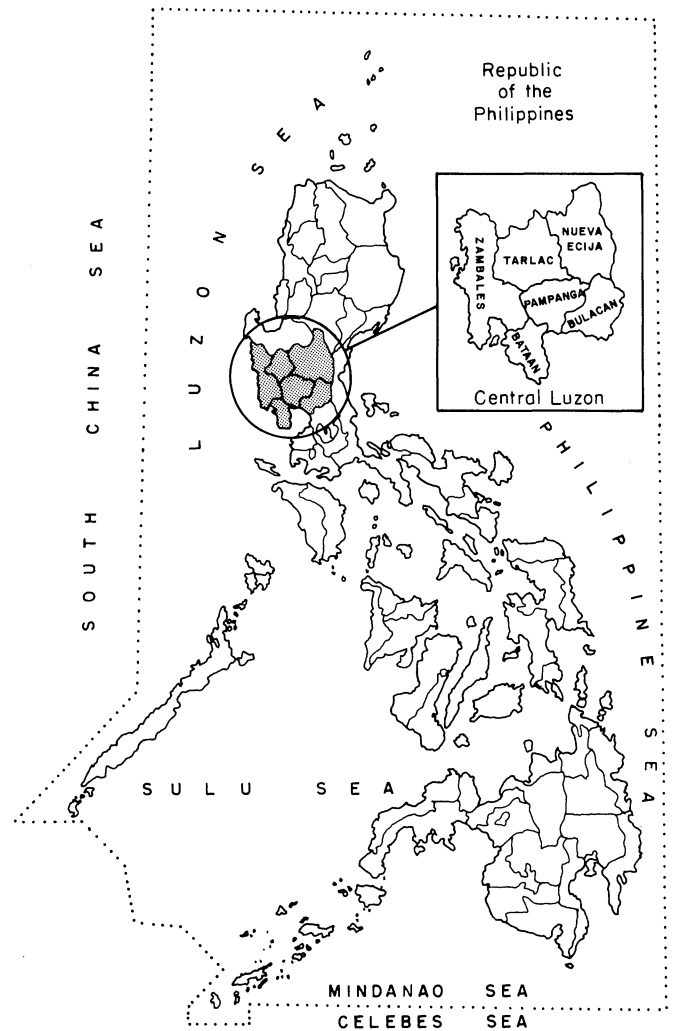


FIG. 1. Map of the Philippines.

tons in gross weight, comprised about 2 percent of the estimated total fish production in the region.

Municipal fishing refers to fishing by boats below 3 tons in gross weight, and also includes fishing operations without boats undertaken for subsistence purposes. Of the estimated total fish production, about 28 percent is generated by municipal operations.

Production from inland fisheries sources accounted for 70 percent of the estimated total fish production in the region.

TABLE 3. ESTIMATED TOTAL FISH PRODUCTION IN CENTRAL LUZON, BY PROVINCE AND SOURCE, 1976

Province	Production, by source			
	Commer- cial	Municipal	Inland	Total
	Tons ¹	Tons	Tons	Tons
Bataan.....	455	9,216	9,253	18,924
Bulacan.....	568	4,784	23,408	28,760
Nueva Ecija.....	.....	.....	308	308
Pampanga.....	.....	1,642	18,583	20,225
Tarlac.....	.....	.....	92	92
Zambales.....	579	4,695	619	5,893
TOTAL.....	1,602	20,337	52,263	74,202

¹ Throughout this report, tons refers to metric tons.

SOURCE: 1976 Statistical Yearbook, Bureau of Fisheries and Aquatic Resources, Region III.



LEFT: Small fishermen use motorized dugout canoes (bancas) in their fishing operations. RIGHT: Cast nets are a popular means of fishing.

Brackishwater ponds, swamplands, lakes, rivers, streams, irrigation canals, and rice paddies provide the main sources for this sector. The chief freshwater areas are found in the Bulacan and Pampanga rivers and Candaba Swamp in Pampanga province. The estimated total fish production in Central Luzon according to source and province is shown in table 3.

Per capita production of fish for the region was about 17.2 kilograms in 1976. Per capita consumption of fish in the area amounted to 17.0 kilograms according to a 1975 study (28), but dropped to 14.2 kilograms per capita the following year (2).

Central Luzon is called the rice bowl of the Philippines. It produces nearly one-quarter of the nation's total rice, but supplies 40 percent of the rice required by the food deficit areas of the country (15). There are over 300,000 hectares of irrigated rice land in the region, table 4. Average farm size is slightly less than 3 hectares (16,26).

The region has a type A climate characterized by a long dry season (about 5 to 6 months) and a pronounced wet season during May to October (15). Most of Central Luzon receives less than 200 centimeters of rain annually (5). However, farms having adequate irrigation facilities can grow two crops of rice annually.

TABLE 4. IRRIGATED AND TOTAL RICE HECTARAGE IN CENTRAL LUZON, BY PROVINCE, 1977

Province	Irrigated <i>Hectares</i>	Total <i>Hectares</i>
Bataan.....	14,240	19,409
Bulacan.....	81,020	123,441
Nueva Ecija.....	122,140	251,900
Pampanga.....	57,800	80,600
Tarlac.....	40,000	96,975
Zambales.....	12,470	24,016
TOTAL.....	327,670	596,341

SOURCE: National Food and Agriculture Council.

Fish Marketing in Central Luzon

There is no systematic marketing of fish products in Central Luzon. Marketing is carried out entirely by private enterprise or individual brokers without any administrative policies or governmental supervision. The system is characterized by too many middlemen, large quantities of low-quality fish sold, extreme fluctuations in supply, and poor and inadequate landing and unloading facilities in the markets (14,23).

Marketing operations vary in different landing places. Wholesale transactions of fresh fish take place at night or during the early hours of the morning. The fish are landed on the beach and sold to brokers or individuals.

There are two main marketing practices used in the region: (1) auction sales, and (2) the "suki" system. When sold by open bidding or auction through private brokers, the fishermen or brokers have no option but to sell to the highest bidder. In most of the small landing sites, the prevailing auction sales practice is by "whisper bidding" or "secret bidding." Also widely used at small landing sites is a cultural, personal, and financial relationship called "suki" system. Under this arrangement, the fisherman or fish farmer is assured of a market for fish and assured of credit. In return, the fisherman, wholesaler, or retailer is obligated to transact business only with the individual granting credit. In both practices, the honor system of selling without receipts is done. Oftentimes, sales are based on non-economic considerations, such as honesty and integrity of the buyer. The system has given rise to the incidence of bad debts beyond controllable proportions. Under present conditions, however, these two practices offer the quickest way of disposing of the fish catch.

Fish movement under the present marketing system indicates that fish pass through many channels before reaching the final consumer. This means that most of the profits of fishing go into the hands of brokers instead of fishermen. It is estimated that more than 80 percent of the profits go to brokers, leaving less than 20 percent to the fishermen (14).

There are few cold storage and ice making plants in the region. The most common means of transporting fish from landing sites to retail markets are trucks and jeepneys, most of which are not provided with refrigeration equipment. The inadequate transportation system is not a serious problem, however, because most of the fish landed are immediately disposed of as fresh fish. Those of less freshness are processed into dried and smoked fish.



Most fish are transported packed in ice.



Among the most popular means of transporting fish to the market are jeepsneys and tricycles.

METHODOLOGY

Selection of Sample

Each province in Central Luzon is subdivided into municipalities, which are further subdivided into several "barangays." Each municipality has at least one daily market where fish are sold.

The Bureau of Fisheries and Aquatic Resources, Region III, in Central Luzon, provided information on the number of markets and the estimated maximum number of sellers in each market within the region. With these estimates as bases, the sample size was established. For sample sizes less than 1,000, more than 50 percent of the population must be sampled for valid parameter estimates (17).

Dual sampling was done to serve the purpose of the study. The number of markets to be sampled was established and the number of sellers in each market was determined. A randomization procedure was used in the selection of markets. All markets within a province were listed in alphabetical order, and a list of random numbers was assigned to the list of markets. Time efficiency was a major factor in completing the survey because of the geographical location of the municipalities within the region. Thus, the number of markets selected was a function of the number of interviewers and the amount of time available to complete the survey.

A separate sampling procedure was established for collecting a random sample of market sellers. For markets with 10 or fewer sellers, all were interviewed. For markets with more than 10 sellers, but not exceeding 20 in number, 50 percent or more of the sellers were interviewed depending on the number of interviewers assigned to the market. In the case of markets with 21 to 30 sellers, no less than 10 vendors, but not more than 50 percent, were sampled. For very large markets, 10 percent of the sellers were interviewed. In some instances all sellers present were interviewed, although the number of sellers at other times was reported to be more than 10. The sampling procedure was designed to yield 10 percent of the sellers in at least 50 percent of the markets within Central Luzon.

There were two kinds of fish sellers in the markets sampled, identified according to the type of stall they used: those who have permanent stalls and those who occupy temporary places in the market. Sellers with permanent stalls were arranged in

rows in one section of the physical market structure. Samples were selected at intervals of five going clockwise starting from a pre-determined corner of the market and from within a row indicated by the last digit of the license plate from a randomly selected passing vehicle. Retailers without permanent stalls were randomly picked since they stay at different places in the market.



In large markets, sellers occupy tiled permanent stalls with running water.

Classification of Fish Types

For survey purposes, the species of fish sold in the markets were classified into first, second, and third class marine fish; first, second, and third class freshwater fish; crustaceans; and others. Brackishwater milkfish or "bangus" (*Chanos chanos*) and mullet or "banak" (*Mugil* sp.) were included in first class marine fish, while tilapia (*Tilapia* sp.) from brackishwater ponds were classified as second class freshwater fish. Among the more important commercial fishes included in the classification were mackerel or "alumahan" (*Rastrelliger* sp.) and snapper or "maya-maya" (*Lutianus* sp.), which were

classified as first class marine fish. Second class marine fish included slipmouth or "sap-sap" (*Leiognathus* sp.), nemipterid or "besugo" (*Nemapterus japonicus*), and sardines or "tamban" (*Sardinella* sp.). The bulk of third class marine fish was composed of round scad or "galonggong" (*Decapterus russelli*), caesio or "dalagang-bukid" (*Caesio* sp.), and anchovy or "dilis" (*Thrissoles* sp.). Freshwater species included catfish or "hito" (*Clarias macrocephalus* and *Clarias batrachus*), gourami (*Trichogaster pectoralis*), and carps which were classified as first, second, and third class, respectively. The complete classifications are listed in Appendix B.

Information Obtained

The sample sellers were questioned regarding their fish marketing activities. Information on daily sales and prices, sources of fish, availability of fish, and price differentiation were obtained following the format of the questionnaire, Appendix D.

Quantities and prices were recorded in kilograms and pesos (P)¹ per kilogram, respectively. When fish were sold by the unit, string, or pile, weights were estimated in kilograms and prices were converted to pesos per kilogram.

Information on sales and prices the previous year and 5 years ago was also obtained to determine sellers' perception of price and quantity changes over time. Observations on sanitary conditions and fish quality were likewise recorded.

Data Analysis

Daily sales data were collected from each sample seller by type and size of fish. All sales data for a particular province were initially aggregated. Average daily sales by province, by type and size of fish, were computed by dividing the aggregate by the number of sample sellers. Total sales per day were computed by multiplying the average daily sales by the average number of dealers per market and the total number of markets in a particular province.

Price data for individual fish species were combined to form an average price for each particular fish type and size. Average weighted price was then computed based on the average price and proportional sales for specific fish types and sizes.

Estimated per capita sales were computed by dividing total sales by total population for each province. A more detailed explanation of the procedure followed in data analysis is explained in Appendix C. Procedures for sampling, data gathering, pre-testing, data handling, and analysis are discussed by McCoy and Hopkins (17).

RESULTS AND DISCUSSION

A total of 724 fish sellers was interviewed in 77 markets in Central Luzon, table 5. The markets visited varied in size, selling conditions, number of market days, and number of days fish was available. In larger markets, sellers occupied tiled permanent stalls with running water and operated 7 days a week. Many of the markets visited had fish available daily, with additional sellers present during market days. Others had fish available only on market days. The physical selling conditions were generally unsanitary in the smaller markets, and sellers sometimes operated outside the physical market structure. The markets sampled are listed in Appendix A and shown by location in figure 2.

¹ 7.50 pesos = \$1.00.

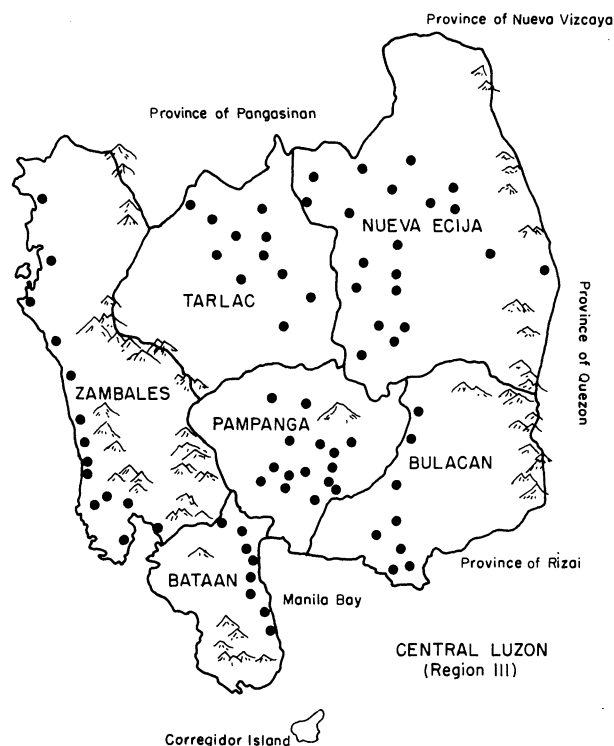


FIG. 2. Region III, Central Luzon.

TABLE 5. NUMBER OF MARKET AREAS, MARKETS SAMPLED, NUMBER OF RETAILERS AND RETAILERS SAMPLED, BY PROVINCE, CENTRAL LUZON, 1977

Province	Total markets	Markets sampled	Total retailers	Retailers sampled
	No.	No.	No.	No.
Bataan.....	12	9	960	93
Bulacan.....	24	8	792	72
Nueva Ecija.....	29	20	1,044	160
Pampanga.....	21	15	1,134	145
Tarlac.....	17	11	901	106
Zambales.....	14	14	602	148
TOTAL.....	117	77	5,433	724

Fish Availability in Central Luzon

Of 2,177 species of fish known to inhabit Philippine waters, only a few more than 100 are of economic value as commercial fish varieties (25). For purposes of this study, the species considered were classified into different groups, according to the listing in Appendix B.

Daily Sales

Daily sales of fish in Central Luzon ranged from about 17.9 tons in Zambales province to approximately 78.3 tons in Bulacan province, table 6. The majority of sales in every province was first class marine fish. Most freshwater fish were sold in the inland provinces of Nueva Ecija, Tarlac, and Pampanga, and the bulk of these were tilapia, a second class fish.

The total quantity of fish available by province is shown in table 7. Approximately 81,716 tons of fish were available in 1977, about 7,000 tons more than the reported 1976 harvest from the region (3). The distribution of fish availability among provinces was markedly different from the distribution of production, according to the type of fish, table 8.

TABLE 6. DAILY SALES OF FISH, BY TYPE AND PROVINCE, CENTRAL LUZON, NOVEMBER-DECEMBER, 1977

Class of fish	Sales by province					
	Bataan	Bulacan	Nueva Ecija	Pampanga	Tarlac	Zambales
	Kg	Kg	Kg	Kg	Kg	Kg
Marine						
1st	13.38	26.13	13.17	19.61	13.22	16.33
2nd	3.50	2.37	2.95	7.97	3.58	3.60
3rd	4.58	11.82	7.47	4.68	9.13	2.40
TOTAL	21.46	40.32	23.59	32.26	25.93	22.33
Freshwater						
1st	0.02	0.39	1.77	3.43	2.27	0.08
2nd	4.89	2.71	10.37	4.88	6.36	1.96
3rd	0.24	1.36	0.54	3.64	0.56	0.13
TOTAL	5.15	4.46	12.68	11.95	9.19	2.17
Crustaceans	3.34	1.08	1.26	1.28	0.95	0.76
Others	4.24	2.12	3.59	4.56	4.90	4.43
TOTAL	7.58	3.20	4.85	5.84	5.85	5.19
GRAND TOTAL	34.19	47.98	41.12	50.05	40.97	29.69
Dealers/market, av.	80	68	36	54	53	43
No. of markets	12	24	29	21	17	14
Total sales per day	32,822	78,303	42,929	56,756	36,913	17,873

TABLE 7. TOTAL QUANTITY OF FISH SALES IN CENTRAL LUZON, BY PROVINCE, 1977

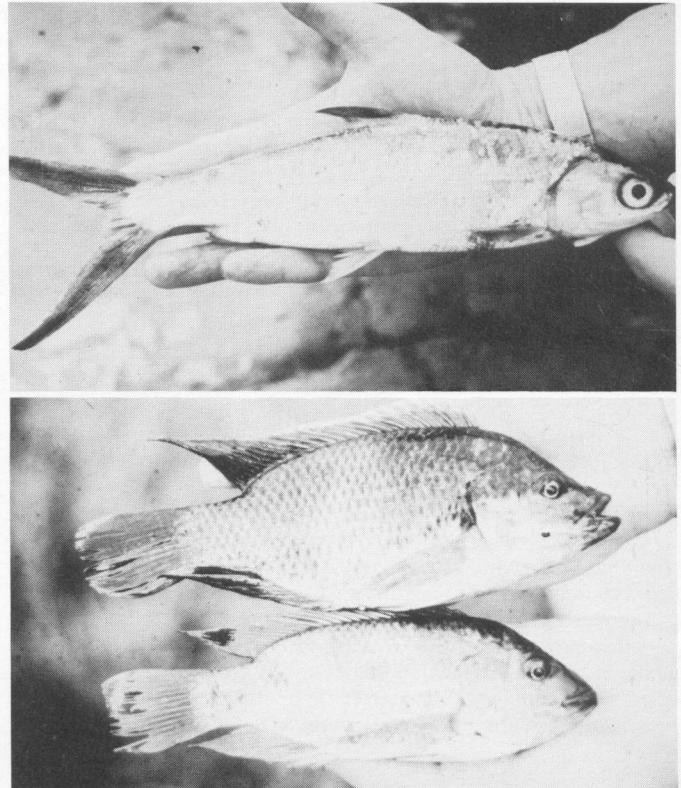
Province	Daily sales	Market days	Total sales
	Tons	Days	Tons
Bataan	32.8	306	10,036
Bulacan	78.3	349	27,327
Nueva Ecija	42.9	290	12,441
Pampanga	56.7	301	17,066
Tarlac	36.9	250	9,225
Zambales	17.9	314	5,621
TOTAL	265.5		81,716

TABLE 8. TOTAL QUANTITY OF FISH SALES, BY TYPE AND PROVINCE, CENTRAL LUZON, 1977

Class of fish	Sales by province					
	Bataan	Bulacan	Nueva Ecija	Pampanga	Tarlac	Zambales
	Tons	Tons	Tons	Tons	Tons	Tons
Marine						
1st	3,928	14,882	3,985	6,687	2,977	3,091
2nd	1,027	1,350	893	2,718	806	682
3rd	1,345	6,732	2,260	1,596	2,056	454
Freshwater						
1st	6	222	536	1,169	511	15
2nd	1,435	1,544	3,137	1,664	1,432	371
3rd	70	755	163	1,241	126	25
Crustaceans	980	615	381	436	214	144
Others	1,245	1,207	1,086	1,555	1,103	839
TOTAL	10,036	27,327	12,441	17,066	9,225	5,621

Per Capita Availability

Overall per capita fish availability for Central Luzon was approximately 18.9 kilograms, table 9. This estimate was somewhat higher than the quantity reported by NFAC consumption studies and substantially below the amount reported by NORCONSULT (24). As could be expected, areas close to a supply of fish had greater sales. Bataan, a coastal province, had the highest per capita availability, 38.3 kilograms. Bulacan province, which has some coastal areas and a large area of fishponds, was next with 26.2 kilograms. Nueva Ecija, an inland province, reported the least per capita sales, 13.2 kilograms.



TOP: Milkfish or "bangus" (*Chanos chanos*) is the most popular commercial fish. BOTTOM: Tilapia comprise most of the freshwater fish sold in the markets.

Zambales, a coastal province, was an exception to the pattern. Sellers indicated a portion of the fish was shipped into the area. In general, the transshipments were equalized by sales, and the quantity handled by area markets nearly equaled the quantity harvested in the province. Municipalities in Zambales province were isolated from each other by poor road conditions, thus the number of fishermen, non-market, or direct-from-fishermen purchases may have been higher in the province. Nearly all sellers purchased directly from fishermen or fishermen's wives. No outside province brokers were encountered in Zambales, and few province brokers were identified.

The estimated per capita availability of fish in the region is far below the 1976 NEDA-BFAR goal of 34.3 kilograms per capita. Even with equalized distribution of the surplus fish from Bataan province, per capita availability would still be short of the goal. If population remains constant, approximately 66,000 and 96,000 tons of additional fish must be supplied to meet the NEDA-BFAR and the integrated Fisheries Development Plan goals, respectively.

TABLE 9. POPULATION, ESTIMATED SALES AND PER CAPITA SALES IN CENTRAL LUZON, BY PROVINCE, 1977

Province	Population	Estimated sales	Average sales per capita
	Thousands	Tons	Kilograms
Bataan	262	10,036	38.3
Bulacan	1,042	27,327	26.2
Nueva Ecija	940	12,441	13.2
Pampanga	1,032	17,066	16.5
Tarlac	634	9,225	14.5
Zambales	411	5,621	13.6
TOTAL	4,321	81,716	18.9

TABLE 10. SOURCE OF FISH, BY TYPE AND PROVINCE, CENTRAL LUZON, 1977

Class	Bataan			Bulacan			Nueva Ecija			Pampanga			Tarlac			Zambales		
	WP ¹	WCL	OCL	WP	WCL	OCL	WP	WCL	OCL	WP	WCL	OCL	WP	WCL	OCL	WP	WCL	OCL
	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
Marine																		
1st	97	0	3	58	15	27	0	59	41	68	18	14	0	63	37	70	26	4
2nd	79	4	17	8	38	54	0	41	59	59	9	32	0	54	46	82	4	14
3rd	92	4	4	17	9	74	0	51	49	53	7	40	0	55	45	76	10	14
Freshwater																		
1st	100	0	0	100	0	0	86	14	0	93	5	2	78	22	0	67	33	0
2nd	96	0	4	63	12	25	55	25	20	76	12	12	44	32	24	20	80	0
3rd	100	0	0	75	25	0	61	17	22	94	6	0	17	50	33	50	50	0
Crustaceans	100	0	0	75	25	0	0	39	61	81	16	3	0	56	44	57	57	0
Others	98	0	2	33	17	50	34	4	62	32	28	40	50	17	33	87	87	0

¹ WP = within province, WCL = within Central Luzon, and OCL = outside Central Luzon.

Availability of Fish by Source of Supply

Supply of fish either came from sources within the province, within Central Luzon, or from outside the region. No marine fish sources are available in Nueva Ecija and Tarlac provinces. Sellers reported that of the total first class marine fish sold in these provinces, 41 and 37 percent, respectively, were purchased from sources outside of Central Luzon, table 10. The rest were supplied by sources from other provinces within Central Luzon, primarily from Guagua in Pampanga and Malolos in Bulacan provinces. In contrast, essentially all of the sales in Bataan were from within-province harvest. In addition, approximately 9,000 tons of fish were transported to other provinces.

Most of the freshwater fish were produced within the provinces, with a substantial quantity coming from inter-provincial shipments. Data from BFAR indicated that approximately 308 tons of inland fish were produced in Nueva

Ecija province during 1976 (3). Dealers reported 2,654 tons were purchased from sources within the province. The BFAR statistics understated actual production by a factor of eight for the province.

Bataan, Nueva Ecija, and Tarlac provinces represent the extremes in fish marketing in Central Luzon. Bataan had an oversupply of fish while Nueva Ecija and Tarlac imported most of the fish sold in the area. Zambales, a coastal province like Bataan, has near equality between fish production and fish availability. Both Bulacan and Pampanga, with limited coastal areas, are net importers of fish. The amount of fish available by type, source of supply, and province is listed in table 11.

Price and Sales Trends

Several factors were thought to influence prices of fish in Central Luzon. Among them were size of fish, class, and season.

TABLE 11. AMOUNT OF FISH AVAILABLE ACCORDING TO LOCATION OF SOURCE, TYPE, AND PROVINCE, CENTRAL LUZON, 1977

Class	Bataan				Bulacan				Nueva Ecija			
	WP ¹	WCL	OCL	Total	WP	WCL	OCL	Total	WP	WCL	OCL	Total
	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons
Marine												
1st	3,810	0	118	3,928	8,632	2,232	4,018	14,882	0	2,351	1,634	3,985
2nd	811	41	175	1,027	108	513	729	1,350	0	366	527	893
3rd	1,237	54	54	1,345	1,144	606	4,982	6,732	0	1,153	1,107	2,260
Freshwater												
1st	6	0	0	6	222	0	0	222	461	75	0	536
2nd	1,378	0	57	1,435	973	185	386	1,544	1,725	784	628	3,137
3rd	70	0	0	70	581	194	0	775	99	28	36	163
Crustaceans	980	0	0	980	461	154	0	615	0	149	232	381
Others	1,220	0	25	1,245	398	205	604	1,207	369	43	674	1,086
TOTAL	9,512	95	429	10,036	12,519	4,089	10,719	27,327	2,654	4,949	4,838	12,441
	Pampanga				Tarlac				Zambales			
	WP	WCL	OCL	Total	WP	WCL	OCL	Total	WP	WCL	OCL	Total
	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons
Marine												
1st	4,547	1,204	936	6,687	0	1,876	1,101	2,977	2,164	804	123	3,091
2nd	1,604	244	870	2,718	0	435	371	559	559	27	96	682
3rd	846	112	638	1,596	0	1,131	925	2,056	345	45	64	454
Freshwater												
1st	1,087	59	23	1,169	399	112	0	511	10	5	0	15
2nd	1,264	200	200	1,664	630	458	344	1,432	74	297	0	371
3rd	1,167	74	0	1,241	21	63	42	126	12.5	12.5	0	25
Crustaceans	353	70	13	436	0	120	94	214	82	62	0	144
Others	498	435	622	1,555	551	188	364	1,103	730	109	0	839
TOTAL	11,366	2,398	3,302	17,066	1,601	4,383	3,241	9,225	3,976.5	1,361.5	283	5,621

¹ WP = within province, WCL = within Central Luzon, and OCL = outside Central Luzon.

TABLE 12. AMOUNT OF FISH SOLD, BY TYPE, SIZE, AND PROVINCE, CENTRAL LUZON, 1977

Class	Bataan					Bulacan					Nueva Ecija				
	Size group (number per kg)					Size group (number per kg)					Size group (number per kg)				
	>10	5-9	2-4	<1	Total	>10	5-9	2-4	<1	Total	>10	5-9	2-4	<1	Total
	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons
Marine															
1st.....	1,787	672	962	507	3,928	1,295	10,477	3,110	0	14,882	1,765	1,734	482	4	3,985
2nd.....	1,020	0	7	0	1,027	1,303	47	0	0	1,350	714	107	72	0	893
3rd.....	944	401	0	0	1,345	3,689	2,100	943	0	6,732	1,587	621	52	0	2,260
Freshwater															
1st.....	0	6	0	0	6	0	222	0	0	222	379	139	18	0	536
2nd.....	1,317	118	0	0	1,435	990	554	0	0	1,544	2,742	382	13	0	3,137
3rd.....	16	21	0	33	70	167	0	0	608	775	152	5	6	0	163
Crustaceans.....	859	0	121	0	980	443	43	129	0	615	288	91	2	0	381
Others.....	1,072	32	35	106	1,245	637	94	51	425	1,207	982	88	16	0	1,086
TOTAL.....	7,015	1,250	1,125	646	10,036	8,524	13,537	4,233	1,033	27,327	8,609	3,167	661	4	12,441
	Pampanga					Tarlac					Zambales				
	Size group (number per kg)					Size group (number per kg)					Size group (number per kg)				
	>10	5-9	2-4	<1	Total	>10	5-9	2-4	<1	Total	>10	5-9	2-4	<1	Total
	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons
Marine															
1st.....	2,481	2,561	1,444	201	6,687	1,173	1,319	485	0	2,977	1,641	300	356	794	3,091
2nd.....	2,672	46	0	0	2,718	771	35	0	0	806	621	16	27	18	682
3rd.....	555	597	179	265	1,596	1,468	423	101	64	2,056	301	89	25	39	454
Freshwater															
1st.....	735	318	101	15	1,169	233	214	64	0	511	8	3	4	0	15
2nd.....	1,142	406	5	111	1,664	1,395	37	0	0	1,432	362	9	0	0	371
3rd.....	710	387	137	7	1,241	123	0	3	0	126	18	7	0	0	25
Crustaceans.....	402	23	11	0	436	206	8	0	0	214	139	1	4	0	144
Others.....	808	742	5	0	1,555	1,004	99	0	0	1,103	561	121	47	110	839
TOTAL.....	9,505	5,080	1,882	599	17,066	6,373	2,135	653	64	9,225	3,651	546	463	961	5,621

Size Classification

As previously mentioned, the fish species considered for this study were preclassified into seven groups according to the system used by NORCONSULT. However, these classifications were seldom used by BFAR or the sellers. Fish classifications normally indicate buyer preference and size of fish; however, the system used did not indicate these relationships. A quality standard scheme was introduced by the Philippine Fish Marketing Authority (PFMA) which was not available at the time the study was made (24). The standards are:

Grade I	live fish
Grade II	fish and slightly fresh fish (iced or chilled)
Grade III	slightly spoiled fish
Grade IV	unfit for consumption

According to this standard, all fish in Bataan and Zambales provinces would be in grades I and II. Fish in Bulacan and Pampanga would be in grades I, II, and III. Over 50 percent of

the fish in Nueva Ecija and Tarlac would be classified in grades III and IV. In smaller markets, the proportion of fish in Grade IV would be as high as 50 percent.

There were four size groups considered for this study: (1) 10 or more fish per kilogram, (2) 5 to 9 fish per kilogram, (3) 2 to 4 fish per kilogram, and (4) 1 or less fish per kilogram.

More than 50 percent of all the fish sold in central Luzon were less than 100 grams in size, table 12. Sellers from Bulacan province reported more fish sales of the second size group (5 to 9 fish per kilogram) than in any other province. In Bataan, Nueva Ecija, and Tarlac provinces, approximately 70 percent of the fish sold belonged to the first size group.

Price - Size Relationship

Prices were influenced by size and class of fish. Fish prices in the markets varied more between two sizes of fish in the same class than between two classes of fish of the same size. For example, in Nueva Ecija province, 100-gram fish sold for

TABLE 13. TOTAL QUANTITY AND AVERAGE PURCHASE PRICE PER KILOGRAM OF FISH SOLD IN NUEVA ECIIJA PROVINCE, BY SIZE AND TYPE, 1977

Type of fish	Number of fish per kilogram								Total	
	>10		5-9		2-4		<1			
	m.t.	P/kg	m.t.	P/kg	m.t.	P/kg	m.t.	P/kg	m.t.	P/kg
Marine										
1st.....	1,807	7.30	1,765	6.90	493	8.95	41	8.00	4,106	7.35
2nd.....	846	5.50	127	7.90	85	7.00	---	---	1,058	5.90
3rd.....	1,481	5.90	592	9.50	42	8.40	---	---	2,115	6.95
Freshwater										
1st.....	265	7.65	97	7.80	11	6.65	---	---	373	7.65
2nd.....	2,706	5.40	373	6.75	31	3.00	---	---	3,110	5.50
3rd.....	115	5.70	5	4.00	4	5.00	---	---	124	5.60
Crustaceans.....	233	13.90	75	10.20	3	40.00	---	---	311	13.25
Other.....	1,120	6.60	99	6.40	25	10.65	---	---	1,244	6.65
TOTAL.....	8,573	6.35	3,133	7.50	694	8.55	41	8.00	12,441	6.75

TABLE 14. TOTAL QUANTITY AND AVERAGE PURCHASE PRICE PER KILOGRAM OF FISH SOLD, BY TYPE AND PROVINCE, CENTRAL LUZON, 1977

Class	Bataan		Bulacan		Nueva Ecija		Pampanga		Tarlac		Zambales	
	Amt.	₱/kg	Amt.	₱/kg	Amt.	₱/kg	Amt.	₱/kg	Amt.	₱/kg	Amt.	₱/kg
	Tons		Tons		Tons		Tons		Tons		Tons	
Marine												
1st.....	3,928	8.35	14,882	6.45	3,985	7.35	6,687	8.05	2,977	7.60	3,091	6.80
2nd.....	1,027	5.75	1,359	12.40	893	5.90	2,718	7.15	806	5.00	682	5.05
3rd.....	1,345	6.45	6,732	5.45	2,260	6.90	1,596	9.00	2,056	6.20	454	5.50
Freshwater												
1st.....	6	5.50	222	9.00	536	7.65	1,169	8.40	511	8.75	15	6.55
2nd.....	1,435	5.90	1,544	3.15	3,137	5.50	1,664	5.25	1,432	4.45	371	4.95
3rd.....	70	6.00	775	3.90	163	5.60	1,241	5.90	126	4.55	25	5.50
Crustaceans.....	980	12.10	615	14.75	381	13.15	436	11.65	214	14.25	144	12.05
Others.....	1,245	7.15	1,207	5.45	1,086	6.65	1,555	6.60	1,103	6.15	839	4.80
TOTAL.....	10,036	7.65	27,327	6.35	12,441	6.80	17,066	7.55	9,925	6.60	5,621	6.20

₱1.15 per kilogram less than 200-gram fish and ₱2.20 per kilogram less than 500-gram fish, table 13.

In general, Nueva Ecija and Tarlac provinces have higher prices regardless of fish size, table 14. Even more visible is the price-quality differential between provinces. With movement inland from the coastal provinces, the quality of fish noticeably declined. In general, the majority of the fish in rural markets in Nueva Ecija and Tarlac would be classified as grades III and IV according to PFMA standards, yet prices for these fish are comparable or higher than prices for first class fish in the coastal markets. Because of the scarcity of high quality marine fish in Nueva Ecija province, for example, third class marine fish, mostly round scad ("galonggong"), command a higher price than freshwater tilapia and carp, which are much better in quality. The average price of fish by type, size, and province is listed in table 15.

Seasonality of Supply

The overall variation in supply for all types of fish is listed in table 16. In general, certain species of fish were least

available from September through January, while other species were most abundant during November and December. Within months, variations in some species may be greater than seasonal variation. For marine species, weather conditions strongly influence the catch. During the rainy season, especially during the months of September and October, a low supply of capture fish is experienced because of the incidence of storms and general unfavorable conditions for fishing (27).

An insufficient supply of fish was most noticeable during December, January, and February. Consequently, these months correspond to the period of highest prices. Several other factors also influence this situation. Many farmers harvest their fish prior to the rainy months for fear of total loss from floods, which is fairly common. Finally, there is stimulated buying during the Christmas season (December and January).

Seller's Perception of Market Changes

One of the objectives of this study was to determine the seller's perception of price and quantity changes over time.

TABLE 15. AVERAGE PRICE OF FISH, BY TYPE, SIZE, AND PROVINCE, CENTRAL LUZON

Class	Bataan				Bulacan				Nueva Ecija			
	Size group (number per kg)				Size group (number per kg)				Size group (number per kg)			
	>10	5-9	2-4	<1	>10	5-9	2-4	<1	>10	5-9	2-4	<1
	₱	₱	₱	₱	₱	₱	₱	₱	₱	₱	₱	₱
Marine												
1st.....	7.35	8.30	8.10	12.60	4.65	6.60	6.60	---	7.30	6.90	8.95	8.00
2nd.....	5.70	---	12.00	---	12.60	7.00	---	---	5.50	7.90	7.00	---
3rd.....	6.20	7.00	---	---	4.80	6.35	6.00	---	5.85	9.50	8.40	---
Freshwater												
1st.....	---	---	---	---	---	9.00	---	---	7.65	7.80	6.65	---
2nd.....	6.00	5.00	---	---	1.80	5.50	---	---	5.35	6.75	3.00	---
3rd.....	4.00	6.00	---	7.00	3.50	---	---	4.00	5.70	4.00	5.00	---
Crustaceans.....	11.40	---	17.00	---	17.00	12.00	8.00	---	13.90	10.20	40.00	---
Others.....	6.90	9.00	7.20	9.00	7.70	6.00	1.00	2.50	6.60	6.40	10.65	---
	Pampanga				Tarlac				Zambales			
	Size group (number per kg)				Size group (number per kg)				Size group (number per kg)			
	>10	5-9	2-4	<1	>10	5-9	2-4	<1	>10	5-9	2-4	<1
	₱	₱	₱	₱	₱	₱	₱	₱	₱	₱	₱	₱
Marine												
1st.....	7.70	9.10	6.90	7.75	8.40	7.00	7.35	---	6.60	7.90	7.60	6.40
2nd.....	7.20	4.00	---	---	4.90	7.80	---	---	5.00	7.00	6.00	4.50
3rd.....	6.20	6.90	6.70	21.00	5.80	7.00	7.50	8.00	5.30	7.15	4.00	4.25
Freshwater												
1st.....	8.50	5.50	4.90	8.50	10.45	7.20	7.80	---	6.00	7.00	7.25	---
2nd.....	4.65	6.55	5.00	7.00	4.50	3.00	---	---	4.90	7.00	---	---
3rd.....	5.90	6.60	4.25	4.00	4.50	---	6.00	---	5.70	5.00	---	---
Crustaceans.....	11.55	12.00	14.00	---	14.10	18.00	---	---	12.10	8.00	11.00	---
Others.....	6.20	7.00	6.00	---	6.35	3.90	---	---	4.60	5.80	5.90	4.45

TABLE 16. PROPORTION OF SELLERS REPORTING VARIATIONS IN SUPPLY OF FISH BY MONTH, CENTRAL LUZON, 1977

Month	Dealers reporting		
	Least available	Most abundant	Insufficient supply
	Percent	Percent	Percent
January.....	9	6	14
February.....	8	1	12
March.....	6	9	6
April.....	6	9	6
May.....	6	6	4
June.....	6	10	6
July.....	6	9	6
August.....	7	7	6
September.....	9	4	8
October.....	8	7	6
November.....	10	14	8
December.....	14	18	17

TABLE 17. PROPORTION OF SELLERS RESPONDING YES TO SELECTED MARKETING QUESTIONS, CENTRAL LUZON, 1977

Question	Responding yes, by province					
	Bataan	Bula-can	Nueva Ecija	Pam-panga	Tarlac	Zam-bales
	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
Does quantity vary?.....	95	83	78	96	95	93
Can you get desired quantity?...	70	75	88	51	64	46
Can you get the size you want?...	36	41	65	51	36	59
Could you sell more if available?.....	51	57	62	32	70	51

The sample vendors were asked about their marketing activities during the previous year and 5 years ago. General questions regarding the availability of fish by size, species, price, and other factors were asked, table 17. Certain anomalies appear in the data. In Nueva Ecija province, for example, 88 percent of the sellers received the quantity desired and 65 percent received the size of fish desired; however, 62 percent said they could sell more fish if available. The lower volume sellers said they were unable to finance larger volumes of fish with the brokers. Thus, while they could sell more fish, the present marketing system entailed too much risk for them to increase volume.

The sellers' perception of change over time in Nueva Ecija province indicated an increase in marine and freshwater species, except first class freshwater fish, during the last year, table 18. The total quantity available remained essentially the same, with shifts in other classifications. Over a 5-year period, only first class freshwater fish decreased in availability.

The prices of fish have not remained constant in relationship to the change in quantity. Only crustaceans have decreased in price over the time period. Second class freshwater fish, primarily tilapia, increased in quantity nearly 100 percent; however, price increased nearly 225 percent. A portion of the increase can be attributed to inflation; however, some portion must be due to an increased awareness in quality factors. The freshwater fish in Nueva Ecija are of higher quality than marine species.

Projected Demand for Fish in Central Luzon

Simple projections of market demand in the region were calculated to provide estimates of the quantities of fish which consumers will be willing to purchase within a relatively short time. The projections were based on estimated consumption of

fish and expected changes in population. Possible changes in income were not considered. It was assumed that all other factors will remain constant.

An estimated 4,321,000 people lived in Central Luzon in 1977. Based on expected growth in population and present trend in migration, the population will increase to approximately 4,889,000 by 1980 and 5,308,000 by 1982.

Based on consumption studies, per capita consumption of fish in the region was estimated at 17.0 kilograms. Market demand for fish is projected to be 83,113 tons in 1980 and 90,236 tons in 1982, table 19.

If the NEDA-BFAR goal of 34.3 kilograms is to be met, an additional 85,942 and 100,280 tons of fish must be supplied in 1980 and 1982, respectively, table 20.

ECONOMIC FEASIBILITY OF RICE-FISH CULTURE

For farms with adequate irrigation facilities, two or three crops of rice can be planted annually. Irrigated land also offers the option of concurrent production of rice and fish. This option offers potential for Central Luzon, which had over 300,000 hectares of irrigated rice land in 1977.

Information on the culture of fish concurrent with rice is still limited. Experiments at Central Luzon State University have shown that up to approximately 5 tons of rice and 200

TABLE 18. SELLERS' PERCEPTIONS OF QUANTITY AND PRICE CHANGES AS A PERCENTAGE OF PRESENT, FOR SELECTED TYPES OF FISH IN NUEVA ECIIJA PROVINCE, CENTRAL LUZON, 1977

Type	Present		Change from the present			
	Quantity	Price/kg	Last year		5 years ago	
			Quantity	Price	Quantity	Price
	Tons	P	Pct.	Pct.	Pct.	Pct.
Marine						
1st.....	3,985	7.35	100	79	77	42
2nd.....	893	5.90	88	70	47	24
3rd.....	2,260	6.90	86	76	73	40
Freshwater						
1st.....	536	7.65	131	85	200	16
2nd.....	3,137	5.50	80	80	50	26
3rd.....	163	5.60	76	100	22	10
Crustaceans.....	381	13.15	94	126	80	100
Other.....	1,086	6.65	216	80	72	60
Total quantity	12,441 tons		12,906 tons		8,676 tons	

TABLE 19. PROJECTION OF MARKET DEMAND FOR FISH IN CENTRAL LUZON IN 1980 AND 1982

Year	Population	Per capita consumption	Estimated supply	Projected demand	Additional need
			Tons	Tons	Tons
1977.....	4,321,000	17.0	81,716	-----	-----
1980.....	4,889,000	17.0	-----	83,113	1,397
1982.....	5,308,000	17.0	-----	90,236	8,520

TABLE 20. PROJECTION OF MARKET DEMAND FOR FISH IN CENTRAL LUZON IN 1980 AND 1982 (BASED ON NEDA-BFAR GOAL)

Year	Population	Per capita consumption	Estimated supply	Projected demand	Additional need
			Tons	Tons	Tons
1977.....	4,321,000	34.3	81,716	-----	-----
1980.....	4,889,000	34.3	-----	167,693	85,977
1982.....	5,308,000	34.3	-----	182,064	100,348

kilograms of fish per hectare can be attained. Little data are available from farm results. A conservative estimate of expected costs and returns has been derived where neither the highest nor the lowest values for production and costs were used.

Description of Rice-Fish Culture Methods

The primary input requirements for rice-fish culture are fingerlings, labor, and a stable water supply. Traditional rice culture practices are followed, except for the use of insecticide and a modified land preparation technique.

It is important to have a paddy soil with high clay content to ensure minimum water seepage. Dikes are constructed higher and stronger than the conventional rice paddy dike to keep more water without leaking.

Trenches are built along the sides, all around, or across the paddy. These serve as a refuge for fish when the water gets too low and as passageways when the fish wish to move around the paddy. When the water level is lowered during harvest, the fish will collect in these trenches. This makes recovery of fish easier. Wire screens at water inlets are needed to prevent the entry of wild fish into the paddy and at water outlets to prevent the escape of cultured fish.

The fish commonly used in rice-fish culture are common carp (*Cyprinus carpio*) and monosex tilapia (*Tilapia* sp.). The stocking rate depends on the size and kind of fish used, but

500 to 1,000 common carp fingerlings or 3,000 to 5,000 tilapia fingerlings per hectare are considered sufficient.

Seedbed preparation and basal and topdressing fertilizer (urea) applications should be done without concern for the fish. Weeds can be controlled by mechanical or hand weeding methods. The use of herbicides such as 2-4D IPE formulations does not harm the fish.

Depending on the species and kind of fingerlings stocked, the fish will average 100 grams in weight at harvest. Fish are commonly harvested by draining the rice paddy before rice harvest. Carefully screening the water outlets will prevent fish loss. Should the farmer choose to hold the fish for a longer growth period, the fish can be kept in the trenches while the rice is being harvested. If there is sufficient water, it is practical to plant a second rice crop.

Labor Requirements

Total labor required per hectare of rice-fish culture is 76.61 man-days, table 21. Rice production alone requires an average of 70.51 man-days (31). Because of the less effective area devoted to rice in rice-fish culture, less labor is required for farm operations common to both rice-fish and rice production. However, the construction of trenches and drainage canals, cleaning and repairing dikes, and stocking and harvesting of fish increase labor requirements for rice-fish culture.

Labor costs were computed based on 8 hours per man-day at ₱1.25 per hour. Total labor costs amount to ₱766.10. Costs



Trenches built along the sides of the rice paddy facilitate easier harvesting of fish. They also serve as refuge for fish when the water level gets low.

TABLE 21. LABOR REQUIREMENTS AND VALUE PER HECTARE OF RICE-FISH CULTURE, BY TYPE OF FARM OPERATION, CENTRAL LUZON

Operation	Man-days	Value* Pesos
Seedbed preparation:		
Plowing.....	2.00	20.00
Care of seedlings.....	7.25	72.50
Preparation of seedlings.....	2.90	29.00
Land preparation:		
Plowing.....	2.34	23.40
Harrowing.....	3.42	34.20
Construction of trenches and drainage canals.....	10.00	100.00
Clearing/repairing dikes.....	4.57	45.70
Transplanting.....	16.87	168.70
Stocking.....	0.63	6.30
Fertilizing.....	1.20	12.00
Weeding.....	2.00	20.00
Harvesting		
Rice.....	16.50	165.00
Fish.....	0.83	8.30
Threshing, cleaning, and packaging....	6.10	61.00
TOTAL.....	76.61	766.10

* Based on 8 hours per man-day at ₱1.25 per hour.

for construction, transplanting, and harvesting account for 56.6 percent of the total.

The Enterprise Budget

The example budget, a modification of a rice enterprise budget, shows little variation from a rice production budget. Yields were based on results of experiments and field trials conducted at the Central Luzon State University. The kind and amount of inputs were based on generally accepted cultural and management practices. For a more realistic budget analysis, prices should reflect current local prices and general price trends. Since the latest information on prices was not available, 1975 price quotations were used.

Capital Investment

The example budget was derived for a farm already devoted to rice production, thus some investment in farm building and equipment had been made previously. Additional investment is needed once the farm is modified for rice-fish culture. Before production of fish in the same paddy is possible, new investment items, such as construction of trenches and drainage canals, drainage structures, nets, harvesting buckets, and wire screens, are needed. Table 22 has an itemized listing of the investments needed per hectare of rice-fish culture. The total capital requirement is ₱9,590.00, of which land alone comprised 83 percent.

Capital items are defined as units which have useful life longer than one production period. Such items are divided into two groups: depreciable and non-depreciable. Some capital investments, those associated with real property and without an estimated life, do not depreciate. Depreciable items have a determinable life. They include items directly associated with fish production, such as nets, wire screens, and harvesting buckets. Total capital for depreciable items is ₱1,010.00.

Budget analysis requires computation of fixed costs associated with capital. Depreciation is a technique used to spread the cost of certain capital items over the expected useful life of the item (7). In the example budget, all depreciation was calculated using the straight line method. The annual depreciation expense is equal to the difference between

TABLE 22. AVERAGE CAPITAL INVESTMENT PER HECTARE OF RICE-FISH CULTURE, CENTRAL LUZON

Item	Year life	Value Pesos	Depreciation Pesos
Non-depreciable items:			
Land.....		8,000.00	
Construction of trenches and drainage canals.....		100.00	
Work animals.....		450.00	
Other animals.....		30.00	
Subtotal.....		8,580.00	
Depreciable items:			
Drainage structures.....	10	40.00	4.00
Tractor (hand).....	15	350.00	23.33
Pump.....	10	250.00	25.00
Tools and equipment.....	5	190.00	38.00
Nets.....	5	25.00	5.00
Harvesting buckets (banyera).....	5	50.00	10.00
Wire screens.....	5	30.00	6.00
Farm building.....	10	75.00	7.50
Subtotal.....		1,010.00	118.83
TOTAL CAPITAL INVESTMENT		9,590.00	
Cost:			
Depreciation.....			118.83
Interest on average capital investment*.....		628.95	
Land tax.....		5.00	
TOTAL.....		752.78	

* Based on 7 percent of average capital investment, except construction.

the cost minus the salvage value divided by the expected useful life. Salvage value is what the item would be worth at the end of its useful life. It was assumed that all depreciable items have zero salvage value. Total depreciation expense is ₱118.83, table 22.

A measurement of average capital is needed when preparing a standard budget analysis without a specified production period. Average capital is the sum of non-depreciable items plus one-half of the value of depreciable items (18). Interest on capital investment represents either the amount the farmer would have to pay if he borrowed the money or the amount he would give up if he used his own funds. Including land tax, total ownership cost amounted to ₱752.78.

Cost and Returns

Costs and returns per hectare of rice-fish culture are listed in table 23. The analysis is for one production period only.

Costs are divided into cash and non-cash variable costs, fixed costs, and labor costs. Variable costs are those that change according to the specified level of production. Of cash variable costs of ₱878.69, fingerling expenses comprise 40 percent of the total. Non-cash variable costs include landlord share of the rice produce, harvester/thresher share, seed, Samahang Nayon contribution, and irrigation fee. A landlord's share of the rice harvest usually is based on the amount of production. Under normal harvest conditions, the owner of the land expects to receive, on the average, 11 cavans of rice. The harvester/thresher share is 10 percent of the rice produced. Samahang Nayon contribution is a forced saving by the farmer to the local cooperative. This is termed as the Barrio Guarantee Fund, which serves as a source of funds to pay insurance premiums of farmers, guarantees payment for loans, and capitalization of full-pledged cooperatives (14).

Net returns represent the difference between total costs and total returns. On a production basis, ₱2,869.77 was available from a hectare of rice-fish culture. The system had a 31.95 percent return on average capital.

TABLE 23. COSTS AND RETURNS PER HECTARE OF RICE-FISH CULTURE

Item	Unit	Quantity	Rate		Value
			Pesos	Pesos	
Receipts:					
Threshed palay.....	cavan	95.00	57.50		5,462.50
Marketable tilapia.....	kilograms	200.00	6.00		1,200.00
Expenses:					
I. Variable costs:					
A. Cash					
Seed.....	cavan	0.40	57.50		23.00
Fingerlings (monosex tilapia).....	each	5,000.00	0.07		350.00
Fertilizer.....	bags	3.70	64.87		240.02
Insecticide.....	quart	1.00	22.40		22.40
Herbicide.....	kilograms	3.75	4.71		17.66
Interest/fees/loans.....					50.00
Food.....					60.00
Samahang Nayon.....					5.00
Fuel and oil.....					10.00
Repairs.....	man-day	1.75	10.00		17.50
Transportation.....					15.00
Irrigation fee.....					30.00
Rent.....					38.11
Subtotal.....					878.69
B. Non-cash					
Landlord share.....	cavan	11.00	57.50		632.50
Harvester/thresher share.....	cavan	9.50	57.50		546.25
Seed.....	cavan	1.00	57.50		57.50
Samahang Nayon.....	cavan	0.38	57.50		21.85
Irrigation fee.....	cavan	0.75	57.50		43.12
Subtotal.....					1,301.22
Interest on operating capital (8%).....					93.94
TOTAL VARIABLE COST.....					2,273.85
II. Fixed costs:					
Depreciation.....					118.83
Interest on average investment (7% except construction).....					628.95
Land tax.....					5.00
TOTAL FIXED COSTS.....					752.78
III. Labor costs:					
Seedbed preparation					
Plowing.....	man-day	2.00	10.00		20.00
Care of seedlings.....	man-day	7.25	10.00		72.50
Seedling preparation.....	man-day	2.90	10.00		29.00
Land preparation					
Plowing.....	man-day	2.34	10.00		23.40
Harrowing.....	man-day	3.42	10.00		34.20
Construction of trenches and drainage canals.....	man-day	10.00	10.00		100.00
Cleaning/repairing dikes.....	man-day	4.57	10.00		45.70
Transplanting.....	man-day	16.87	10.00		168.70
Stocking.....	man-day	0.63	10.00		6.30
Fertilizing.....	man-day	1.20	10.00		12.00
Weeding.....	man-day	2.00	10.00		20.00
Harvesting					
Rice.....	man-day	16.50	10.00		165.00
Fish.....	man-day	0.83	10.00		8.30
Threshing, cleaning, and packaging.....	man-day	6.10	10.00		61.00
TOTAL LABOR COSTS.....					766.10
TOTAL EXPENSES.....					3,792.73
NET RETURNS.....					2,869.77
PERCENTAGE RETURN ON AVERAGE INVESTMENT.....					31.95

Partial Budget

The introduction of fish in rice paddies requires several, but minimal, changes in the farm business organization. This means that the farm structure is not entirely revamped. A partial budget was developed to estimate the possible changes

TABLE 24. PARTIAL BUDGET FOR TESTING PROFITABILITY OF INTRODUCING FISH PER HECTARE OF RICE FARM

Item	Value	
	Pesos	
1. Additional receipts		
a. Marketable tilapia (200 kilograms at ₱6.00/kg)		1,200.00
2. Reduced costs		
a. Fertilizer (0.41 bag at ₱64.87/bag).....		26.60
b. Insecticide (0.74 quart at ₱22.40/quart).....		16.58
c. Herbicide (1.16 kilograms at ₱4.71/kg).....		5.46
d. Seed (0.15 cavan at ₱57.50/cavan).....		8.62
e. Others*.....		99.47
Subtotal.....		156.73
3. Total credits.....		
		1,356.73
4. Additional costs		
a. Labor (6.10 man-days at ₱10.00/man-day)....		61.00
b. Fingerlings (5,000 monosex tilapia fingerlings at ₱0.07 each).....		350.00
c. Drainage structures.....		40.00
d. Nets.....		25.00
e. Wire screens.....		30.00
f. Harvesting buckets.....		50.00
g. Irrigation fee.....		11.85
h. Repairs (1.12 man-days at ₱10.00/man-day) ..		11.20
i. Depreciation.....		13.38
j. Others.....		28.87
Subtotal.....		621.30
5. Reduced receipts		
a. Threshed palay (5 cavans at ₱57.50/cavan)....		287.50
6. Total debits.....		
		908.80
7. Change in net income.....		
		447.93

* Include landlord's share and harvester/thresher share.

in costs and returns brought about by the introduction of the new enterprise.

Expected additional receipts from a hectare of rice-fish culture come from the expected fish yield of 200 kilograms valued at ₱1,200.00, item 1, table 24. Reduced costs include fertilizer, insecticide, herbicide, seed, and others. These amount to ₱156.73, item 2. This would involve total credits of ₱1,356.73, item 3.

Additional cost items include labor of 6.10 man-days valued at ₱61.00, fingerlings valued at ₱350.00, and other items directly related to fish production (nets, wire screens, harvesting buckets, irrigation fee, repairs, and depreciation). Total additional costs amount to ₱621.30, item 4.

In the culture of fish in rice paddies, the effective area devoted to rice is slightly lessened. As a result, the rice yield is expected to decrease by 5 cavans. Total value of reduced receipts is ₱287.50, item 5. The additional costs plus reduced receipts amount to ₱908.80, item 6.

The difference or change in net income is ₱447.93, item 7. This indicates that the introduction of fish in a hectare of rice farm is profitable.

Economic Impact

Farmers depend largely on rice production as their means of livelihood. Any consideration of rice-fish culture would be on the basis of fish production being secondary to rice production. Although the return from fish will not provide sufficient incentive to shift rice production, growing fish simultaneously with rice does not significantly decrease rice yield. Thus, it will serve as an additional source of income.

The average size farm in Central Luzon is slightly less than 3 hectares. With an expected fish yield of 200 kilograms per hectare, the average farm will produce 600 kilograms of fish per rice crop if the entire hectare is devoted to rice-fish culture.

Most rice farms are subdivided into segments, called paddies, encompassing about 2,500 square meters or smaller in area. Due to custom, disease problems, and other factors, the rice is planted at the same time. Harvest, then, also occurs simultaneously. Rice is planted and harvested paddy by paddy, with the harvest period extending over a period of 6 weeks to 2 months. Under these conditions, the 600 kilograms of fish would not be simultaneously available, but would become available in units of 40 to 60 kilograms per week during the harvest period.

Substantial quantities of the fish produced from rice paddies would undoubtedly be consumed by the farm family. This would improve the diet of the family members, and at the same time slightly lessen the demand for fish in the local markets. In addition, any excess supply of fish could be sold or traded to other farm families, further reducing the demand in local market places.

Marine fish in the inland provinces are not as readily available as in the coastal provinces. More than 50 percent of the marine fish available in the inland provinces, especially in Nueva Ecija and Tarlac, are poor in quality, yet they sell almost the same or even higher than those in the coastal provinces. The fish from the rice paddies can directly substitute for the low quality fish now available. Rice fish then will serve to fill both a quality and a quantity gap in the market in rural inland areas.

The adoption of rice-fish culture may be a slow process. While the extension program in the region is well established, the degree of acceptance of the new technology will depend on the degree of conflict with existing systems. The rice marketing system in Central Luzon is well organized, but fish marketing is not. At the time of planting, farmers are assured of a place to sell their rice crop. No certainty exists for the sale of fish.

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APPENDIX A

Sample Markets

Province	Municipality	Retailers	Sample	Province	Municipality	Retailers	Sample	
Bataan	Hermosa	6	3	Pampanga	Sta. Ana	27	10	
	Mariveles	25	18		Magalang	25	9	
	Limay	22	15		Macabebe	10	7	
	Orion	70	10		Mabalacat	10	11	
	Balanga	270	14		Minalin	54	10	
	Abucay	10	7		San Simon	10	5	
	Samal	33	6		Mexico	8	3	
	Orani	240	11		Guagua	210	10	
	Dinalupihan	67	9		Angeles City	303	25	
			93		San Luis	20	7	
					Apalit	45	11	
Bulacan	Baliwag	50	9		Sto. Tomas	10	6	
	Malolos (Atlag)	10	5		Florida Blanca	21	9	
	Balagtas	---	12		Bacolor	22	10	
	Bocause	60	15		Candaba	20	12	
	San Ildefonso	---	5				145	
	Plaridel	20	8		Tarlac	Victoria	18	13
	Bulacan	40	9			Concepcion	70	13
	San Miguel	20	14	Camiling		100	12	
		77	Paniqui	30		6		
			San Clemente	12		8		
			Moncada	78		9		
			Mayantoc	29		7		
			Sta. Ignacia	54		3		
Nueva Ecija	Guimba	26	13	Zambales	San Felipe	46	13	
	Rizal	23	7		Botolan	18	7	
	Capan	67	9		Cabangan	23	9	
	Talavera	28	6		San Narcisco	57	14	
	San Isidro	25	8		San Antonio	35	8	
	San Jose City	34	10		Subic	60	12	
	Cabiao	35	9		San Marcelino	78	10	
	Sta. Rosa	20	15		Iba	20	13	
	Muñoz	43	9		Castillejos	28	12	
	Cabanatuan City	74	27		Olongapo	85	12	
	Llanera	30	9	Sta. Cruz	34	13		
	Gabalton	46	4	Candelaria	20	5		
	Laur	50	4	Palawig	17	6		
	Jaen	49	4	Masinloc	49	14		
	Cuyapo	52	5			148		
	Nampicuan	43	3					
	Zaragosa	38	6					
	Talugtog	47	4					
	Aliaga	38	5					
	Bongabong	55	3					
		160						

APPENDIX B

CLASSIFICATION OF SPECIES IN CENTRAL LUZON

Class	Marine		Freshwater		Brackishwater	
	English name	Local name	English name	Local name	English name	Local name
First class	Grouper	lapu-lapu (<i>Epinephelus</i> sp.)	Catfish	hito (<i>Clarias macrocephalus</i>) (<i>Clarias batrachus</i>)	milkfish	bangus (<i>Chanos chanos</i>)
	Cavalla	talakitok (<i>Caranx</i> sp.)	Mudfish	dalag (<i>Channa striatus</i>)		
	Mackerel	alumahan; hasa-hasa; tangigue (<i>Rastrelliger</i> sp.)				
	Tuna	tuna (<i>Thunnus thynnus</i>)				
	Snapper	maya-maya (<i>Lutianus</i> sp.)				
	Pompano	pompano (<i>Caranx</i> sp.)				
	Bonito	tulingan (<i>Euthynus yaito</i>)				
	Mullet	alugasin, banak (<i>Mugil</i> sp.)				

Continued

CLASSIFICATION OF SPECIES IN CENTRAL LUZON (Continued)

Class	Marine		Freshwater		Brackishwater	
	English name	Local name	English name	Local name	English name	Local name
Second class	Slipmouth	sap-sap (<i>Leiognathus</i> sp.)	Tilapia	tilapia (<i>Tilapia</i> sp.)		
	Nemipterid	besugo (<i>Nemapterus japonicus</i>)	Gourami	gorami (<i>Trichogaster pectoralis</i>)		
	Sardines	tamban; tunsoy (<i>Sardinella</i> sp.)				
	Herring	saliniasi; dilat (<i>Dussumiera acuta</i>) (<i>Dussumiera hasselti</i>) (<i>Ilisha hoeveni</i>) (<i>Ilisha dichoa</i>)				
	Siganid	samaral; malaga (<i>Theutis</i> sp.)				
Third class	Caesio	dalagang-bukid (<i>Caesio</i> sp.)	White goby	biyang-puti; buktu (<i>Glossogobius giurus</i>)		
	Round scad	galonggong (<i>Decapterus russelli</i>)	Carp	karpa (<i>Cyprinus carpio</i>) (<i>Hypophthalmichthys molitrix</i>)		
	Big-eyed scad	matang-baka (<i>Selar boops</i>) (<i>Selar cremenophthalmus</i>)				
	Anchovy	dilis (<i>Thrissocles</i> sp.)				
Others	Lizard fish	kalaso (<i>Trachinocephalus myops</i>) (<i>Saurida tumbil</i>)	Theraponid	ayungin; babansi (<i>Therapon plumbeus</i>)		
	Sea bass	apahap (<i>Lates calcalifer</i>)				
	Crevalle	salay-salay (<i>Caranx</i> sp.)	Shrimps	} crustaceans		
	Halfbeak	buguing (<i>Hemiramphus</i> sp.)	Crabs			
	Flying fish	borador; tirong (<i>Cypselurus oligolepis</i>)				
	Parrot fish	mulmul; loro (<i>Scarus</i> sp.)				
	Whiting	asohos (<i>Sillago sihama</i>)				
	Surgeon fish	labahita; tarian (<i>Acanthurus bleekeri</i>)				
	Stingray	page (<i>Dasystis</i> sp.)				
	Hairtail	balila (<i>Trichiurus haumela</i>)				
	Sword fish	espada (<i>Xiphias gladius</i>)				
	Goat fish	saramulyete (<i>Upensides sulphureus</i>)				
	Striped barracuda	torcillo (<i>Sphyaena obtusata</i>)				
	Porgy	(<i>Sparus berda</i>)				
	Cuttle fishes					
	a) squid	pusit (<i>Sepioteuthis lessoniana</i>) (<i>S. sepioidea</i>)				
	b) octopus	pugita				
	Rock fish	kubalen				
	corral fish					
	babayute					
	mabalakit					
	mayobyob					
	kandangan					
	lamok					
	tuko					
	susay					
	lapad					
tabios; ipon						
karay-an						
bayang						
bulwagan						
damis						
lalakasin						
balaki						

APPENDIX C

Estimation Procedure

The questionnaire used in this study was designed to yield information on each aspect of the marketing activities from individual sample sellers, so the data had to be expanded to provincial level. The sample data gathered were statistically valid and, therefore, are justified estimators or population parameters.

Estimation methods for this study were done using the procedure formulated by McCoy (12). Expansion of daily quantity of fish sold was done using the following formula:

$$Q_t = \sum X_{ij}$$

$$X_{ij} = M_j(S_{ij}X_{ij})$$

where:

Q_t = total quantity of fish sold

X_{ij} = quantity of fish of the i th species sold in the j th province

M_j = number of markets in the j th province

S_{ij} = number of sellers of the i th species in the j th province

X_{ij} = average quantity sold of the i th species in the j th province

Estimation of total quantity of fish sold on an annual basis was done by multiplying the total daily sales by the adjusted number of market days. The adjustment in the number of market days was necessary to avoid overestimation of the quantity of fish available. In most of the markets surveyed, fish was available every day; however, more sellers were present during "market days." In some markets, the quantity

of fish available was essentially the same daily, but in others fish was available only on "market days." For markets reporting a large number of sellers, the quantity tends to be overestimated since sellers not present during the survey tended to handle less fish.

The total number of dealers and the average dealers per market listed in tables 5 and 6 were representative of the numbers during market days. The adjusted number of market days was computed using this formula:

$$\text{adjusted number of market days} = \frac{\sum N_i D_i}{D_i}$$

where:

N_i = number of market days in the i th market

D_i = number of dealers in the i th market

Quantity composition of fish available according to species was computed based on total daily sales. The average daily quantity sold for each species was converted as a percentage of total daily sales. The amount was then multiplied by the adjusted number of market days to obtain the quantity of fish available by species on a yearly basis.

Size composition of the existing supply was determined based on the average daily amount of fish sold. The daily quantity of fish available, according to size for each species, was converted into a percentage. This was quantified into total kilograms based on the annual amount of fish available for species of fish.

APPENDIX D

Questionnaire Used in Study

Fish Marketing Survey
District III, Central Luzon
Retailer Questionnaire

Date _____

Interviewer _____

Province _____ Barangay _____

Municipality _____ Name of Market _____

Distance to Manila _____

Distance to market source by type

Type

Source

Distance

Marine

Brackishwater

Freshwater

1. How long have you sold fish? _____

2. What type of stall do you use? (check)
permanent _____
temporary _____

3. How many days per week is the market open? _____

4. How many days per week is fish available in the market? _____

5. How many hours per day are fish available? _____

6. Do you clean the fish for the buyers? _____ If yes, how? (check)
scaled _____ beheaded and gutted _____
beheaded _____ sliced _____
gutted _____ other (specify) _____

Is there a charge for this service? _____ How much? _____

Continued

Table 2

Species Code (Key to previous table)

Number per kilo										
10 or more										
No. or kg.										
Difficulty										
Price										
lowest price										
time										
highest price										
time										
left over										
resale										
5-9										
No. or kg.										
Difficulty										
Price										
lowest price										
time										
highest price										
time										
left over										
resale										
2-4										
No. or kg.										
Difficulty										
Price										
lowest price										
time										
highest price										
time										
left over										
resale										
1 or less										
No. or kg.										
Difficulty										
Price										
lowest price										
time										
highest price										
time										
left over										
resale										

