

## ECONOMICS OF PRODUCTION IN PUERTO RICO

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Very little is known on economics of production in the fishery industries, generally, and still less on the economics of production in certain areas which are either far away from the center points of research or which are considered as less important because of the comparable small contribution to the over-all production of fish and fishery products. Analytical studies on costs of production before the war were done only in rare cases. Some studies were made in salmon production in connection with studies of canning and distribution of salmon. Limited research was also done by Massachusetts Fisheries Association with regard to filleting. Some specific studies were made by the United States Tariff Commission in connection with the tariff problems, however, referring only to a few items, such as herring, cod fillets, canned salmon, and canned tuna.

The lack of appropriate information on cost of production became especially obvious during the war, when the Office of Price Administration was called upon to regulate fish prices and when my office was called upon to make proper recommendations concerning the regulation of fish prices for the purpose of increased production and for assuring the proper fish food supply essential to the conduct of the war. In the beginning of 1944, we felt that production of fish would decrease if we would not establish prices so as to cover the cost of production. Since the Fish and Wildlife Service had only limited funds, the Service attempted to obtain the cooperation of other government agencies. On April 6, 1944, the Director of the Fish and Wildlife Service, Dr. Gabrielson, addressed a letter to the Federal Trade Commission from which I quote, "We feel that the field of production and distribution methods and costs is one of those subjects we know comparatively little of, and in which our knowledge should be enriched in the general interest as well as in the interest of the fishing and the fish-processing industries. Sound price policies, and in connection with them sound production policies, should consider the components of original production costs and which costs of handling on the different distribution levels are added to the original production costs."

On the basis of a cooperative agreement with the Federal Trade Commission about 500 firms and vessels were studied. Balance sheets, cost sheets, sales slips, settlement sheets, and other business papers were copied and later on summarized and analyzed in Washington, D. C. The years 1941, 1942, 1943 and in some cases 1944 were considered. The combined plan of the Fish and Wildlife Service and the Federal Trade Commission called for a study of the gross proceeds from the production and sale of fish in cents per pound as compared to the cost of production in cents per pound. The cost of production should be established in details as composed by the crew's share; captain's commission; food, ice and oil; fishing gear; boat and engine repairs; insurance; depreciation; and all other costs. The result of this study has proven most valuable, especially during the war when it was necessary to adjust the selling prices of the Office of Price Administration to the changing costs. In cooperation with the Federal Trade Commission, three studies were published. One study was on, "Cost of Production and Distribution of Fish in New England," another study on the, "Cost of Production and Distribution of Fish in the Great Lakes Area," and the third study on, "Cost of Production and Distribution of Fish on the Pacific Coast." The over-all results on this study were published in the, "Fishery Resources of the United States," a publication which, at first, was issued as a government document in 1945 and later reprinted by the Public Affairs' press.

On an over-all basis, the gross proceeds obtained from the sale of fish go at 53%

for the fishermen's share and labor; 16% for boat supplies, repairs, and depreciation; 5% for fishing gear and repairing of fishing gear; 5% for fuel and oil; 2% for ice; 7% for miscellaneous costs as telephone, telegraph, wrapping material; 3% for food; and 9% net profit for the vessel owner. It will be advisable to remember these percentages when it comes to comparing these with the results of a study which was done in Puerto Rico. We encouraged Mr. P. Vergne Roig, head of our Technological Laboratory in Puerto Rico, which is located in Mayaguez, to undertake a study along similar lines which we had undertaken with the Federal Trade Commission, the results of which are these:

"Fishermen - In 1946, the fisheries of Puerto Rico employed 2,656 fishermen, 1,734 classified as regular and 922 as casual. The number of fishermen employed in the industry varies in accordance with prices. Low prices discourage the production of fish and influence personnel toward more lucrative jobs. In some areas the number of fishermen is considerably reduced during the sugar cane grinding season.

"A recent study made by the Insular Experiment Station with the aid of the Service showed that the fishing industry does not seem to be a very attractive occupation for the young men of the Island, proved by the fact that 48% of the boat owning fishermen are over 48 years of age, 28% from 30 to 40, 13% from 25 to 29, and only 11% were 24 years or under. The number of years of employment in the fisheries varies from 6 years up to more than 25 years, with 23% of the fishermen classified as having worked over 25 years in the industry.

"The study also shows that the average monthly net income per fisherman is \$47.00, the auxiliary fisherman being paid \$13.00 out of this net income. The monthly expenses incurred per fisherman average \$15.00 and they are distributed as follows: 31% in food, 14% in repair of boats and row boats, 15% in repair of gear, 10% in rope, and 12% in other expenses as wire, hooks, bait, and preservatives. In addition, 14% in marketing expenses and 4% in other miscellaneous costs.

"Fishing Boats - The number of fishing boats operated in the fisheries amounted to 900; 609 classified as row boats, 277 as sail boats and 14 motor boats. The western coastal section of Puerto Rico, where the wholesalers control a large volume of the actual production, shows a tendency toward the use of either Diesel or gasoline motors. Reliance on wind as propulsive power results in long runs to and from the fishing grounds and in considerable fish spoilage. The average fishing trip is reported as consuming 9 hours, the trip to and from the fishing grounds taking 4 hours, while 5 hours are devoted to actual fishing. However, sailboats in operation presecuting distant fisheries at Mona, Desecheo, Vieques and Culebra Islands, stay out, the fishermen report, 15 hours. They are provided with ice for storage of the catch, the quantity ranging from 2 to 3 hundred pounds. Of the total number of fishing boats operated, 195 are equipped with live wells for storage of the catch.

"Rowboats range from 12 to 18 feet. Are of local construction and have a limited range of operations, the total investment on same amount to \$19,190.00. Sailboats, although of local construction are well built on the average, and pursue fishing operations as far as 40 to 50 miles offshore to snapper and grouper banks, the total investment on boats amounting to \$67,400.00. Motor boats consist of one Diesel-powered shrimp trawler utilized by the Puerto Rico Agricultural Company, 3 motor launches utilized by wholesalers, and 10 fishing boats equipped with auxiliary Diesel or gasoline motors, valued at \$34,300. The total capital investment in fishing boats of all types in operation in the Puerto Rican fisheries amounted thus to \$120,890.00. Wholesalers owned 12.33% of fishing boats operated.

"Fishing Gear - The nature of Puerto Rico's fishing grounds is a limiting factor in the utilization of mass production methods such as are employed in the American fisheries. The U. S. Fish and Wildlife Service and the Fisheries Division of the Puerto Rico Department of Agriculture and Commerce, under a joint agreement, tried in the course of exploratory surveys to use the otter trawl as well as purse seines. The former's use was restricted to a very limited area as the river basins and its use not recommendable as intensive fishing, would in the end, result in depletion. The latter was tried on several

occasions trying to adapt it to the catching of tuna-like fishes, but had no particularly good results. In efforts to set the seine around small schools of "vaca" and "bonito" as well as dolphins, it was found in almost every instance that the fish moved so erratically and rapidly that they eluded the seines before the circle could be completed around the school. Possibly, the small size of schools and as a result, their fast movements, were the direct factor involved in the failure.

"The fish population of the Puerto Rican banks is concentrated in the rocks and coral reefs, certain types of gear being specially devised to meet these unique conditions and the efficiency of which has led to their wide use in the Island fisheries. The most widely used type of gear in Puerto Rico is the fishpot, 3,812 units being operated, valued at \$11,436.00 to the fishermen. This gear is specially adapted to rocky bottoms and is operated at depths of 3 to 40 fathoms, fishermen of the western and southern areas showing preference for higher depths as they report that in a few fathoms of water the catch is made up primarily of second and third class fish, while deeper waters are more productive both as to amount and quality of the catch.

"Fishpots are reported to produce 45 to 50% of the total fisheries catch, 33% of the production being first class. Fishermen reported that they are extensively used due to the fact that they require less attention, pots being lifted either daily or at one-day intervals. The medium size pot is the most popular type, and its cost is estimated at \$4.00. Fishermen are reported to operate an average of 15 pots, although some may operate as many as 60 fishpots. The latter practice is not followed to a great extent inasmuch as more losses of gear occur.

"Another type of gear extensively used in Puerto Rico is the hand-line. This type of gear is used in combination with the fishpots in the western area, pots being lifted when returning from the hand-line fisheries. Fishermen used 939 hand-lines with a total of 5,150 hooks, valued at \$7,512.00 to the fishermen. Hand-lines are used for deep-water fishing. Spanish mackerel is preferred as bait by the fishermen.

"Haul seines in operation amounted to 97 at an estimated value of \$16,975.00 to the fishermen. Their size ranges from 100 to 200 yards in length and from 15 to 25 feet in depth, the mesh varying from 3 to 3 1/2 inches on the wings to 1/2 inch on the bunt. Although haul seines are used and operated in the four coastal areas their greater use is concentrated in the western and northern areas, the same being also true of gill and trammel nets. Other gears utilized and of lesser importance are cast nets, trawl and troll lines, etc., as shown in Table I.

"The production of fish in Puerto Rico in 1945 was estimated at 3,276,000 pounds valued at \$458,640.00, to the fishermen. The general belief stresses that a disrapture in trade caused by the war reduced the catch which should have been much higher. Supplies of linen and cotton, net twine, hooks, rope, sail canvas, leader wire, hand-lines and trolling lines, and wire netting, suitable for fish traps, were entirely exhausted in local stores and warehouses. Particularly dealing with fishpots, those in existence are reported to represent only 25% of the fisheries requirements.

"Fishing efforts diminished somewhat during the emergency and the shortage of food supplies due to the limited shipping space plus the decrease in the catch, substantially increased ex-vessel prices. During normal times, the low prices of fishery products in Puerto Rico have resulted in a great deal of intermittent fishing, fishermen tending to rely upon other activities for their main support. During the past war, although prices were high, ranging from 15 to 18 cents per pound, for first class fish; 8 to 10 cents for second class fish; 5 cents for third class fish and 9 cents for lobsters, many fishermen were kept out of the industry due to the already mentioned scarcity of fishing gear and materials needed in carrying out operations.

"Cost of Production of Fish Caught by Sailboats, 1945

"Sailboats in operation in Puerto Rico range in tonnage from 3 to 5 gross tons, averaging

TABLE I

Fishermen, Boats, and Gear in Operation in Puerto Rico - 1946

Item	Number	Value
"Fishermen. . . . .	2,656	
Boats:		
Row . . . . .	609 . . . . .	.\$ 19,190.00
Sail. . . . .	277 . . . . .	67,400.00
Motor . . . . .	14 . . . . .	<u>34,300.00</u>
		\$120,890.00
Gear:		
Haul seines . . . . .	97 . . . . .	.\$ 16,975.00
Gill nets . . . . .	46 . . . . .	3,450.00
Trammel nets. . . . .	19 . . . . .	1,710.00
Cast nets . . . . .	243 . . . . .	1,944.00
Weirs*. . . . .	9 . . . . .	
Hand-lines. . . . .	939 . . . . .	7,512.00
Trawl lines . . . . .	73 . . . . .	730.00
Troll lines . . . . .	510 . . . . .	5,100.00
Fishpots. . . . .	<u>3,812</u> . . . . .	<u>11,436.00</u>
Total. . . . .	5,707 . . . . .	.\$ 48,857.00
Catch (in pounds, 1945) . . . . .	.3,276,000 . . . . .	.\$458,640.00"

\* Weirs - Value not estimated

roughly \$245.00 in value to the fishermen. The crew of a sailboat is made up of one fisherman and the captain, who also engages actively in fishing. Sailboats studied are engaged primarily in the operation of fishpots and hand-lines in the southern and western coasts of Puerto Rico. Although sailboats are reported in some instances to operate as many as 60 pots, the general practice is to operate an average of 20, thus minimizing losses. Usually they operate from 4 to 6 hand-lines, the number of hooks varying from 6 to 8. Fishpots are intensively fished from April to November, while hand-lines are from November to April. During the fishpot season an average of three trips per week are made for lifting pots, while during the hand-line season two trips are made to snapper and grouper banks, and one to fishpot banks to lift any pots being operated.

"In addition to the four sailboats studied and due to the marked tendency shown in the western coast by both dealers and fishermen toward the adaptation of auxiliary gasoline motors to sailboats, one of the motor-equipped sailboats was studied to gain data on the economic feasibility of such a step.

"The following shows on a comparative basis, the average gross proceeds, cost of production, and profit per pound of fish landed:

Year - 1945	Average Proceeds in cents	Average Cost in cents	Average Profit in cents
"Sailboat.....	11.341	9.551	1.790
Motor-powered boat.....	8.682	7.978	.704

"The detail of costs and expenses were as follows:

Cost and Expenses	Cents per pound	
	Motor	Sailboat
Fisherman's share.....	1.729	2.788
Captain's share.....	2.438	3.796
Food.....	.405	.981
Ice.....	.371	.108
Fishing gear.....	.778	.890
Boat repairs.....	.324	.388
Depreciation.....	.259	.279
Gas and oil.....	1.674	
Other costs.....		.321
<b>Total.....</b>	<b>7.978</b>	<b>9.551</b>

The percentage relationships of individual costs to sales and total costs are these:

MOTORBOATS

	% of Sales Price	% of Costs
Fisherman's share.....	48.1 (19.9	62.3 (21.7
Captain's share.....	(28.2	(30.6
Food.....	4.7	5.1
Ice.....	4.2	4.5
Fishing gear.....	8.9	9.7
Boat repairs.....	3.7	4.1
Depreciation.....	2.9	3.2
Gas and oil.....	19.4	21.0
Other costs.....	-	-
Profit.....	8.1	-
	<u>100</u>	<u>100</u>

SAILBOATS

	% of Sales Price	% of Costs
Fisherman's share.....	57.6 (24.5	68.8 (29.1
Captain's share.....	(33.1	(39.7
Food.....	8.5	10.3
Ice.....	.9	1.1
Fishing gear.....	8.7	9.3
Boat repairs.....	3.4	4.1
Depreciation.....	2.5	2.9
Gas and oil.....	-	-
Other costs.....	2.7	3.5
Profit.....	15.7	-
<b>Total.....</b>	<b>100.0</b>	<b>100.0</b>

"The total fish landings, by the four sailboats, averaged 18,020 pounds per boat, valued at \$2,043.77, while the motor-powered sailboat landed 38,541 pounds, valued at \$3,346.36. In the case of the former, approximately 75 percent of the catch was credited to fishpots, while in the latter 82 percent, hand and troll lines accounting for the balance. The yield of the motor-powered boat represents 114 percent increase over the average of the sailboats studied. However, the net income to the boat owner was higher in the case of the sailboat than in the motor-powered boat, amounting to \$322.00 in the former and \$271.00 in the latter. On the other hand, the increased production resulted in an increase in the earnings of the captain, the owner of the boat and the fisherman.

"Food, gas and oil, are deductible items of expense from the gross income. The share is determined by the type of gear operated. In the case of fishpots, the fisherman shares 25 percent of the proceeds after items of expense are deducted, while in the case of hand and troll lines, the three parts share equally. The balance of the fishpot proceeds, after the fisherman's share has been deducted, is divided equally between the boat owner and the captain. The boat owner must pay from his share all other expenditures as boat repairs, ice, etc.

"The annual net earnings of both the captain and the fisherman, as well as the earnings of the boat owner are shown in the following tabulation:

Year - 1945	Boat Owner	Captain	Crew Member
"Motor-powered boat....	\$939.48 .....	\$ 939.48 .....	\$666.39
Sailboat.....	684.02 .....	684.02 .....	502.39

"Motor propulsion offers several advantages over reliance on wind as propulsive power. The production is greatly increased due to a greater fishing radius of operations and more boat trips per year. Faster trips considerably reduce fish spoilage and maximize the time devoted to actual fishing operations".

Since the time the survey, which is a basis of my report, was made, the prices of fish have increased in Puerto Rico and also the taste of consumers to certain varieties have changed to a certain extent. While the proceeds for fish were in the above-mentioned samples on the average 10 to 8 cents a pound, the recent fish prices were reported as bringing 14 to 22 cents a pound. This increase is due to two factors, first, as reports indicate the demand for fresh fish has enormously increased in the San Juan area, and, secondly, improved icing and selection methods have made fish more attractive food. Perhaps the former is also a consequence of the latter one. Only to a small extent fresh fish production in Puerto Rico has contributed in the past to the total fish consumption of the country. It is estimated that 91% of the total consumption of fish in 1945 was made up of imported fishery products. The imports of that year were about 33 million pounds. The fresh fish production was made for the same year as being about 3,276,000 pounds. Of the imported salted codfish, 50% comes from Newfoundland and Labrador, and about 22% from Canada.

My presentation of production economics should not be closed without saying a few words about the economics of distribution, wholesale as well as retail distribution. When we received Mr. Roig's report, distribution practices in Puerto Rico were in a bad shape. A few wholesalers had sort of a monopoly, which is typical for colonial countries. Profits were enormous in relation to investments. For example, four wholesalers had invested in 1945 \$10,300 and had made a net profit of \$21,100 (205% on investment). They were able to push the average sales price from 10 cents (8 cents respectively) paid to fishermen to 19 cents to the retailer. In the meantime, the Agriculture Company has entered the fish business. By the end of April 1948, the Agricultural Company had the following prices for

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fresh fish pinned on its bulletin board:

Fish (gutted)	\$0.22	per	pound
Fish steaks	.42	"	"
Fish tails	.09	"	"
Fish heads	.08	"	"
Lobsters (boiled)	.30	"	"
Shrimp	.82	"	"
Turtle	.40	"	"

In the meantime, other fresh fish supplies have developed for Puerto Rico. The Virgin Islands Fisheries, Inc. ship by air express fish to Puerto Rico. At the end of April, the following prices of fresh fish delivered to the airport at Saint Thomas, Virgin Islands, are quoted:

Grunts	\$0.18
Doctorfish	.18
Yellowtails	.18
Carange	.16
Bonito	.14

Even if one adds to these prices a fairly high transportation rate, one can see that more and more fresh fish at reasonable prices will enter the Puerto Rican wholesale market.

Fresh fish in Puerto Rico are sold in three classes. Fish weighing 1 1/2 pounds (sparisoma, sharks, and eels exempt) are considered first class. Fish weighing less than 1 1/2 pounds are second class. Fish weighing less than 1/4 pound are considered third class, including the parrot-fish, sharks, and eels.

The retailers make even a larger profit in relation to investment. Mr. Roig shows that three retailers had in 1945 invested only \$990 and had made a net profit of \$3,935 (397% on investment). These figures alone show the unsatisfactory conditions which are augmented by peddling practices which are most objectionable under sanitary considerations. Mr. Roig and his assistants investigated 80 peddlers and found that the average peddler has an investment of \$13.00

The problem of improving the economic condition of the fisheries in Puerto Rico is to a large extent an educational and technological problem. Since we received Mr. Roig's report, the situation in Puerto Rico has somewhat improved. It is, however, far from being perfect, and I hope that in a later meeting I will be able to report that further improvements have been made.