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**SOCIO-ECONOMIC EFFECTS OF AN INCREASE IN
INLAND FISHERIES PRODUCTION IN EL SALVADOR**

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**Socio-Economic Effects of an Increase in Inland Fisheries
Production in El Salvador**

A Preliminary Study

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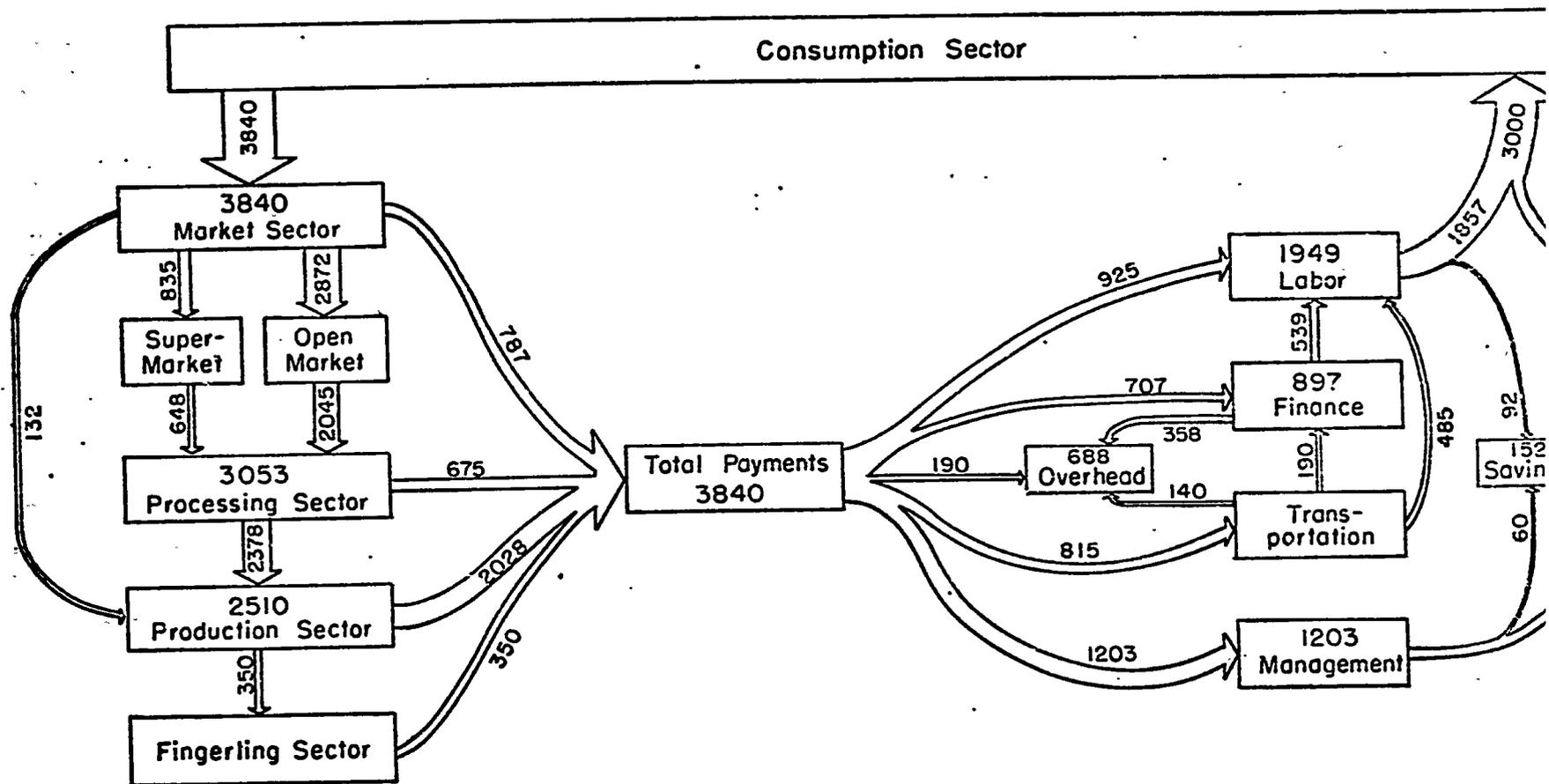
In a free enterprise economy increases in production are induced by favorable profit ratios at the market price. Production increases continue until the profit level is just sufficient to induce existing producers to remain in business but insufficient to attract new entrants into the field. Other studies have indicated the profit levels that can be attained from inland fisheries enterprises in El Salvador and have estimated the levels of demand that will exist over time, (1, 2). The impact of pond construction expenditures was covered in the second report cited. Employment and income both receive a temporary boost from construction activities; however, the primary effects occur after the facilities are put into operation. This study, then, was designed to indicate the first round effects on employment and income with an increase in inland fisheries production in El Salvador.

- (1) Bayne, David R., 1974. Progress Report on Fisheries Development in El Salvador. International Center for Aquaculture, Auburn, Alabama. Research and Development Series No. 7.
- (2) McCoy, E. W., 1974. Economic Analysis of the Inland Fisheries Project in El Salvador. International Center for Aquaculture, Auburn, Alabama. Research and Development Series No. 6.

A total production and marketing sector for 3000 metric tons of fish production from 1000 hectares of inland water was assumed for the analysis. Both the production per hectare and the number of hectares of production are conservative for El Salvador. Given the population pressures within the country and the limited land resources, a gradual increase in production to these levels will not significantly alter the market price for inland fish. Substantial dislocations of its existing marketing structure as well as changes in marketing practices will occur. The primary visible change will involve shifts of low quality marine fish into the dried fish sector.

Consumer expenditures of $\text{¢}3,840,000$ will be necessary to induce production of 3000 metric tons of production from 1000 hectares of inland water in El Salvador. The fish will be purchased at open or public markets, supermarkets, and directly from producers. In terms of enterprise accounts, the expenditure flow will be as shown in the figure. Consumer expenditures of $\text{¢}3840$ thousand will be distributed with 75 per cent to public markets, 22 per cent to super markets, and 3 per cent to pond bank sales.

Under the assumed conditions the open markets will purchase 1728 metric tons of fish from the processing sector at $\text{¢}1.39$ per kilo and resell the fish at $\text{¢}1.66$ per kilo, Table 1. The price markup represents costs of labor, overhead, and capital for the public market sellers. The super markets will purchase 432 metric tons of fish at $\text{¢}1.50$ per kilo and resell at $\text{¢}1.93$ per kilo. The higher purchase price represents a greater degree of processing and packaging for fish designated for supermarket sales. The $\text{¢}.43$ per kilo markup again will cover fixed and variable costs of the supermarket. The two markets will employ 1,559,446 man hours of labor at a cost of $\text{¢}467,858$. Much of the employment will occur in urban areas.



Circular Flow of Funds -
Fish Industry

Table 1. Cost of the Fish Market Enterprise in El Salvador

A. Open Market

<u>Item</u>	<u>Units</u>	<u>Cost/Unit</u>	<u>No. Units</u>	<u>Total Cost</u>
		¢		¢
Fish	metric tons	1,392.00	1,728	2,405,376
Labor	man hours	0.30	1,246,880	374,064
Overhead	metric ton	27.06	1,728	46,759
Capital	metric ton	<u>27.06</u>	<u>1,728</u>	<u>46,759</u>
Total		1,662.59	1,728	2,872,958

B. Super Market

<u>Item</u>	<u>Units</u>	<u>Cost/Unit</u>	<u>No. Units</u>	<u>Total Cost</u>
		¢		¢
Fish	metric tons	1,499.51	432	647,789
Labor	man hours	0.30	312,646	93,794
Overhead	metric ton	130.27	432	56,276
Capital	metric ton	<u>86.85</u>	<u>432</u>	<u>37,518</u>
Total		1,933.74	432	835,377

Processors will purchase 2700 metric tons of live fish and sell 2260 metric tons of processed fish to open markets and supermarkets. Live fish will be purchased at ¢.88 per kilo and sold for ¢1.11 per kilo of live weight to public markets and ¢1.20 to supermarkets, Table 2. These prices convert to ¢1.39 per kilo processed weight to public markets and ¢1.50 per kilo for supermarkets. Waste material from processing is assumed to have a zero value; however, it could be converted into feed for subsequent fish production. Processing fish would be an entirely new industry and would increase demand for labor, transportation, capital, and other activities. Labor demand would be increased by 524,880 man hours with payments to labor of approximately ¢157,000 per year. Since processing facilities should be located near production areas, most of the additional labor would be in the rural area.

Two production enterprises would arise in El Salvador: market production and fingerling production. Market production would receive most of its revenue from sales to processors, although 300 metric tons of smaller fish would go to direct pond bank sales in the rural area, Table 3. Market producers purchase fingerlings, feed, and fertilizer and sell live fish. No direct comparison of purchase and sale price can be made as in the previous sectors. The length of time between expenditures and returns would also be extended in the production sector. Either one or two batches of fish can be grown each year depending on the reliability of the water supply. The example assumes only one batch was grown. A slightly less conservative but more realistic estimate might be 4500 metric tons from 1000 hectares of water. The 4500 metric ton quantity could be reached by raising two batches in half the ponds and one batch in the remaining ponds. Production of 3000 metric tons would require 568,000 man hours of labor with payments of ¢170,400 per year. All of the labor income from market production would be in the

Table 2. Costs and Returns from Fish Processing Enterprises in El Salvador

A. Processed for Open Market

	Cost/Unit ¢	No. Units metric tons	Total Cost ¢
Live fish	880.00	2,160	1,900,800
Transportation	48.55	2,160	104,868
Labor Cost A (hrs)	.30	349,920	104,976
Utilities A	5.0	2,160	10,800
Capital	3.0	2,160	6,480
Transportation 2	97.20	2,160	209,952
Fixed Capital	<u>31.25</u>	<u>2,160</u>	<u>67,500</u>
Total	1,113.60	2,160	2,405,376

B. Processed for Super Market

	Cost/Unit ¢	No. Units metric tons	Total Cost ¢
Live fish	880.00	540	475,200
Transportation	48.55	540	26,217
Labor Cost B (hrs)	0.30	174,960	52,488
Packaging	15.00	540	8,100
Utilities-freezing	15.00	540	8,100
Capital	5.00	540	2,700
Transportation 2	97.20	540	52,488
Fixed Capital	<u>41.66</u>	<u>540</u>	<u>22,496</u>
Total	1,199.61	540	647,789

Table 3. Costs and Returns from 1,000 Hectares of Production of Tilapia-Guapote Tigre in El Salvador

Item	Units	Cost/Unit	No. Units	Total Cost
		¢	No.	¢
Labor	man/hrs.	.30	408,000	122,400
Supplies				
fert.	kgm.	.176	79,380	14,000
fingerlings	no.	.018	19,466,000	350,390
feed (chicken manure)	kgm.	.066	5,206,840	344,370
Maintenance				
labor	man/hrs.	.30	160,000	48,000
depreciation				46,000
Interest on operating capital	per cent		9	31,900
Capital charge for pond construction				<u>397,600</u>
Total Cost				1,354,660
Total labor hrs.		568,000		
Gross Returns				
large fish	14 cm. sales to processors		2,700,000	2,376,000
small fish	14 cm. pond bank sales		300,000	132,000
Net returns to Land and Mngt.				1,153,340

be needed during the period when cotton, coffee, and sugar cane are growing, a period of substantial rural unemployment.

Not only would fish production enhance employment opportunities for seasonal labor but significant returns would accrue to producers. Besides providing labor for the operator and family members, additional income would be available for improvement in the general family level of living. In the short run the producer would increase expenditures for food and clothing, but in the longer run, as income became stabilized, consumption of durable goods would increase. One secondary benefit would be an increase in education of family members as income became sufficient to release younger members from the work force.

The production sector would make payments of ₺350,390 to the fingerling producers. Fingerling production could occur in the same enterprise as market production and the fingerling production charges would be inputed to market fish production. Fingerling production would require 430,207 man hours of labor at a total cost of ₺129,062 per year, ^{1,000,000}Essentially all of the fingerling labor would be drawn from the rural labor force. Returns to the fingerling production sector would substantially increase incomes of fingerling producers and lead to similar results as those experienced in the market production sector.

Funds channeled into a market, processing, or production sector would not remain within the sector as indicated above. Much of the income derived by the sector would be used in purchasing primary inputs from some other sector. Even profits would not be retained, but would be distributed as dividends to stockholders or utilized for living expenses, investments, and savings by entrepreneurs. If profits exceeded current needs, they often

Item	Cost/unit	No. units	Total cost
Labor (man/hrs.)	0.30	430,207	129,062
Supplies			77,442
Capital			8,600
Total operating expense			215,104
Fixed capital			86,000
Total expenses			301,104
Gross returns			350,390
Net returns to land and management			49,286

sumption through the market system and back into consumption. The amount of time necessary for a round turn of funds would be dependent on the income position of members of the economy. Among relatively low income groups in the economy, the rate of turnover of funds would be very rapid, while higher income groups may expend income over a relatively-longer time period. The rural labor force generally can be considered to have the fastest turnover rate of income while management would have the slowest. With multiple-harvesting production management would have a faster income turnover than is typical in some farm enterprises.

Funds thus would flow from the consumption sector to marketing, processing and production sectors. The same funds would flow from these sectors into the payment sectors. The payments sector is comprised of labor, finance or capital, transportation, overhead, and savings. Capital consists of short term operating funds, intermediate length funds for equipment, and long term loans for pond construction. Overhead consists of payments for utilities, supplies, and the employers' share of any employee-benefit programs.

In direct sector payments labor would receive approximately \$925 thousand per year for in excess of three million man hours of work, Table 5. Under the postulated marketing conditions it would require more man hours of labor to sell the fish than would be required to raise them. All of the labor income in the open market is assumed to accrue to the seller. In actuality, several levels of income would exist. Management income would be derived by both wholesalers and retailers. In addition, a portion of the labor occurring within the market sector has been attributed to the transportation sector. Under the system as illustrated, the processor would bear the cost

Labor	Hours	Cost
		¢
Open market	1,246,880	374,064
Super market	312,646	93,794
Processor O	349,920	104,976
Processor S	174,960	52,488
Producer	568,000	170,400
Fingerling producer	430,207	<u>129,062</u>
Total labor	3,082,613	924,784
Transportation		Cost
Processor O		314,820
Processor S		78,705
Producer		344,370
Fingerling producer		<u>77,442</u>
Total transportation		815,337
Capital		Cost
Open market		46,759
Super market		37,518
Processor O		73,980
Processor S		25,196
Producer		429,500
Fingerling producer		<u>94,600</u>
Total capital		707,553

Management	Cost
Producer	1,153,340
Fingerling producer	<u>49,286</u>
Total management	1,202,626
Overhead	Cost
Open market	46,759
Supermarket	56,276
Processor O	10,800
Processor S	16,200
Producer	<u>60,000</u>
Total overhead	190,035

Table 6. Total Sector Account Direct Income in El Salvador

Account	Amount (1000)	Per cent
	¢	
Labor	925	24
Transportation	815	21
Capital	707	19
Management	1,203	31
Overhead	<u>190</u>	5
Total	3,840	100

of pick up of fish from the producer and delivery of fish to the ultimate seller. The transportation sector also would deliver supplies to the production sector. Direct income to transportation would be approximately ₪815 thousand. Capital or finance would receive payments of ₪707 thousand from the expenditures sector with the major payment from the producers. A capital cost was assumed even though a portion of investments for production, processing, and marketing would be internally generated. The internally generated capital must bear an opportunity cost and generate sufficient returns to maintain capital flow into the inland fish industry. The opportunity cost represents returns to management's capital; however, it was not included in payments to management. Management payments in the example would represent the returns over all costs incurred in the production sectors. Management returns represent the amount of funds beyond payments for family labor that the operator has available for amortization of land costs and current consumption. In effect, excluding returns to land, management payments represent the yearly amount of funds that could be withdrawn from inland fisheries production without changing the scope of the industry. Approximately 30 per cent of the total expenditures would accrue to land and management. Land amortization would be applicable if the managers financed purchase of the land. In this instance about 30 per cent of the return to management would be unavailable for current consumption. Given the target group of producers, most of the land converted to inland fish production was assumed owned by the manager.

The overhead payments were assumed to comprise about five per cent of the total payments sector. Essentially all of the production and processing and much of the transporting would be conducted by the labor sector. Only freezing of the fish, depreciation, and utilities used in marketing were

Table 7. Intersector Account Payments in El Salvador

Labor	Man hrs.	Cost
Capital	1,796,923	539,077
Transportation	1,611,163	485,349
Intersector total	3,408,086	1,022,426
Sector total	<u>3,082,613</u>	<u>924,784</u>
Total labor	6,490,699	1,949,210
Capital		cost
		¢
Transportation		190,904
Sector total		<u>707,555</u>
Total capital		898,459
Overhead		cost
		¢
Capital		358,384
Transportation		140,099
Intersector total		497,483
Sector total		<u>190,035</u>
Total overhead		688,518
Savings		cost
		¢
Labor		92,000
Management		<u>60,000</u>
		152,000

placed in the overhead classification. The overhead account consists of miscellaneous expenses accruing in the system.

The total sector accounts are summarized in Table 6. Labor would receive 24 per cent of direct sector payments, transportation 21 per cent, capital 19 per cent, management 31 per cent, and overhead 5 per cent. The first round effects of the original consumer expenditures would appear to be complete. The ₡3,840,000 spent for consumption of fish has been distributed to various payment sectors. The expenditures would not remain within the payment sectors, however, since second round activity occurs. Intersector transactions take place. For example the transportation sector would have expenditures for labor, capital, and overhead, and the finance sector would have labor payments. The intersector payments would increase labor to about six and one-half millions man hours with almost two million colones in payments, Table 7. Overhead would be increased to ₡688,000, following the payments from capital and transportation. At the intersector-payments level, both labor and management would divert a portion of their returns to savings.

Following the intersector transactions, approximately three million colones would flow directly back into consumption with ₡840,000 retained in overhead and savings. Savings would reenter the income stream in the form of loans for productive purposes. Overhead payments include all expenses not covered by the sector accounts and would be returned to the income stream as payments to labor, capital, etc. The entire expenditure by consumers would be distributed throughout the system and returned to consumption. Major changes would occur in the system with the redistribution of funds. The rural labor force has a much higher propensity to consume plus the velocity of transactions would create additional employment in the service sectors, which include food, clothing, and education. Direct employment in the inland

fisheries industry would be 2,254 man-years assuming full time employment 240 hours a month. A detailed input-output analysis would be necessary to delineate the amount of additional employment created in service industries; however, in a highly labor intensive economy the employment multiplier would be relatively large. Since the consumption expenditures represent at least a partial redistribution of income, the new consumption will not pattern the old. Original expenditures of c3,840,000 created 2,254 man-years of employment. The inflow back to consumption, especially from the rural labor force, will create a proportionate amount of activity in fruit, vegetable, livestock, and grain production as well as increases in clothing, home construction, education and personal transportation. Combining secondary and tertiary effects, the amount of new employment in other industries should at least equal the employment created in the inland fish industry.

Inland fisheries production does not represent a panacea for the income and population problems of El Salvador. Working within the limited guidelines of increasing the level of protein intake, the level of income, and the level of education of a target group of farmers with relatively small landholdings, fish production represents an alternative that should be considered in planning the farm operation. On an aggregate level, inland fish production generates high returns to labor and management and represents an attractive alternative for investment decisions.