84/85-002

LESSONS FROM FISHERIES DEVELOPMENT IN WEST AFRICA

PURSE SEINE/TRAWLER CONSTRUCTION, GHANA

by

T.R.Brainerd

Resource Economics Department

ICMRD Working Paper # 10

International Center for Marine Resource Development

University of Rhode Island

Kingston, Rhode Island 02881

USA

June, 1984

PREFACE

This is one of five working papers that evaluates fisheries development projects in West Africa. Working paper # 9 presents an overview of fisheries development projects in West Africa, summarizes the conclusions of the four case studies presented in the other working papers, and suggests some recommendations for future fisheries development planning in West Africa. Working paper # 10 evaluates the purse seine/trawler construction project in Ghana, and compares the financial data obtained from the operations of the 10 vessels that were constructed by the project with the estimates made during the appraisal of the project. Working paper # 11 evaluates the oyster culture project in Sierra Leone, and discusses the possible factors that led to the non-implementation of the extension phase of the project. Working paper # 12 evaluates the artisanal fisheries project implemented at Cacheu in Guinea-Bissau, and discusses the project's contribution to employment and protein supply in Cacheu. Working paper # 13 evaluates artisanal fisheries projects in Senegal and discusses their contribution to national income and Gross National Product (GNP).

LESSONS FROM FISHERIES DEVELOPMENT IN WEST AFRICA: PURSE SEINE/TRAWLER CONSTRUCTION, GHANA

by

T.R.Brainerd

1. Introduction

During the early 1960s, Ghana's fishing industry developed from a predominantly traditional canoe fleet to a mixed traditional-modern fleet with fishing craft ranging from the canoe to factory trawler. This rapid development was due mainly to the need for providing more animal protein to Ghana's growing population, to conserve foreign exchange by reducing the importation of fish, and to create employment opportunities.

The domestic catch increased from 42,653 tons in 1962 to 157,578 tons in 1970, an average annual increase of 30 percent (Nyanteng, 1981). This increase was likely due to increased motorization of canoes (about 50 percent motorized by 1967), the provision of funds to Ghanaians under a "Charter Party Scheme" to purchase inshore fishing vessels, and an increase in the deep-sea fleet to 45 vessels, (including trawlers, seiners, and one factory ship). However, by the late 1960s the deep-sea fleet which initially accounted for about 32 percent of the annual catch had a number of setbacks. Its annual catch decreased about 50 percent as a result of the loss of external fishing

grounds due to the extension of EEZs by other coastal countries, the lack of spare parts and equipment for fishing vessels because of foreign exchange problems, and poor management of the fleet.

The Ghanaian Government requested assistance from the Food and Agriculture Organization and the International Bank for Reconstruction and Development (FAO/IBRD) to review the status of its fishing industry, and to make recommendations for reorganization and improvement. The FAO/IBRD Cooperative Program Mission which visited Ghana in June 1957 identified the inshore fishery as a possible area for increasing fish production because inshore vessels can exploit pelagic stocks further off-shore, out of the range of the canoe fishery. After considering the recommendations of the mission, the Ghanaian Government submitted a proposal to IBRD for funding the construction of inshore fishing vessels. A project was prepared, appraised, and accepted for funding by IBRD. This project was called the Ghana Fisheries Project.

One principal objective is to evaluate the Ghana Fisheries Project. A brief description of the project with the revision to its major components is presented in section 2. Section 3 contains a detailed financial analysis of the project fishing vessels. The project performance is assessed in section 4, and the paper concludes with a summary of the results of the evaluation.

2. Description of the Project

The Government of Ghana submitted a request to the World Bank for financing the project in August 1968. The project was appraised in September/October 1968 and World Bank credit became effective in January 1970. The objectives of the original project were to expand the fishing industry, to save foreign exchange by reducing imports of fish, and to contribute to the improvement of nutrition in Ghana.

The original project included five components.

a. The design and construction of 40 fishing vessels, each having an overall length of approximaely 43 feet, and hold capacity of approximately 20 tons, fully equipped for purse seine operation.

b. The provision of loans or other forms of credit to fishermen or fishing enterprises through the Agricultural Development Bank (ADB) for the purchase of the fishing vessels.

c. The procurement of spare parts for the 40 vessels.

d. Provision of management staff for the Boatyard Division.

e. Studies for the improvement, expansion and development of fisheries in Ghana, including: detailed engineering studies at the fishing port of Tema, comparative preliminary engineering studies at the fishing ports of Elmina and Mumford, and detailed engineering studies at

either the fishing port of Elmina or the fishing port of Mumford.

The present analysis covers the first four components only. The 40 purse seiners financed under the project were expected to average 75 trips each year, and to fish for sardinella between July and October. The average annual catch per vessel was estimated at 225 tons (three tons per trip). The annual increase in total production was estimated at 9,000 tons. This should have provided a valuable addition to annual protein supplies for consumption, and created employment opportunities for approximately 800 fishermen. The construction of the 40 vessels would enable the Boatyard Division to operate at full capacity during the construction period.

Between January 1970 (the time the credit became effective) and August 1971, an increase in the construction costs of the vessels, and information on the level of the fish stocks to be exploited by these vessels led to major revision in the project components.

The proposed number of vessels was reduced from 40 to 10, with a change in their design to allow for trawling as well as purse seining. The Boatyard completed the construction of the 10 hulls by mid-1972. Nine were fitted with engines and accessories and started fishing operations in September 1973. The tenth vessel started fishing operations in July 1973. An allocation of U.S.$150,000 was made to the Agricultural Development Bank (ADB) in Ghana for

technical assistance, and an allocation of U.S.$100,000 was made to the Boatyard Division for the purchase of equipment. (Both allocations were made by IBRD).

The World Bank provided credit for U.S.$1.3 million to cover 56 percent of the costs (foreign exchange components) as follows:

a. U.S.$325,000 for materials, components, nets, and gear for fishing vessels.

b. U.S.$100,000 for spare parts and equipment for the Boatyard Division.

c. U.S.$75,000 for staff for the Boatyard Division.

d. U.S.$250,000 for consultant's services for harbor studies.

e. U.S.$70,000 as unallocated.

The Ghanaian Government contributed an additional U.S.$1.0 million to cover the rest of the cost of the project.

The total cost of the 5-year project at appraisal was U.S.$2.3 million.

3. Financial Analysis

The financial analysis consists of two parts. The first, ex-ante part deals with the analysis of the estimated annual incomes and financial ratios of the three vessel types (purse seine, trawl, purse seine/trawl) under the assumptions made at the project appraisal. The second, ex-post part analyzes the actual annual production costs and

financial ratios over a 3-year period for the 10 vessels that operated, and then compares the two results.

3.1. Estimated Annual Incomes and Financial Ratios of the Three Vessel Types

Purse Seine. The estimated annual net earnings for a purse seine vessel is 9,733 cedis (appendix I). With a 10-year operating life, the Internal Rate of Return (IRR) is 15 percent. The Operating Ratio (which is the operating expenses divided by the revenue) is 69 percent (Table 1). This ratio indicates the ability of management to control the operating costs. As a rule of thumb, Gittinger (1982) recommends this value be between 50 percent and 80 percent. The value of 69 percent shows that the vessel is expected to make adequate returns on its operations.

The return on sales (which is the net income divided by the revenue) is 31 percent. This value shows how large an operating margin the vessel has on its sales. In general, the value depends on the nature of the activity. If the sale of the product or merchandise is continous throughout the year or season, and the demand for it is fairly high, then the ratio need not be nigh. For these three vessel types, the purse seine vessel operation is highly seasonal,

TABLE 1. ESTIMATED FINANCIAL RATIOS FOR FISHING VESSELS
GHANA FISHERIES PROJECT

Ratios	Type of Vessel		
	Purse Seine	Trawl	Purse Seine/Trawl
Operating Ratio (%) $\frac{\text{Operating Expenses}}{\text{Revenue}}$	68.9	77.9	77.4
Return on Sales (%) $\frac{\text{Net Income}}{\text{Revenue}}$	31.1	22.1	22.6
Return on Asset (%) $\frac{\text{Operating Income}}{\text{Assets}}$	20.0	28.0	23.4

while the operations of the other two vessel types are year round. This suggests that the return on sales ratio should be higher for the purse seine vessel to allow for a wide enough margin for it to operate.

The return on assets (which is the operating income divided by the assets) is 20 percent. This value indicates the earning power of its assets, and is vital if this vessel is to compete with other enterprises for funds. A crude rule of thumb is that, once the business is operating at normal capacity, the return on assets should exceed the cost of capital as measured by the bank lending rate to industries, provided that there is no interest subsidy (Gittinger, 1982). No data is available on the bank lending rate in Ghana, but it is possible that it was lower than 20 percent at the beginning of the project.

Appendix 1 gives the annual production costs of a purse seine vessel under the same assumptions. The estimated average total cost per ton of fish for a purse seine vessel making 75 trips a year, and catching an average of three tons of fish per trip is 114 cedis, and the estimated average variable cost per ton for the same vessel is 34 cedis. The average price per ton is 140 cedis, and the profit per ton is 26 cedis.

Trawler. The estimated annual net earnings for a trawl vessel is 15,000 cedis (appendix 2). With a 10-year operating life, the Internal Rate of Return (IRR) is 24 percent. The operating ratio of 73 percent is within

Gittinger's recommended range and indicates that the vessel can make adequate returns on its operations. The return on sales is 22 percent. The return on assets is 28 percent (Table 1), which likely is greater than the bank lending rate to industries in Ghana at the time of the project's appraisal.

Appendix 2 gives the annual production costs for the trawl vessel. The estimated average total cost per ton of fish for a trawl vessel fishing for 220 days in a year at an annual average of 1.18 tons per day is 201 cedis, and the estimated average variable cost per ton is 155 cedis. The average price per ton is 240 cedis, and the profit per ton is 39 cedis.

Purse Seine/Trawler. The estimated annual net earnings for a purse seine/trawl vessel is 13,914 cedis (appendix 3). With a 10-year operating life the IRR is 20 percent. The operating ratio is 77 percent and is within Gittinger's recommended range, indicating that the vessel can make adequate returns on its operations. The return on sales is 22 percent. The return on assets is 25 percent.

Appendix 3 gives the annual production costs for a purse seine/trawl vessel under the same assumptions. The estimated average total cost per ton is 154 cedis, and the estimated average variable cost per ton is 123 cedis. The estimated average price per ton for both purse seine and trawl operations is 190 cedis.

In summary, the purse seine/trawl vessel has the

highest annual net earnings (13,914 cedis), and the purse seine vessel has the lowest (9,785 cedis). The trawl vessel has the highest IRR (24 percent), and the purse seine vessel has the lowest IRR (15 percent). The financial ratios indicate that the purse seine vessel has the highest return on sales (31 percent), and the lowest operating ratio (59 percent), i.e. the lowest operating expenses to revenue. The annual production costs estimates show that the trawl vessel has the highest profit margin with respect to the average price per ton of fish.

3.2. Net Revenues and Financial Ratios of the 10 Vessels

We now examine the net revenues and financial ratios for the 10 purse seine/trawl vessels that actually operated. One vessel was fitted with an engine of higher horse power than the others, and its cost, including the trawl net was 30,128 cedis. The cost of the other 9 vessels, including trawl net was 57,455 cedis each. The cost of the purse seine net was 23,152 cedis. Straight line depreciation is used in the calculations. The variable costs are lumped together in the data, thus the variable cost factors cannot be itemized. There is no data on the number of fishing trips or fishing days, and no data on catch per trip for the vessels.

Table 2 gives the net revenues for the 10 vessels. Rapid inflation and import restrictions caused average costs for individual vessels to increase considerably. This increase in costs range from 49 percent to 350 percent, while average revenues increased up to 200 percent. Most of the vessels were unable to cover their costs. During the first year, all nine vessels that operated covered their average variable costs. Four vessels did not cover their average total costs. Two of these four vessels discontinued operations after the first year, one of the two vessels sunk.

TABLE 2. NET REVENUES FOR 10 PURSE SEINE/TRAWL VESSELS
GHANA FISHERIES PROJECT

Vessel No.	Net Revenues (Cedis)*		
	July 1973-June 1974	July 1974-June 1975	July 1975-March 1976
1	3652	--	--
2	14175	-4157	4506
3	1119	1669	1502
4	-4003	-4757	-8534
5	6055	--	4580
6	15132	-327	-1505
7	-2565	-8938	-9887
8	3232	-11133	2348
9	--	-6824	--
10	--	--	9011

*2.75 Cedis = U.S.$ 1.0 (USAID Country Profile, 1983).

During the second year, only six vessels operated. Four of them covered their average variable costs, while tw vessels did not. Only one vessel covered its average total cost. (It is likely that there were serious design and/or management problems that affected tne operations of these vessels.) During the third year, eight vessels operated, seven covered their average variable costs, and six of these seven covered tneir average total costs.

Appendix 4 gives the financial ratios for the ten vessels during the 3-year period. There was a wide variation in the operating ratios of these vessels. Given the rule of thumb (between 50 percent and 80 percent), some values are worth mention. Three vessels had their operaing ratios below 50 percent for the first year of operation. This may indicate that some costs nave been omitted, or were not reported. Three other vessels nad their operating ratios within the expected range for the first year. The ratios for the remaining vessels were over 80 percent. For the second and tnird years, tne operating ratios showed similar variation, but were higher than the first year, and for two vessels, the ratios were over 100 percent. The return on sales ratios also varied considerably for the first year. Two vessels nad low ratios compared to the other vessels. For the second year, two vessels had low ratios, and three vessels had negative values indicating that the net incomes were negative. The ratios for the third year showed that one vessel had a low value, and one

vessel had a negative value indicating a negative net income for this vessel.

Assuming that the commercial bank lending rate was above 13 percent, the return on assets ratio exhibited values likely below the bank lending rate to industries for six vessels for the first year of operations. For the second year, the ratios for all operating vessels were likely below the bank lending rate to industries. Three vessels had negative values indicating negative operating incomes for those vessels. For the third year's operations, only two vessels had ratios that were likely above the bank lending rate. One vessel had a negative value.

The results of this analysis show that there were serious problems with the operations of these vessels. Only one vessel covered its costs (both fixed and variable) during the 5-year operations of these vessels. Another vessel covered its costs during the two years it operated. (It did not operate during the second year). One vessel covered its costs during the third year it operated. All other vessels did not cover their fixed costs throughout their operations. One vessel covered its variable costs in the first year only.

For these vessels to continue operations in the short-run, they must cover their average variable costs, and for them to continue operations in the long-run, they must cover their fixed costs also. It is evident that only one vessel, possibly two could have continued operating in the

long-run. (One of the two vessels only started operating in the third year). Several factors could have been responsible for the overall poor performance. It is likely that there were frequent breakdowns of engines and equipment. This could have disrupted fishing operations and also increased repairs and maintenance costs considerably. Spare parts could have been difficult to obtain, and their costs likely increased during the operation of the vessels. It is possible that vessel owners lacked management skills. No data is available on the number of trips and the catch rate, thus it is not possible to indicate whether the vessels had low catch rates.

The results of the financial analysis of the 10 vessels are compared with the results of the financial analysis of the purse seine/trawl vessel using the assumptions made at the project's appraisal. Only two vessels obtained net revenues close to the appraisal estimate during the first year of operations. For the other vessels, and for the rest of the period, the net revenues were lower than the appraisal estimate. For some vessels, the net revenues were negative. One would have expected the net revenues to be higher since the ex-vessel price of fish was much higher than at the time of the appraisal. However, costs rose much faster than revenues, and there were considerable variations in the average costs of operations of these vessels during the period.

The operating ratios for the 10 vessels also varied

considerably. Some ratios were much higher than the appraisal estimate, and a few were lower. The evidence suggests that they were unable to control operating expenses. Most of the vessels had fairly high values for return on sales. This shows that there was no problem with the sale of the products, and that prices were high enough to bring adequate returns on sales. The return on assets ratios for the 10 vessels were much lower than the appraisal estimate, except for one vessel. This indicates that these vessels did not cover the costs of capital.

These large differences between the values for the 10 vessels and the appraisal estimates emphasize the need for sensitivity analysis to provide insight to the economic viability of the operations if conditions change, or if wrong assumptions were made during the appraisal of the project. The next section presents a sensitivity analysis of the purse seine/trawl vessel operations using the assumptions made during the appraisal to see what sort of economic problems could have been prepared for.

3.3. Sensitivity Analysis

Sensitivity analysis is useful for project planning, because catch rates can drop, prices rise or fall, or operating expenses could increase considerably, any of which may affect the feasibility of the project. No data is available on the catch rates for this type of vessel, and there is no information on price variation, whether

seasonal, or over a period of time. Thus, there is no data base to perform any statistical analysis that would indicate the degree of variability in these factors. Our approach here is to vary within reasonable bounds the expected average catch and average price values to determine whether fishing operations are economically viable under these changed conditions. The average catch per trip for purse seine operations is adjusted to plus and minus 20 percent, and the average catch per day for trawl operations is adjusted to plus and minus 50 percent. The average prices per ton for the catches of both operations are adjusted to plus and minus 10 cedis.

The sensitivity analysis shows significant changes in the labor costs (Appendices 1 to 3). This is because of the share system used to compute the labor costs. Since labor costs are computed as shares of the net earnings from the sale of fish, changes in earnings due to a price change, an increase in operating costs, etc., affect labor costs. All other variable cost factors are not affected by these adjustments.

The average costs show significant variations (up to 27 percent) particularly when the average catch and the average prices are reduced. The average total cost values indicate that at least 50 percent of the catch should be high priced fish (average price per ton = 240 cedis) if the vessel is to continue operating in the long-run. With the results obtained from the analysis of the operations of the 10

vessels, average costs for individual vessels increased up to 550 percent, and average revenues increased up to 200 percent.

It is evident that the changes in the sensitivity analysis should have been of much higher magnitudes, but there were no objective evidence for measuring likely variations that could account for such changes. During the life of the project, there was an upward trend in prices, and the costs of repairs and equipment rose rapidly. Most of the factors responsible for the upward trend in prices were exogenous, such as the global effect of rapid increases in oil prices in the early 1970s, the effect of import restrictions by the Ghanaian Government, and the falling value of the cedis against the United States dollar. Since these factors did not exist at the time the project was appraised, they could not have been considered in a sensitivity analysis.

4. Assessment of the Project's Performance

Our assessment of project performance consists of determining whether the project succeeded in fulfilling its objectives, including identifying plausible causes of any failure to do so.

The first objective puts emphasis on expanding the fishing industry in Ghana. The revision made to the project components reduced the number of vessels constructed from 40 to 10. These 10 vessels accounted for two percent of the

total number of industrial fishing vessels (inshore and deep sea) between 1973 and 1975, and for only 0.1 percent of the total number of fishing craft (artisanal and industrial) over the same period. During this period the fishing industry in Ghana experienced serious setbacks. Prior to 1973, the number of fishing vessels reached their highest (358 industrial vessels, and 3728 artisanal canoes in 1972). Since 1973 the number of fishing vessels declined steadily, especially the number of industrial vessels (Nyanteng, 1981; p.12). Between 1973 and 1975, there was a 15 percent decrease in the number of industrial fishing vessels. (The number of artisanal fishing vessels decreased from 1972 to 1973, remained constant until 1975, and then continued to decline.) Since the reduction in the number of industrial vessels was 15 percent, and the 10 vessels accounted for only two percent of the total number of industrial vessels, the project neither caused any expansion to the fishing industry, nor prevented its decline.

Various factors could have been responsible for the decline in the fishing industry. There were two loan schemes to fishermen prior to the formulation and implementation of this project. One was the "Charter Party Scheme", providing funds under hire purchase agreement by the Ghanaian Government for purchasing inshore fishing vessels. This scheme increased the number of inshore vessels by approximately 200 percent from 1950 to the early 1970s (Nyanteng, 1981). The second scheme provided loans to

artisanal fishermen for purchasing outboard engines. Spare parts and repair facilities were also provided in large towns and villages. By 1975, the country was faced with foreign exchange problems, and the importation of equipment and spare parts for these schemes suffered severe reduction. Fishing vessel operations were seriously affected by this problem, and some vessels were laid up. The distant water fleet also lost access to fishing grounds because other countries extended their economic zones.

The annual total production of the 10 vessels was 787 tons, 455 tons, and 423 tons for 1973, 1974, and 1975 respectively. These figures fell far below the appraisal estimate of 225 tons per vessel. The total annual production based on this estimate should have been 2,250 tons. The 1973 production which was the highest was only 35 percent of the estimated value. The actual contributions of the 10 vessels in the total domestic production for the three years were 0.4 percent, 0.2 percent, and 0.2 percent respectively.

The Internal Rate of Return (IRR) for the 10 vessels was also low. The highest IRR was 10 percent. Most vessels had values less than one percent. In some cases, the total operating costs exceeded the total revenues. For these vessels to be able to pay-off the loans in five years, they must earn an IRR of at least 20 percent. Despite this extremely low rate of return, the loans on seven of the vessels were repaid within five years (one was fully paid by

the insurance). The loans on three vessels were still outstanding, one of which had repaid only 27 percent of the loan at the end of the 5-year loan period. From the results, it is impossible for the loans to have been paid from the revenues of these vessels. Two possible reasons could be given for the repayment of the loans. Either the vessel owners/fishermen obtained funds from other sources to repay the loans and avoid defaulting, or there was considerable under reporting of the revenues, and over reporting of the operating costs. Nyanteng (1981) suggests that some local fishing vessels were discharging fish in neighbouring countries to earn hard currencies.

The per capita fish consumption in Ghana increased from 19 kg. in 1960 to 35 kg. in 1972 (Nyanteng,1981). During the period the 10 vessels operated (from 1973), the per capita fish consumption decreased, and in 1975 it was down to 23 kg. The small level of production did little to prevent this drop in consumption. The 10 vessels could have created about 100 jobs for fishermen assuming that 10 fishermen were working on one vessel. This number is far short of the estimated 300 jobs that the projec was supposed to create for fishermen.

The Boatyard Division suffered considerable delays during the construction of the 10 vessels because of lack of materials and equipment. This was due to the foreign exchange problem in Ghana. The Boatyard Division was only able to continue construction of the vessels after IDA made

funds available due, to the reduction in the number of vessels that was constructed. The Division also lacked efficient management at the time the vessels were constructed. Expatriate technical assistance which was called for in the project document was never provided. The financial statements of the Boatyard Division did not separate the project's costs and revenues from other costs and revenues incurred in its general operations, thus the performance of the Boatyard Division during the project could not be determined.

Two other factors are relevant to this evaluation. These are the procurement procedures that were followed by the project for obtaining engines and equipment for the vessels and the Boatyard Division, and the institutional structure under which fisheries development activities were being undertaken. The procurement procedures, outlined by IBRD and followed by the project, established specific guidelines for international bidding and the acceptance of bidders. There were considerable delays particularly with the procurement of engines for the vessels. Fishermen wanted engines that they were already familiar with, but the guidelines were not sufficiently flexible to accomodate their requests. By the time an agreement was finally reached, the costs of the engines had increased significantly. Such delays could have been avoided if the appraisal team had included this consideration in the project.

The development of the fisheries sector in Ghana was the responsibility of different institutions with little or no coordination of their activities. The Fisheries Department was responsible for implementing the other two schemes, and for general extension and development activities. The Fisheries Research Unit (FRU) was responsible for all fisheries research activities, e.g. stock assessment, biological studies, etc. The Boatyard Division was under the management of the Ghana Industrial Holding Corporation (GIHOC), and the Agricultural Development Bank (ADB) was an autonomous institution. There is no evidence that any attempt was made to develop a structure or framework for coordinating the activities of these institutions. The Fisheries Department could have contributed to the design and implementation of the project, given the experience the Department had over the years with fisheries development activities. The FRU could have provided information on the stock level for the appraisal team to determine whether an increase in the number of inshore vessels could have been economically feasible. It was apparent that the ADB in Ghana lacked expertise in fisheries, and was not familiar with the activities of the fishing industry. If a framework for coordinating the activities of these institutions had been in operation, some of the problems that created major setbacks to the implementation of the project could have been avoided or minimized.

5. Conclusion

The project did not succeed in expanding the fishing industry. The 10 vessels were only two percent of the total number of industrial vessels, and 0.1 percent of the total number of fishing crafts at that time. (The total number of industrial vessels declined by 15 percent during the project period.) The data for the three years showed that the 10 vessels contributed less than 0.5 percent to the total domestic production over this period. This level of production is not likely to have contributed to the improvement of nutrition in Ghana. Moreover, the per capita fish consumption fell by 7.0 kg. during this period. The number of jobs created by the project for fishermen was likely around 100. This was far short of the estimated 800 jobs that the project was supposed to provide to fishermen.

The financial analysis of the operations of the 10 vessels shows that none of them were able to obtain an Internal Rate of Return (IRR) greater than 10 percent. For most of these vessels the IRR was less than one percent, and there were cases with total costs exceeding total revenues. This extremely low rate of return could have created problems for vessel owners in meeting the loans agreement, but the loans on seven vessels were fully paid within the loan period. The possible explanation for this is that vessel owners were able to obtain funds from other sources, or the reports of the operations of the 10 vessels were

inaccurate. Also, none of these vessels were able to obtain the estimated annual catch of 225 tons. The highest annual catch was 140 tons.

There were protracted delays in the construction of the vessels. At first, the number of vessels was reduced from 40 to 10 because of information released by the FRU that the fish stocks could not sustain such a high level of harvesting. Next, fishermen wanted the Boatyard Division to install engines they were familiar with on the vessels. Because of the procurement procedures set by IBRD, it was not possible for the Boatyard Division to meet their demand, and a considerable time elapsed before the issue was resolved. The Boatyard Division also experienced delays due to restrictions in the importation of materials and equipment for the construction of the vessels. No technical assistance was provided to the Boatyard Division as called for in the project document. It could have performed better if technical assistance was provided to manage its activities.

Although the project was implemented at a time when there was a general decline in the fishing industry due to the economic situation in Ghana, the project could have performed better if the various institutions involved in fisheries development activities in Ghana coordinated their activities. There is evidence that there was complete lack of knowledge on some aspects during the formulation of the project, and that key fisheries institutions were not

consulted.

In summary, the project did not create an expansion to the fishing industry in Ghana, nor significantly save foreign exchange. Far fewer jobs were created than envisaged. The results from the analysis show that vessel owners reaped little, if any benefit and the country as a whole did not benefit economically from the project.

LITERATURE CITED

Gittinger, J. Price 1982. Economic Analysis of Agricultural Projects. Second Edition, Completely Revised and expanded. EDI Series in Economic Development, Johns Hopkins Univ. Press.

Nyanteng, V. K. 1981. Trends in Fish Prices and Implications for the Development of the Ghanaian Fishing Industry. CECAF/Tech/81/33 (en).

APPENDIX 1: ESTIMATED ANNUAL PRODUCTION COSTS AND GROSS EARNINGS FOR PURSE SEINE VESSEL (CEDIS)

GHANA FISHERIES PROJECT

No. Trips/Year	75	75	75	75	75	75	75	75	75
Av. Catch/Trip (tons)	1	1	1	2	2	2	3	3	3
Av. Price/Ton (cedis)	130	140	150	130	140	150	130	140	150
Gross Earnings	9750	10500	11250	19500	21000	22500	29250	31500	33750
Fixed Costs:	6860	6860	6860	6860	6860	6860	6860	6860	6860
•Boat & Equipment[a]	3100								
•Gear[b]	900								
•Insurance	2400								
•Standard Tax	250								
•Fishing License Fee	50								
•Harbor Fee	160								
Variable Costs:	10907	11157	11407	14507	15007	15507	18107	18357	19607
•Diesel Fuel[c]	1950								
•Lubricating Oil[d]	637								
•Ice[e]	525								
•Food[f]	495								
•Hull, Engine & Equip. Maintenance[g]	2000								
•Gear Maintenance[h]	2250								
•Labor[i]	2050								
•Miscellaneous	1000								
Total Costs (cedis)	17767	18017	18267	21367	21867	22367	24967	25717	26467
Total Catch (tons)	75	75	75	150	150	150	225	225	225
Av. Total Cost (cedis/ton)	237	240	244	143	146	149	111	114	118
Av. Variable Cost (cedis/ton)	145	149	152	97	100	103	81	84	87

Note: The Internal Rate of Return (IRR) with av. catch/trip of 3.0 tons and av. price/ton of 140 cedis, assuming 10 years economic life of vessel, is 15%.

FOOTNOTES, APPENDIX 1.

[a]Cost of vessel & equipment = 4000,000 cedis. Straight line depreciation with 9,000 cedis salvage value after 10 years.

[b]Cost of gear = 9,000 cedis. Straight line depreciation. No salvage value

[c]Seventy-five trips at 13 hours per trip at five gals. per hour at 0.4 cedis per gal.

[d]Five percent of diesel fuel consumed at 2.60 cedis per gal.

[e]Average of half ton to one ton of fish at 14 cedis per ton.

[f]0.30 cedis per head for 75 trips, est. 22 fishermen per trip.

[g]Five percent of cost.

[h]Twenty-five percent of cost.

[i]One-third gross earnings after deducting costs of fuel, lubricating oil, ice and food.

2.75 CEDIS = U.S.$ 1.0 (USAID Country Profile, 1983).

APPENDIX 2: ESTIMATED ANNUAL PRODUCTION COSTS AND GROSS EARNINGS FOR TRAWL VESSEL (CEDIS)

GHANA FISHERIES PROJECT

No. Trips/Year	220	220	220	220	220	220	220	220	20
Av. Catch/Trip (tons)	0.68	0.68	0.68	1.18	1.18	1.18	1.68	1.68	1.68
Av. Price/Ton (cedis)	230	240	250	230	240	250	230	240	250
Gross Earnings	34408	35904	37400	59708	62304	64900	85008	88704	92400
Fixed Costs:	11480	11480	11480	11480	11480	11480	11480	11480	11480
▪Boat & Equipment[a]	3550								
▪Gear[b]	4800								
▪Insurance	2670								
▪Standard Tax	250								
▪Fishing License Fee	50								
▪Harbor Fee	160								
Variable Costs:	30339	30839	31339	39799	40666	41533	49250	50493	51726
▪Diesel Fuel[c]	14784								
▪Lubricating Oil[d]	4805								
▪Ice[e]	2100								
▪Food[f]	1320								
▪Hull, Engine & Equip. Maintenance[g]	2500								
▪Labor[h]	3830								
▪Miscellaneous	1000								
Total Costs (cedis)	41819	42319	42819	51279	52146	53013	60739	51973	63206
Total Catch (tons)	150	150	150	260	260	260	370	370	370
Av. Total Cost (cedis/ton)	279	282	286	197	201	204	164	168	171
Av. Variable Cost (cedis/ton)	202	206	209	153	156	160	133	137	140

Note: The Internal Rate of Return (IRR) with av. catch/trip of 1.5 tons for 80 trips (on-season), av. catch/trip of 1.0 tons for 140 trips (off-season), and av. price/ton of 240 cedis, assuming 10 years economic life of vessel, is 24%.

FOOTNOTES, APPENDIX 2:

[a]Cost of vessel & equipment = 44,500 cedis. Straight line depreciation with 9,000 cedis salvage value after 10 years.

[b]Cost of gear: 10 trawl nets at 480 cedis each. No salvage value.

[c]Two hundred and twenty days per year, 24 hours a day fishing time, seven gal./hour at 0.40 cedis/gal.

[d]Five percent of diesel fuel consumed at 2.60 cedis per gal.

[e]Average of one ton to one ton of fish at 14 cedis per ton.

[f]0.60 cedis per head for 220 fishing days: est. 10 fishermen.

[g]Five and one-half percent of cost.

[h]One-third of sales after deducting costs of fuel, lubricating oil, ice and food.

2.75 CEDIS = U.S.$ 1.0 (USAID Country Profile, 1983).

APPENDIX 3: ESTIMATED ANNUAL PRODUCTION COSTS AND GROSS EARNINGS FOR PURSE SEINE/TRAWL VESSEL (CEDIS)
GHANA FISHERIES PROJECT

No. Fishing Days/Year	220	220	220	220	220	220	220	220	220
Purse Seining: Av. Catch/Trip (tons)	3.0	3.0	3.0	2.5	2.5	2.5	2.0	2.0	2.0
Trawling: Av. Catch/Day (tons)	1.5	1.5	1.5	1.0	1.0	1.0	0.5	0.5	0.5
Purse Seining: Av. Price/Ton	130	140	150	130	140	150	130	140	150
Trawling: Av. Price/ Ton	230	240	250	230	240	250	230	240	250
Gross Earnings	79500	84000	88500	58200	61600	65000	36900	39200	41500
Fixed Costs:	10760	10760	10760	10760	10760	10760	10760	10760	10760
•Boat & Equipment[a]	3550								
•Gears[b]	4080								
•Insurance	2670								
•Standard Tax	250								
•Fishing License Fee	50								
•Harbor Fee	160								
Variable Costs:	48483	49983	51483	40543	41676	42809	32603	33369	34136
•Diesel Fuel[c]	12320								
•Lubricating Oil[d]	4004								
•Ice[e]	4620								
•Food[f]	1368								
•Hull, Engine & Equip. Maintenance[g]	3108								
•Purse Seine Net Maintenance[h]	3000								
•Labor[i]	19063								
•Miscellaneous	1000								
Total Costs (cedis)	59243	60741	62243	51303	52436	53569	43363	44129	44896
Total Catch (tons)	450	450	450	340	340	340	230	230	230
Av. Total Cost (cedis/ton)	131	135	138	151	154	158	189	192	195
Av. Variable Cost (cedis/ton)	107	111	114	119	123	126	142	145	148

FOOTNOTES, APPENDIX 3:

Note: The Internal Rate of Return (IRR) assuming: 1) Purse Seining--80 trips, av. catch/trip 2.5 tons, av. price/ton 140 cedis; and 2) Trawling--140 fishing days, av. catch/day 1.0 ton, av. price/ton 240 cedis, assuming 10 years economic life of vessel, is 20%.

[a]Cost of vessel & equipment = 44,500 cedis. Straight line depreciation with 9,000 cedis salvage value after 10 years.

[b]Cost of purse seine = 13,000 cedis. Cost of six trawl nets = 2,880 cedis. No salvage value.

[c]Eighty trips at 13 hours/trip purse seining, seven gals./hour at 0.40 cedis/hour.
One hundred and forty fishing days at 24 hours fishing time per fishing day, seven gals./hour.

[d]Five percent of diesel fuel consumed at 2.60 cedis per gal.

[e]Half-ton of ice per one ton of fish (purse seining) at 14 cedis per ton.
One ton of ice per one ton of fish (trawling).

[f]Purse seining: 0.30 cedis per head for 80 trips: est. 22 fishermen.
Trawling: 0.60 cedis per head for 140 fishing days: est. 10 fishermen.

[g]Five and one-half percent of cost.

[h]Twenty-five percent of cost.

[i]One-third of sales after deducting costs of fuel, lubricating oil, ice and food.

2.75 CEDIS = U.S.$ 1.0 (USAID Country Profile, 1983).

APPENDIX 4: FINANCIAL RATIOS FOR 10 PURSE SEINE/TRAWL VESSELS
GHANA FISHERIES PROJECT

Vessel No.	Operating Ratio (%)			Return on Sales (%)			Return on Assets (%)		
	1973-74	1974-75	1975-76	1973-74	1974-75	1975-76	1973-74	1974-75	1975-76
1	39.9	--	--	60.1	--	--	13.1	--	--
2	39.2	87.5	76.8	60.9	12.6	23.2	25.2	4.0	11.1
3	55.4	74.1	79.2	44.6	25.9	20.8	10.1	10.8	7.6
4	82.1	92.1	64.1	17.9	8.0	35.9	4.2	3.4	15.8
5	51.5	--	78.8	48.5	--	21.2	15.8	--	12.2
6	48.2	79.0	90.1	51.8	21.0	9.9	26.3	8.5	4.2
7	83.0	104.4	114.8	17.0	N	N	5.9	N	N
8	68.7	111.9	74.4	31.3	N	25.6	12.6	N	8.6
9	--	62.0	--	--	38.0	--	--	1.0	--
10	--	--	61.4	--	--	38.6	--	--	17.0

N = Negative.