ECONOMICS OF MARINE CANOE FISHERIES IN GHANA

by [1]
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Abstract :

The artisanal canoe fishery has, in recent recent times, reverted to its role as the mainstay of Ghana's fishing industry ; it now contributes well over 70 percent annually to total domestic catch. It is in light of this that greater attention needs to be to every aspect of fishery including the economics of its operation. This paper therefore explores the economics of the fishery relying on secondary sources of data.

The paper examines, in particular, the net effects of Ghana's structural adjustment policies on the canoe fishery with regards to pricing policy and access to credit. The analysis reveals that whereas the industry may have suffered from the removal of statutory lending to the industry from financial institutions, pricing policies have generally enhanced the earning capacity of canoe fishermen since real prices of fish have generally moved in sympathy with the general rise in the cost of operations.

Nevertheless, prices of fishing gear as well as fishing inputs have generally resulted in high cost of fishing operations. The increase in operations cost has, however, been largely cushioned by heavy subsidy on premix (at the study) which is major cost item for motorized operators. The conclusion from his study is that the canoe fishery seems to be reaping some profits from their operation and profits arise mainly out of upward movements in the prices of fish coupled with a subsidy on fuel (which has since been removed).

Résumé :

La pêcherie artisanale de pirogues est redevenue, au cours des années récentes, la composante essentielle de l'industrie des pêches ghanéenne. Elle représente maintenant plus de 70 % des captures totales du pays. C'est pourquoi il est nécessaire d'accorder une plus grand attention à tous aspects de la pêcherie

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en incluant l'analyse économique des opérations. En conséquence ce document explore l'économie de cette pêcherie en se fondant sur des sources de données déjà publiées.

Le document examine en particulier l'effet net des politiques d'ajustement structurel sur la pêcherie de pirogues en étudiant les mécanismes de formation des prix et l'accès au crédit. L'analyse révèle que bien que cette activité aie souffert de l'abolition du système de prêts statutaires venant des institutions de crédit, les mécanismes de formation des prix ont généralement amélioré le potentiel de gain des pêcheurs car les prix réels des poissons ont généralement évolué en concomitance avec la montée globale des coûts d'opération.

Néanmoins, le prix des engins de pêche, aussi bien que celui des intrants, a d'une manière générale induit des coûts d'opération élevés. Cet accroissement du coût d'opération a toutefois été fortement amorti par les subsides au carburant deux-temps (au moment de l'étude) qui représente le source principale de dépenses pour les opérations motorisées. La conclusion de cette étude est que la pêcherie piroguière semble tirer profit de ses activités et que ces profits proviennent essentiellement de la tendance ascendant des prix, jointe au subside sur le carburant (qui a été depuis supprimé).

1. Introduction

Fish is an important source of animal protein for most Ghanaians and it is also the most significant of the non-traditional exports of Ghana. It is for these twin reasons that fishery development has attracted the attention of governments dating back to the colonial days. The strategy has been to increase overall production of fish for both domestic consumption and exports. Development of the fishery sector will also ultimately help in alleviating rural poverty among the fishing communities.

The components of Ghana's fisheries include marine fishing activities, inland or fresh water fishing, aquaculture or fish farming and other ancillary fishing activities. However, the marine fishery being the largest component has attracted a lot of developmental attention. The marine fishery has a well established traditional expertise for exploiting coastal fishing by canoe fishermen. The marine fishing industry is classified into four main sectors by the Fisheries Department namely the artisanal, semi-industrial, industrial and tuna. The artisanal sector uses various types of fishing gear and employs the dug-out canoe as the main fishing craft.

This paper examines the economics of the marine artisanal sector. It is the largest of the fishing sectors in Ghana and contibutes over 60 percent to total domestic fish production annually. The canoe fisheries is operated exclusively by the private sector and fishermen in this sector are based in fishing villages located along the Ghanaian coastline. Often, these fishermen migrate beyond Ghana's territorial waters and can be found as far as Mauritania to the north and Angola to the south of Ghana. The structure and size of the canoe fisheries, its performance in relation to resource utilization as well as costs and returns to fishing operations are the main focus of this paper.

2. Structure and Size of Industry

The number of canoes operating from the Ghanaian coastal fishing villages is established in periodic censuses by the Fisheries Department. Any changes in the artisanal fishery, especially in canoe and fishing gear designs and operations are also noted in such surveys. The census of 1992 recorded a total of 8,688 canoes at 189 fishing villages. The artisanal fleet is characterized by the use of a large number of fishing gear which often gives a canoe its name. Thus all canoes in marine fisheries in Ghana are grouped into four main categories accoding to size and gear (Doyi, 1984) :

(i) small-sized one-man canoes, measuring up to about 5 metres long and half a metre wide ;

(ii) medium sized line and net canoes which measure between 6 and 11 metres long and up to one metre wide and used mainly for bottom set net, gill-net and drifting-gill net operations ;

(iii) large ali/poli/watsa canoes,which measure up to 18 metres long and 1.8 metres wide, are the largest canoes in use in Ghana's marine fisheries ;

(iv) large beach seine canoes, which are usually old ali/poli canoes that have had their bows raised to avoid taking in a lot of water as they work in or close to the surf.

Though not invalidating the above classification, recent surveys have, however, reclassified canoes and their gear into 9 categories, namely, ali, poli, watsa, lobster set net, set nets (mainly "toga" or "tenga"), beach seine, line, drift gill net and one-man canoe (Koranteng and Nmashie, 1987). Table 1 gives the distirbution of canoes by gear and region. The table indicates that Greater Accra has the largest population of canoes most of which use poli and line gear. Central Region follows in terms of canoe population but most canoe fishermen in this region use set nets. The Western Region with the third largest number of canoes does not appear to specialise while beach seining seems to be the speciality of canoe fishermen in the Volta Region. For the country as a whole, there is no significant difference between the five major types of marine

Table 1. Distribution of Canoes by Gear and Region (numbers)

Gear/Region	Volta	Gt. Accra	Central	Western	Total
Pursing Nets	61	896	841	368	2166
Ali	1	34	1642	308	1292
Lagas Line	0	103	32	22	157
Other Line	6	476	341	60	883
Beacch Seine	382	135	127	1	775
Set Nets	12	187	605	604	1408
Lobster Set Net	30	138	150	229	547
Nifa-Nifa	1	36	13	199	249
Drift Gill Net	0	50	514	67	631
One-Man Canoe	14	19	116	431	580
Total	**546**	**3154**	**2717**	**1635**	**8052**

Source : Koranteng K.A.et.al, 1993 ; Ghana Canoe Frame Survey, 1992.

canoe fisheries, that is, watsa, set nets, poli, line and ali fisheries. It should be noted, however, that even though canoes are classified according to the nature of gear it normally uses, many canoes can be used for more than one type of fishing and the classification given here is based solely on frequency of use of each canoe enumerated (Koranteng, 1990).

Table 2. Level of Motorization by Gear and Region (percentages)

Gear/Region	Volta	Greater Accra	Central	Western	Overall (Ghana)
Ali	--	83.9	77.7	89.9	81.7
Poli	–	89.8	95.3	100.0	91.9
Watsa	98.8	67.6	90.7	99.1	84.4
Beach Seine	9.8	43.8	10.9	9.2	16.9
Set Net	12.1	11.4	9.3	18.1	12.1
Lopster Set Net	0.0	20.0	4.3	32.3	17.9
Line	80.0	53.1	34.9	35.1	49.2
Drift Gill-Net	100.0	73.4	66.7	99.6	90.4
One-Man Canoe	0.0	0.0	0.0	0.0	0.0
Overall					
(Region)	**28.8**	**64.8**	**52.8**	**60.6**	**57.5**

Source : Koranteng, K.A.,(1990), Ghana Canoe Frame Survey, 1989.

Koranteng et. al. note an in the the number of canoes in marine fisheries from 8052 in 1989 to 8688 in 1992,an increase of about 8 percent. The increase is a reflection of the unstable nature of migration of canoe fishermen to neighbouring countries since there was a reduction in previous surveys, that is, from 8214 in 1986 to 8052 in 1989, a decrease of about 2 percent. It is also worth noting that with the gradual depletion of the "wawa" tree from which canoes are dug out, worn out canoes are not been replaced fully. This is particularly so with the larger canoes since it is the large trees that disappear first and is reflected in the reduction in the numbers of ali/poli/watsa and drift-gill net canoes which are in the larger range of marine canoes.

Following their introduction in 1959, outboard motors have become a prominent feature of the canoe fisheries. Outboard motors help fishermen to penetrate far into the sea and thereby improve on their catches. Thus, about 58 percent of the canoes in the 1989 census were motorized as shown in table 2. Although the 58 percent motorization represents an increase of 3.5 percent over the level for 1986, it is far below the level of 87 percent motorization indicated in the Annual Reports of the Fisheries Department in 1974. The decline in the level of motorization is due largely to the astronomical increases in the price of the outboard motor as well as the cost of maintaining and running it. The highest level of motorization, almost 92 percent, is recorded by the poli canoes. Drift gill-nets, watsa, and ali canoes also have high levels of motorization (over 81 percent) while beach seine, set-net, lopster set net and one-man canoes are least motorized, if at all.

It is estimated by Koranteng et. al.,1993 that there are about 96,400 fishermen operating the estimated 8,688 canoes. In other words there are about 11 fishermen to every canoe. This number is close to the average of 10 and a range of 9 to 12 fishermen per canoe estimated by Seini (1977). This suggests that the number of fishermen per canoe may be related closely to the tasks that fishermen perform in a fishing trip. The number of fishermen have, however, decreased from the 1986 level when over 104,000 canoe fishermen were recorded (Koranteng, 1990). There is therefore a reduction of about 7,600 canoe fishermen between 1986 and 1992, representing a decrease of about 7 percent. Whereas some of the canoe fishermen may have migrated, many more seem to be leaving the industry as a result of diminishing rewards to marine canoe fishing.

In addition to the marine fishermen, there are an estimated 1.5 million people who assist the fishermen in their fishing activities. These are mostly the dependants of the fishermen and they include their wives and children. Such dependants and relations help in fishing activities such as offloading the fish from the canoe, sorting, marketing and processing. Apart from the canoe fishermen and their dependants, various estimates have also been made about labour force participation in the marine canoe fishing industry. Lawson and Kwei (1974) for instance estimated that between 65,000 and 75,000 fish traders are involved in the industry.

3. Performance of Canoe Fisheries

The Fisheries Department regularly publishes statistics on the performance of the fishing industry in Ghana which is used to develop an account of the contribution of the canoe fisheries to total marine fish production as shown in table 3. The five-year average production figures show the dominance of the canoe fisheries in marine fish prouction in Ghana. Apart from the mid-60s and early 70s when marine fish production was almost equally shared between the canoes and fishing vessels, the canoes have consistently contributed over 65 percent of total marine fish landings per annum.

The dominance of the canoe fisheries is attributable to the successful use of outboard motors in the canoe fisheries which has contributed tremendously to the increase in the volume of marine fish supply. Marine fish landed in 1962 was a little over 37,000 tonnes of which the canoe fisheries contributed over 33,000 tonnes representing about 90 percent of the total. Productioin figures in 1992 indicate a total of 371,000 tonnes of of which 308,000 tonnes, representing 83 percent of the total, were landed by the canoes.

The significant increase in the contribution of the canoe fisheries can also be attributed to structural adjustment policies which generated rapid depreciation of the currency and sent many enterprises into distress. Such distressed enterprises included many fishing vessel enterprises, for examples Mankoadze, a private fishing company, and the State Fishing Corporation which has been placed on the government divestiture list. The two fishing enterprises contributed between 70 to 90 percent of fishing vessel production in the 1970s. The decline of the fishing vessel industry has placed a heavy responsibility on the canoe fisheries to produce most of the Ghana's fish requirements.

Table 3. Contribution of Fisheries to Marine Fish Production

Years	AverageTotal Production ("000 tonnes)	Average Canoe	Percentage Share of Marine Canoes
1961 - 65	49	32	65.3
1966 - 70	100	50	50.0
1971 - 75	193	117	60.4
1976 - 80	203	146	71.6
1981 - 85	214	152	70.9
1986 - 90	302	232	76.7
91	290	216	74.5
92	371	308	83.0

Source : Computed from Fishery Statistics of the Fisheries Department.

4. Resource Utilization in Canoe Fisheries

The most important resources used in canoe fisheries are labour and invested capital by way of caoe, net and outboard motor. As mentioned earlier on, an average of about 12 fishermen operate a canoe in a fishing expidition. This seems to be on the high side and is likely to cause overcrowdedness given the fact that canoes measure between 5 to 18 metres long and one-half to 1.8 metres wide. The crew size of canoes has not changed much over the years. Indeed, it was anticipated that the use of outboard motors on canoes would lead to a fall in the size of the crew required to operate a canoe. However the expected fall did not occur since additional men were required to operate bigger nets that were introduced simultaneously with the outboard motors (Lawson and Kwei, 1974). In addition family labour accounts for a greater part of the crew and that form of labour is normally used not necessarily according to the needs of the canoe but on the willingness of members of the family to take part and it is usually difficult to prevent a willing member of the family from taking part in a fishing trip.

An important factor which accounts for higher crew sizes is the share of proceeds from fishing. Almost invariably a fisherman must take part in fishing in order to have a share. There is no uniform procedure for sharing the proceeds from fishing. The method differs from one area to another and from gear to gear (Hill,1970). Generally, allocations are made to the canoe, the net, the outboard motor (if used), cost of fuel (in the case of a motorized canoe) and sometimes food. The remainder of the proceeds is then shared equally among members of the crew (Koranteng, 1990).

The most important capital resources used in the canoe fisheries are the canoe and the net. Generally, canoes and large fishing nets such as poli, ali, watsa and beach seines are owned by individuals (who may not even be fishermen), by a group of fishermen belonging to the same crew or jointly by members of the same family. The common feature, however, is for a family to jointly own the canoe, the net and the outboard motor.

5. Credit Utilization

Credit to the agricultural sector in general and the fisheries sub-sector in particular has being a thorny problem for some time now. In the fisheries sub-sector various schemes have been tried in the past. The successful use of outboard motors in the canoe fisheries has for instance been attributed largely to government-assisted schemes of loans for the purchase of outboard motors in the early years of their introduction. For example, the defunct Agricultural Development Corporation introduced a scheme in 1960 that afforded Ghanaian fishermen the opportunity of purchasing outboard motors on moderate credit terms. Its charter party scheme, largely a high purchase agreement, also encouraged fishermen to purchase larger canoes and boats which they paid for over a period of four years at an interest of six percent. The Agricultural Development Bank and other commercial banks also offered credit to fishermen

and farmers at moderate terms in the 1970s and early 1980s. These were in response to government regulations that compelled banks to lend a certain percentage of their loanable funds to the agricultural sector.

In the process of structural adjustment, however, agricultural and financial sector reforms have combined to create an unfavourable environment for credit to the agricultural sector. Agricultural sector reforms have witnessed the roval of subsidies on agricultural inputs and the realignment of prices that have turned the domestic terms of trade largely in favour of cocoa and against other forms of agricultural production (Commander et. al., 1989). Financial sector reforms, introduced in 1987, have involved the implimentation of a comprehensive programme of restructuring within the financial sector to strengthen institutions within the sector and enhance their efficiency and effectiveness. It has also involved the liberalization of interest rates and the roval of credit ceilings to certain sectors of the economy, particularly agriculture. Thus, while loans and advances to the agricultural sector by commercial and secondary banks averaged 26 percent between 1981 and 1985, it averaged 16.4 percent between 1986 and 1991 and was only 14.8 percent in 1991 (Asenso-Okyere et. al., 1993). The twin problems of the removal of subsidies on agricultural inputs and the reduction in agricultural lending by about 12 percent from the early 1980s have created a problem of financing agricultural production.

The lack of access to formal credit from the banking system and the cost of such credit has pushed canoe fishermen into reliance on traditional or informal souces of financing the fleet. Financial assistance to acquire canoes, nets, outboard motors and other fishing inputs are obtained largely from private entrepreneurs including the traditional «fish mammy», and money-lenders. The family, however, is usually the first line of call. Members of the fisherman's household often contribute to purchase the inputs especially the canoe and the large nets. Koranteng (1990), also notes that it is rare for the canoe fishermen to obtain loans from the bank since they often lack collateral.

6. Cost Structure

The cost structure of canoe fisheries are those associated with the resources used in fishing expeditions. Costs are therefore related to the canoe, gear, outboard motor and labour. Costs are also related to the routine as well as incidental maintenance of these resources as well as inputs such as fuel and food that are used up in the course of a fishing trip. All such cost items can be grouped into fixed and variable cost of production.

Fixed costs would normally be incurred whether the fishing apparatus is used in production or not. Thus, such costs do not vary with the level of fish landed and have no bearing upon decisions regarding an increase in fish landings in the short run. Fixed costs of canoe fisheries are due mainly to the purchases of resources such as the canoe, the net, the outboard motor and their accessories. In general, the cost of these inputs will depend on their size or horse power. Table 4 shows the nominal and real average fixed costs based on these purchased

resources. The computation is for the ali, watsa, poli, beach seine and drift gill net canoes - the dominant types of gear in the canoe fisheries. Nominal prices of these inputs have increased rapidly as part of the generally high level of inflation in the country over the past two decades.

Table 4. Nominal and Real Fixed Costs in Canoe Fisheries ("000 cedis)

Item	Average Nominal Prices			Average Real Prices (1977 constant)			
	1986	1989	1992	1986	1989	1992	1977
Canoe	246	913	1219	5.41	8.76	6.95	–
Net	826	3110	4218	18.17	29.86	24.04	–
Motor	197	368	796	4.33	3.53	4.54	–
Total	**1269**	**4391**	**6233**	**27.91**	**42.15**	**35.53**	**11.30**

Source : Computed from Ghana Canoe Frame Survey, 1986, 1989 and 1992. 1977 figure is from Seini, (1977).

Between 1986 and 1992, the average price of a canoe has increased by almost four-fold while the nominal price of a net has increased slightly more than four times in the same period. Though the average price of the outboard motor has also been increasing its price movement has been slower than those of the canoe and net, as its average price only trippled between 1986 and 1992. However, these average nominal prices do mask a lot of variations in the nominal prices of the fishing inputs. Koranteng (1990) reports that the price of an ali canoe, for example, ranges between 160,000 to 1.5 million cedis whereas smaller canoes such as the one-man canoes can cost as low as 10,000 cedis. On the other hand a unit of fishing gear ranges from 3,000 cedis for hook-and-line to 8.5 million cedis for a poli net. The price of an outboard motor in the same period ranged from 160,000 to 575,000 cedis.

The volatility of nominal prices is, however, replaced by fluctuating prices in real terms. The real average price of a canoe increased by 62 percent between 1986 and 1989 and decreased by about 21 percent between 1989 and 1992. The same trend can be observed for nets. The real average price of nets increased by almost 64 percent between 1986 and 1989 and then decreased by almost 20 percent during the succeeding three years, 1989 to 1992. A reverse trend than that of canoes and nets, is observed for the outboard motors. The average real price of outboard motors decreased by over 18 percent between 1986 and 1989 and increased by about 29 percent between 1989 and 1992. Though fluctuating, the general trend in prices of canoe fishing unit is towards higher prices as reflected in the total cost of a fishing unit in table 4. It is clear from the table

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that, in real terms, it costs 35,530 cedis to establish a motorized canoe fishing unit in 1992 as compared to 11,300 cedis in 1977, a more than three-fold increase. Apart from inflationary pressures which account for much of the increases in the nominal prices of canoe inputs, the rapid depreciation of the cedi in the srtuctural adjusment programme has also contributed to the upward trend in input costs not only in canoe fisheries but also in other productive sectors of the economy.

In contrast to fixed costs, variable costs are incurred only when production takes place. They are the costs of adding the variable inputs such as fuel, labour, repair and maintenance. Data on variable costs in canoe fisheries are hard to come by and can only be gathered in a detailed micro survey. Seini's (1977) study of four fishing villages along the coast, however, gives an idea of the structure of variable costs in canoe fisheries in Ghana as shown in table 5. The table shows that labour costs constitutes the major item of variable cost in the canoe fisheries. It forms over 47 percent and over 85 percent of average total variable costs for motorized and non-motorized canoes in the study. It is important to note that canoe fishermen do not pay a fixed wage to crew members. The renumeration for labour depends solely on revenue that is realized from the day's fishing activities. A proportion of the total revenue is paid to crew members and this proportion varies from canoe to canoe. Seini (Ibid.) noted that the total earnings of a crew member was 65 percent of the statatury minimum wage for labour but then the opportunity cost of a crew member may be far less than his earnings from fishing and so he may be better off by going out fishing.

The next important variable cost in the motorized canoes is fuel. It forms over 40 percent of average total variable cost. There are, however, variations in expenditure on fuel between individual canoes depending mainly on the horse power of the motor and the duration of a fishing trip. The higher the horse power and the longer the duration of a fishing trip, the higher the fuel cost.

To keep the fishing unit in a working condition and in order to prolong its life span, maintenance must be carried out regularly and the fishing equipment have to be repaired any time there is a damage. The canoe, the net and the motor

Table 5. Average Variable Costs in Canoe Fisheries (Percentages)

Category	Repair and Maintenance Costs		Fuel	Labour	Food	and
Motor	Canoe	Net	Cost	Cost	Shore	Cost
Motorized						
canoes	5.4	1.1	3.5	40.4	47.5	2.2
Non-Motor-						
ized Canoes	–	1.8	7.1	–	85.3	5.8

Source : Seini, 1977 ; Economics of Operation of Outboard Motors in Ghana's Canoe Fisheries.

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which are the principal components of a fishing unit receive regular repairs and maintenance. Repair and maintenance costs account for about 10 and 9 percent of the average total cost per canoe for the motorized and non-motorized canoes respectively. The motor repair and maintenance costs together account for about 5 percent of the average total variable costs and over 54 percent of the average total repair and maintenance cost and is the highest of the repair and maintenace costs for motorized canoes. Net repairs and maintenance is the second highest, accounting for over 5 percent of average total variable costs and over 35 percent of total repairs and maintenace costs. Very little is usually done by way of maintenance and repair of the canoe and this is reflected in the low canoe repair and maintenance costs which accounts for only about one percent of average total variable costs and about 11 percent of the average total repair and maintenance costs. Other expenditure items during a fishing trip include food purchased for crew members, shore costs and marketing fees. These account for about 2.5 percent of average total variable costs.

7. Returns from Fishing

Apart from the quantity of fish landed the most important variable that determines returns to the canoe fisheries is the price of the fish. This section therefore discusses changes in the real prices of fish landed by canoe fishermen over the previous years and their effects on changes in domestic terms of trade between canoe fisheries and other sub-sectors of agriculture. The nominal fish price in table 6 represents the total value of fish landed by the marine canoe fisheries divided by the total quantity of fish landed in the relevant year. Effectively they represent returns to the canoe fisheries per tonne of fish landed in the year.

Nominal fish prices have increased rapidly to cater for high inflation as well as increases in demand brought about principally by rapid increases in population (about 3 percent per annum) and general increases in wages and salaries. It is interesting to observe that nominal prices increased quite steadily from 1980 to 1985 but increased five-fold in the following year, 1986.

Fish is the most common source of animal protein in the Ghanaian household and its demand is very sensitive to changes in income. Apart from inflation and population growth, the doubling of the minimum wage per annum from 11,340 cedis in 1984 to 22,680 cedis in 1985 probably played a major role in the price hike of fish that followed. Real prices in table 6 represent nominal prices that have been deflated by the rural consumer price index.

Though the real price of fish had been on the declining trend from 1980, the astronomical increase in the nominal price of fish in 1986 turned it to an upward but fluctuating trend between 1986 and 1990. This upward swing in real fish

Table 6. Nominal and Real Price of Fish Compared with Major Crops

Year	Prices of Fish ("000 cedis per tonne)		Indices of Real Prices (1980=100)			
	Nominal	Real	Fish	Maize	Cocoa	Cassava
1980	6.41	6.41	100	100	100	100
1981	10.14	4.87	76	89	139	118
1982	10.85	4.23	66	75	128	108
1983	15.22	2.59	40	158	93	184
1984	23.78	2.85	45	69	101	75
1985	30.87	3.40	53	56	175	65
1986	150.00	13.95	218	74	217	95
1987	189.99	12.92	202	89	261	157
1988	274.93	14.30	223	87	237	102
1989	324.00	13.61	212	54	202	76
1990	**369.88**	**11.44**	**178**	**66**	**192**	**104**

Source : Computed from Fisheries Department and Ministry of Agriculture
Statistics (Various years).

real fish prices made it highly volatile in time as measured by the real fish price index. The real fish price index more than quadrupled from its 1985 level in 1986. This volatility is even more pronounced in cassava and maize, two food crops that are often consumed by canoe fishermen and are sometimes cultivated by them as secondary occupations. For instance, the real (average annual) wholesale price of maize more than doubled in 1983, while it more than halved in the subsequent year. Volatility in fish and food prices can result from seasonality of production and large swings in market prices and can occur

Table 7. Terms of Trade Between Fish, Maize, Cassava and Cocoa Year Prices of Fish Indices of Real Prices (1980=100).

Index of Relative Prices (1980 = 100)				
Year	Fish/ Maize	Fish/ Cassava	Fish/ Cocoa	Maize/ Cocoa
1980	100	100	100	100
1981	85	64	55	64
1982	88	61	52	59
1983	25	46	43	170
1984	65	60	45	68
1985	95	82	30	31
1986	295	229	100	34
1987	227	129	77	34
1988	256	219	94	37
1989	393	279	105	27
1990	**270**	**171**	**93**	**34**

Source : Computed from Fisheries Department and Ministry of Agriculture Statistics (Various years).

following substantial shifts in market supply and demand. In relative terms, the price of fish fell against maize and cassava between 1980 and 1983 and has increased agaist them thereafter. Compared with the producer price of cocoa, Ghana's major export crop, the price trends of fish and the major food crops show some striking differences, particularly after 1983. The price trend of cocoa deviated significantly from comparable trends in fish and food crop prices, particularly in magnitude. As a result, the terms of trade between food crops on the one hand and cocoa on the other hand increased on the whole before 1983, whereas it decreased generally after 1983 (the beginning of the structural adjustment programme) as illustrated in table 7 for the index of relative prices between maize and cocoa. It is pertinent to note that whereas the terms of trade have moved in favour of fish as against food crops (maize and cassava), it has generally favoured cocoa as against fish. Domestic terms of trade has therefore generally favoured cocoa as against other sub-sectors of agriculture. This is hardly surprising since sectoral policies in agriculture in the process of Ghana's structural adjustment has generally pursued a policy of relative price realignment in favour of tradable agricultural commodities, particularly cocoa.

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8. Profitability of Canoe Fisheries

Assessing the profitability of the canoe fisheries is difficult without a detailed field survey of canoe fishermen that include details about variable costs of fishing. Seini's survey of 1977 probably gives the most detailed insight into the profitability of the canoe fisheries (table 8). On the average, both motorized and non-motorized canoes made profits in the one year period surveyed, that is, October 1974 to September, 1975. Seini (Ibid.), however, acknowledges that only 57 percent of the sample actually recorded profits. Profit or loss in the canoe fisheries was attributed to several factors such as size of canoe, size of net, horse power of the outboard motor, size of crew, duration of a fishing trip, the composition of fish landed, the prce of the fish and the cost of the fishing operation. It is significant to note that the profit of the motorized canoes was 98 percent higher than that of the non-motorized canoes. This corroborates the findings of Lawson and Kwei (1974) that average earnings per fisherman were 100 percent greater on motorized canoes as compared with non-motorized canoes.

Table 8   Estimated Profitability of Canoe Fisheries   (in Cedis)

Category	Fixed Cost Per Canoe	VariableCost Per Canoe	Total Cost Per Canoe	Total Revenue	Profit Per Canoe
Motorized Canoes	1733	3400	5133	5961	828
Non-Motorized Canoes	289	214	503	567	64
1992 Estmates	**3530**	**6967**	**10497**	**11408**	**911**

Source : Seini, (1977) ; Economics of Operation of Outboard Motors in Ghana's Canoe Fisheries.

The 1992 estimates in the last row of table 8 is based on the discussion in this paper. Average total fixed cost per canoe represents depreciated cost of the total fixed cost per canoe at 1977 prices. The average variable cost per canoe is then derived as a proportion of fixed cost established by Seini (1977), that is, average fixed costs being 51 percent of average variable costs. Total revenue is the total value of canoe landings in 1977 constant prices divided by the total number of operating canoes in 1992. The average profit per canoe estimated in this manner does not significantly differ from the average profit per motorized canoe in 1977. A canoe operator made only about 10 percent more profit in 1992 than a motorized canoe operator in 1977.

9. Conclusion

The artisanal canoe fisheries remains the main source of domestic fish supply in Ghana, contributing over 60 percent per annum to total domestic marine fish landings. Its dominance in the marine fisheries was reinforced by the introduction of outboard motors into the sub-sector in the late 1950s which helped to increase the catches of the canoe fishermen. In the last decade, however, structural adjustment policies which have removed most subsidies in the economy, stopped mandatory lending of a proportion of loanable funds to the agricultural sector, liberalized interest rates, realigned domestic prices in favour of tradeable commodities and pushed up the operational cost of domestic enterprises through constant depreciation of the local currency among other things, have contributed immensely to the virtual demise of the modern sector (motor vessel fisheries) of the fishing industry in Ghana, thus placing a heavy responsibility on the canoe fisheries to satisfy most of the domestic demand for fish.

The canoe fisheries have coped well in the last decade by not only increasing the total domestic production but also increasing their share of the domestic marine fish landings steadily in the last decade from about 71 percent to-83 percent in 1992. The canoe fisheries have coped by relying more on their own traditional resources, particularly labour. The astronomical increases in the price of purchased resources, namely, canoe, net and outboard motor and the lack of formal credit to the canoe fisheries are beginning to have a shrinking effect on the industry. High costs and decreasing rewards are causing canoe fishermen to immigrate while others leave the industry all together.

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Table 6. Nominal and Real Price of Fish Compared with Major Crops Year Prices of Fish Indices of Real Prices (1980=100).

Source : Computed from Fisheries Department and Ministry of Agriculture Statistics (Various years).

Table 7. Terms of Trade Between Fish, Maize, Cassava and Cocoa Year Prices of Fish Indices of Real Prices (1980=100).

Source : Computed from Fisheries Department and Ministry of Agriculture Statistics (Various years).

Table 8. Estimated Profitability of Canoe Fisheries (in Cedis)

Source : Seini, (1977) ; Economics of Operation of Outboard Motors in Ghana's Canoe Fisheries.