

ECONOMIC ANALYSIS OF UTILIZING KAINJI
GAS KILN FOR FISH SMOKING IN THE
KAINJI LAKE BASIN OF NIGERIA

by

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ABSTRACT

Marketing of smoked fish in the Kainji Lake Basin has been found to be complex, traditional and inefficient. It is also said to be limited in scope due to poor handling and processing techniques, lack of storage facilities and inadequate marketing informations.

The invention of Kainji Gas Kiln has been found suitable to overcoming poor handling and processing techniques.

This paper discusses the feasibility of operating Kainji Gas Kiln commercially supported with adequate storage facilities and competent management hands. The financial indicators of Net Present value (NPV) ₦47,481.11, Internal Rate of Return (IRR) 24% and Payback Period of 2.3 years that are calculated confirmed that the commercial use of Kainji Gas Kiln is indeed profitably feasible.

INTRODUCTION

Lake Kainji, to most Nigerian households is synonymous with FISH as workers from New Bussa to any part of Nigeria would always be accused of not taking fish along with them. Although such accusations are usually in a form of jokes, indeed, it is an indication of shortage of fish supply from the lake basin to meet the demands in other parts of the country.

This claim needs further investigation as to whether or not it is the distribution channels of fish from Lake Kainji that creates the short supply and also whether or not it is the question that fish is not just in the lake.

Ita (1982) provided us with an answer to the second part of the question raised in this assurance that the fish yield from Lake Kainji seems to have stabilised between 4,000 - 6,000 metric tonnes per year. This meant that with adequate fishing technology and distribution channels, a lot of fish catch could still be expected from the lake although the current daily catch per unit effort of a fisherman is estimated at 10 kg. Since there is no law regulating either

the number of fishermen that could fish or the quantity to catch in any day, the yield of a fisherman entirely depends on his fishing technology and effort. The claim could then be that there is fish in the lake but the distribution channel is faulty.

Babalola (1972) looked into the distribution techniques of fresh fish from the lake and concluded that inefficient marketing organization, inadequate market information and poor handling are the major problems militating against disposing the fishermen's catch. This then confirms the assertion that it might be the distribution channels that is faulty.

Antonio (1973) in his studies of smoked fish marketing in Yelwa, noted a number of problems. These problems include inadequate marketing facilities and inefficient traditional processing and storage techniques. He further highlighted that fishermen travel long distances before reaching the market and that grading, packaging and transportation facilities are the major limiting problems to rapid expansion of the distribution of fish.

Whilst Antonio's studies were on the Eastern side of the lake, Jawando (Personal Communication) also made a similar study on the Western side of the lake covering Old-Bussa-Rofia with similar conclusions to those of Antonio.

Eyo (1983) made vivid exposition of improved techniques on fish processing, handling, storage and transportation which he identified as limiting problems of fish distribution in the Kainji Lake Basin. Notable amongst his contributions was his invention of Kainji Gas Kiln which can be used for smoking of fish (Eyo, 1981).

A commercial proposal of this Kiln is now made to afford any interested business concern an opportunity of marketing fish smoked with the Kainji Gas Kiln so that a wider Nigerian population will be disposed to appreciate the taste and flavour of smoked fish landing from Kainji Lake. This proposal was made on a study conducted by the authors to identify a number of fish landing centres that are viable as collection centres for the project (Figure 1).

STUDY AREA

The Kainji Lake is situated between latitudes $9^{\circ} 50'$ - $10^{\circ} 57'$ North and longitudes $4^{\circ} 25'$ - $4^{\circ} 45'$ East. The lake which was impounded on 2nd August 1968 is 136.8 km maximum length and 24.1 km maximum width. Its surface area has been variously quoted as approximately 1,300 km². At full volume, the water level is at altitude 142 m and at low volume, the water level is 133 m. It is 1,014.3 km by river from the sea along river Niger and about 563.5 km by road from Lagos.

METHODOLOGY

In carrying out this study, motor-cars, motorcycles, canoes mounted with outboard engines and bicycles depending on locations, were used to move in between villages covered in the study. For example, canoe was used to cross from Rofia to Zamare enroute to Yelwa in Sokoto State. Other materials include spring balance, scales for weighing both fresh and dried fish. Baskets and plastic containers were used for samples of units of packaging before sale. In addition, a questionnaire jointly prepared by the authors were administered in all the centres shown in Figure 1. A total of 116 respondents were interviewed comprising 39 full-time fishermen, 24 fish sellers (middlemen and women), 40 fish consumers, 2 fisheries officer, 4 superintendents and 8 extension field staff. The questionnaires sought to know the role of each group of the respondents, their problems and prospects.

The questionnaires were also administered at the Dam Site to fish traders from Ilorin and Ibadan. Some of these traders went as far as Shagunu, Rofia and Yauri markets. These distant traders come to buy smoked fish mainly and it was on this observation that our proposal was based.

RESULTS AND DISCUSSIONS

This proposal requires the following inputs:

- (a) 2 Kainji Gas Kilns (Size 0.92 x 0.76m x 1.24 each)
(Figure 2)
- (b) 1 Freezer
- (c) 1 Generator (1.5 kv)
- (d) 2 Cold vans
- (e) 4 Gas cylinders
- (f) 2 Fisheries Assistants
2 Labourers and 2 Drivers
- (g) Building.

Each of this is explained to indicate their relevance(s) to the proposal.

(a) Kainji Gas Kiln

The technicalities in the use and operation of Kainji Gas Kiln have been explained by Eyo (1981). The smoking capacity of each kiln is 80 kg per 4 hours or 160 kg per man-working day of 8 hours. In this proposal, it is not intended to use the kiln to capacity but rather each kiln will smoke 50 kg of fresh fish per 4 hours. A 12-hour man-working day is

envisaged and it is believed that about 150 kg of fish can be smoked per kiln thus, giving a total of 300 kg for the two kilns per 12 hours man-working day. The two kilns are expected to work for 260 days in a year excluding weekends.

(b) Freezer

The freezer will be stationed at the smoking centre in New Bussa. It will be used to store excess fresh fish which the kilns may not handle during any particular day. This will ensure that the fish are kept wholesome especially during weekends when the smoking kilns will not be in use.

(c) Generator

One generator of capacity 1.5 kv will be required as standby in case there is power failure from NEPA to the smoking centre

(d) Cold van

Cold van is particularly favoured for this proposal because it could be used to transport cold smoked or hot smoked fish by switching the Thermo-king on or off. It can also be used to transport fresh fish to meet customers request who may need fresh fish at the marketing centres. An open Pick-up van may not be ideal for transporting fresh fish without adequate freezing facilities.

Two cold vans are, therefore, required for this project. One will go round to collect fresh fish from different landing centres as far as Shagunu to the smoking centre. The other will be used to transport the smoked fish to the marketing centres possibly Ilorin and Ibadan three times in a week.

(e) Labour

The services of two Fisheries Assistants and two Labourers will be required, a labourer to an assistant.

One assistant and a labourer will man one cold van that will collect fresh fish from different landing centres whilst the other pair of labour will man the smoking centres. The Fisheries Assistants will be on Grade Level 04 (N1,800), while the labourers will be on Grade Level 01 (N1,500). The two drivers who will drive the two cold vans will be placed on Grade Level 03 (N1,600) each.

(f) Building

The building is expected to be cement floored to cover an area of 8 x 6 m. Out of this unit, a store of size 2 x 6m will be partitioned to hold the smoked fish before being transported to the marketing centres. This building is estimated at N4,000.00

Purchases

An average of ₦5.00/kg of fresh fish is suggested for this proposal in order to encourage and to ensure the patronage of fishermen in various landing centres shown in Figure 1. This is because the average price of ₦5.00 is considered enough to penetrate the fishermen that are interested in disposing of their daily catches. Market women prices is about an average of ₦4.00 per kilogramme. It should be mentioned that this price takes cognisance of price differentials offered to various fish species. For example, the price of Lates niloticus cannot be the same as the price offered to Tilapias. On the total average price of purchases, an estimate of ₦5.00 per kilogramme is considered an acceptable market price.

An estimated 320 kg daily purchases of fresh fish is proposed from all over the lake basin. The purchases will be made on Saturdays and Sundays inclusive. On this basis, it is expected that 116.8 tonnes of fresh fish will be purchased in a year at an estimated cost of ₦584,000.00

Sales

Only marketing of smoked fish is proposed and as such all sales have to be smoked fish except on occasions when fresh fish is specially requested. Of the 116.8 tonnes of fresh fish to be purchased in a year, 3% is written off to spoilage which may be accidental. Of the remainder, 20% is written off to loss in weight due to smoking. It is expected that a total of 90.6 tonnes of smoked fish will be sold at ₦7.50 per kg. This price is considered very low but for purposes of uncertainty in proposals, it is believed to be a good offer. The turn over in one year will then be ₦679,776.00.

ECONOMIC ASPECTS

The business proposal as indicated is expected to provide employment for five men on full-time basis. It is expected to lead to effective, rational and sustainable use of fisheries resources in Kainji Lake.

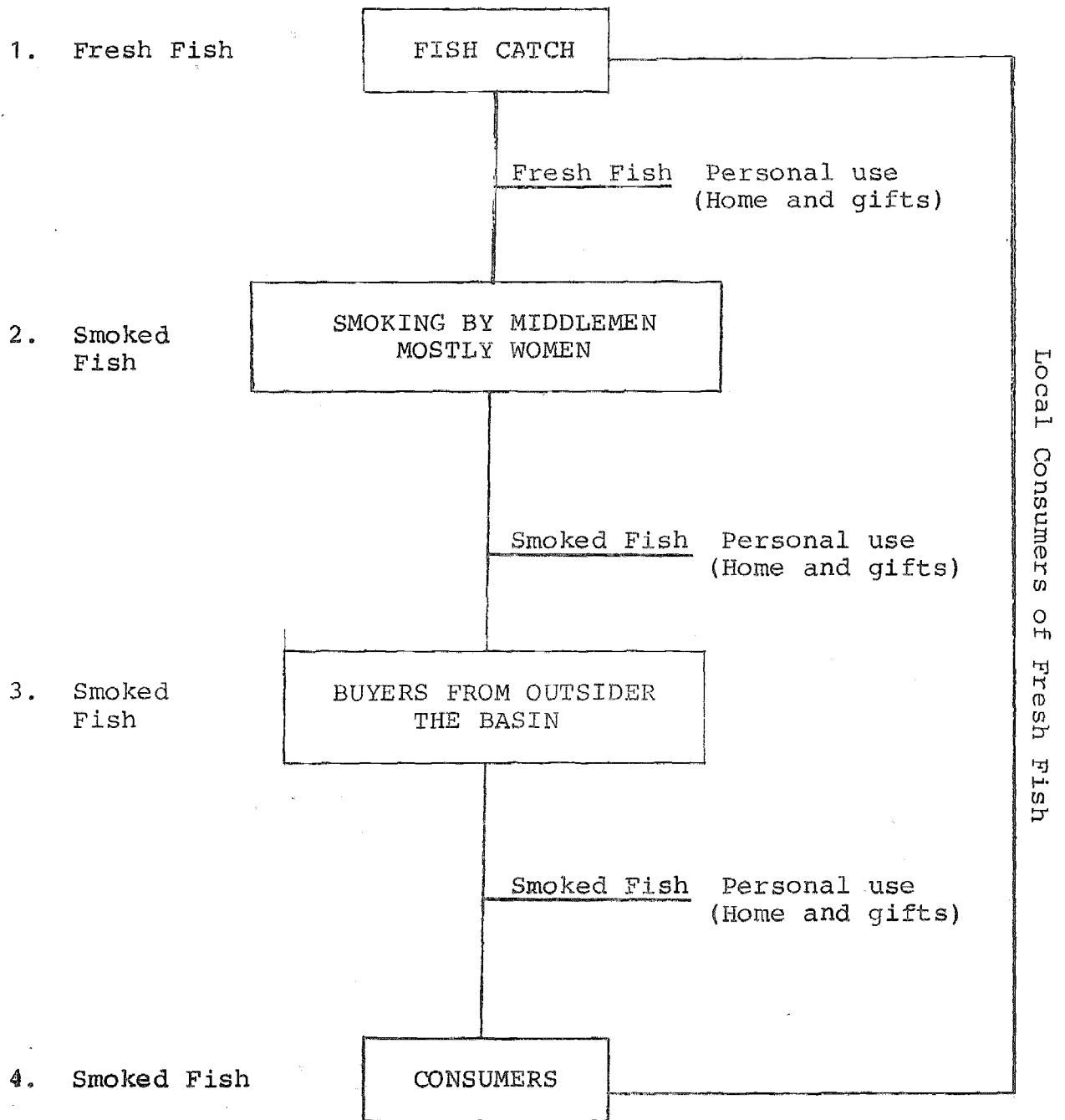
Besides the components which will go into assembling Cold Vans by Peugeot Automobile of Nigeria (PAN) and ALUMACO (Nig) Ltd, there is no other equipment in use that will be imported. Thus, the proposal draws little or nothing on foreign exchange reserves of the Federal Government of Nigeria.

When in operation, the proposal will be an increased source of revenue for the Government since a steady income is ensured to the fishermen who will in turn pay their community taxes promptly and also company tax of 45% to be paid by the project. Thus, it can be said that the proposal presents economic opportunities in terms of revenue, employment and rational use of resources to the nation.

Commercial Considerations

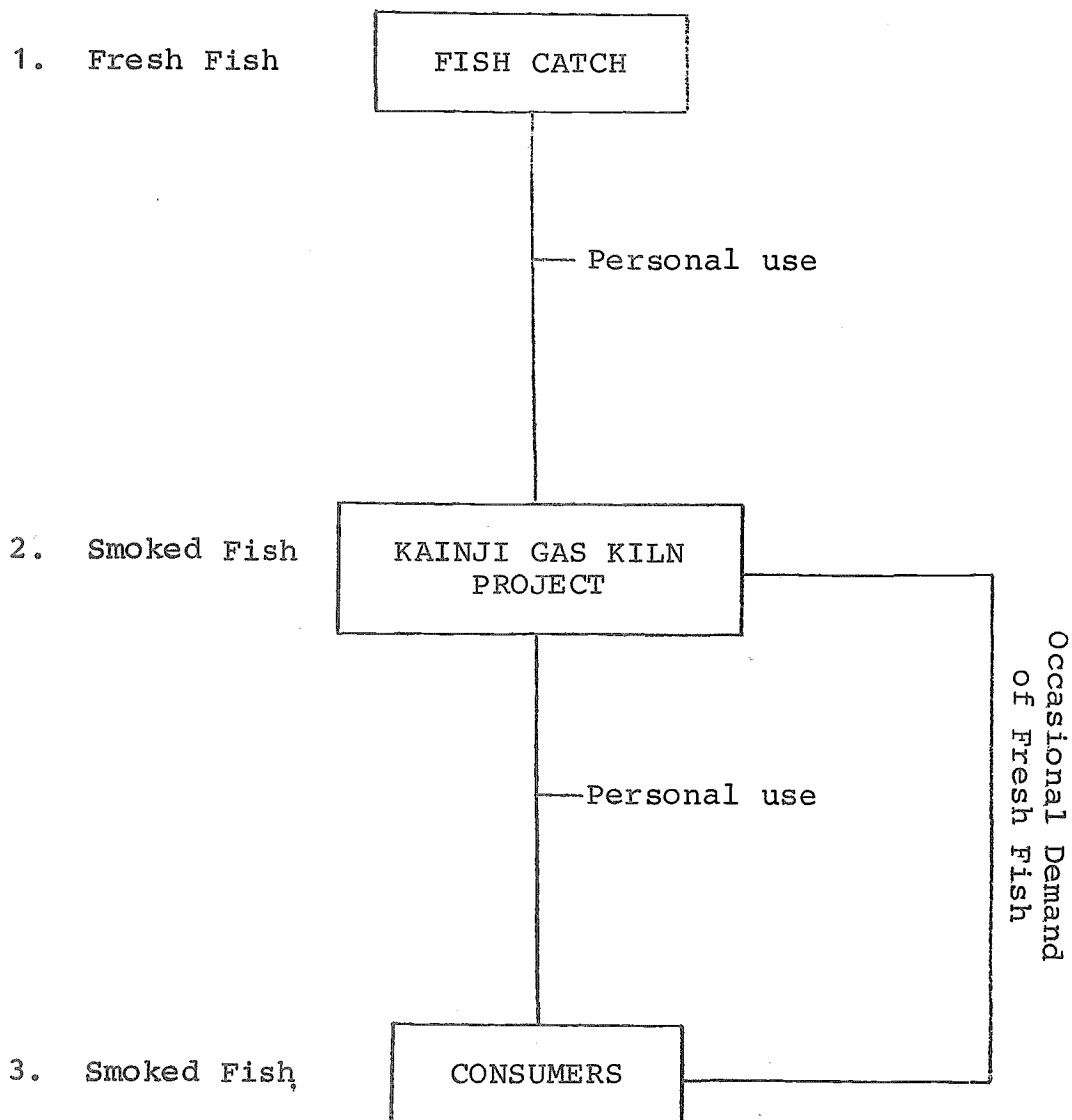
The existing system of fish distribution and marketing in the Kainji Lake basin can be diagrammatically represented as follows:-

Figure 2: Existing channels of Fish Distribution in Kainji Lake Basin



This system has been described inefficient, traditional and complex by various authors earlier mentioned. To overcome this, this proposal will combine stages 2 and 3 to become:-

Figure 3: Proposed Structure of Marketing Smoked Fish in the Kainji Lake Basin



This proposed system has the advantage of smoked fish reaching the consumers early at a relatively cheap price since it eliminates the wholesale buyers from the south. It is assumed therefore, that the project will have a good commercial value if well executed.

Managerial Considerations

The project will be manned by two trained Fisheries Assistants who will ensure that the fish are properly handled before smoking. The assistants will supervise the dressing, brining and smoking at the centre. The labourers will be engaged in doing routine jobs.

The overall control of the unit will be by the Managing Director, or individual that goes in for a loan to start off the project

At the apex of the line of authority is the Managing Director who takes the loan. Next is the Fisheries Assistants, the Drivers and the Labourers. The drivers and the labourers will be under the control of the Fisheries Assistants to ensure discipline and timely discharge of duty.

FINANCIAL PLAN

The project will require ₦80,000 which is expected to be wholly financed with a loan from a bank or other lending financial institutions. Of this amount, ₦51,300 will be spent on capital assets earlier identified, ₦28,700 will be committed to recurrent expenses, whilst a meagre sum of ₦800 will be left for minor incidental expenses that are not covered in this estimate. Details of this is shown in Table 1.

Loan Repayment Schedule

Table 2 shows the repayment of the loan over a period of 5 years. The yearly amount of capital payable and interest is shown using reducing balance method.

Depreciation

Table 3 shows the value of depreciation charged to the projected profit and loss account. The depreciation value is arrived at using the straight line method.

Profit and Loss Account

Table 4 indicate the projected profit and loss account for the project over a period of 5 years.

Profitability Indicators

Three profitability indicators namely Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period are calculated to examine whether or not the project is viable for any bank to stake its money into it. NPV is positive at ₦47,481.11 indicating that the rate loan will be granted out by the bank. The payback period of the ₦80,000 loan is 2 years 3 months.

CONCLUSION

It is important to note here that utilising the Kainji Gas Kiln for smoking fish in the Kainji Lake Basin is a profitable venture. The authors therefore, consider it worthwhile to recommend its establishment to any interested individuals. The amount of loan required for it is within the limit offered to small-scale enterprises and therefore, the three indicators above are sufficient criteria for a bank to honour a request for such a loan.

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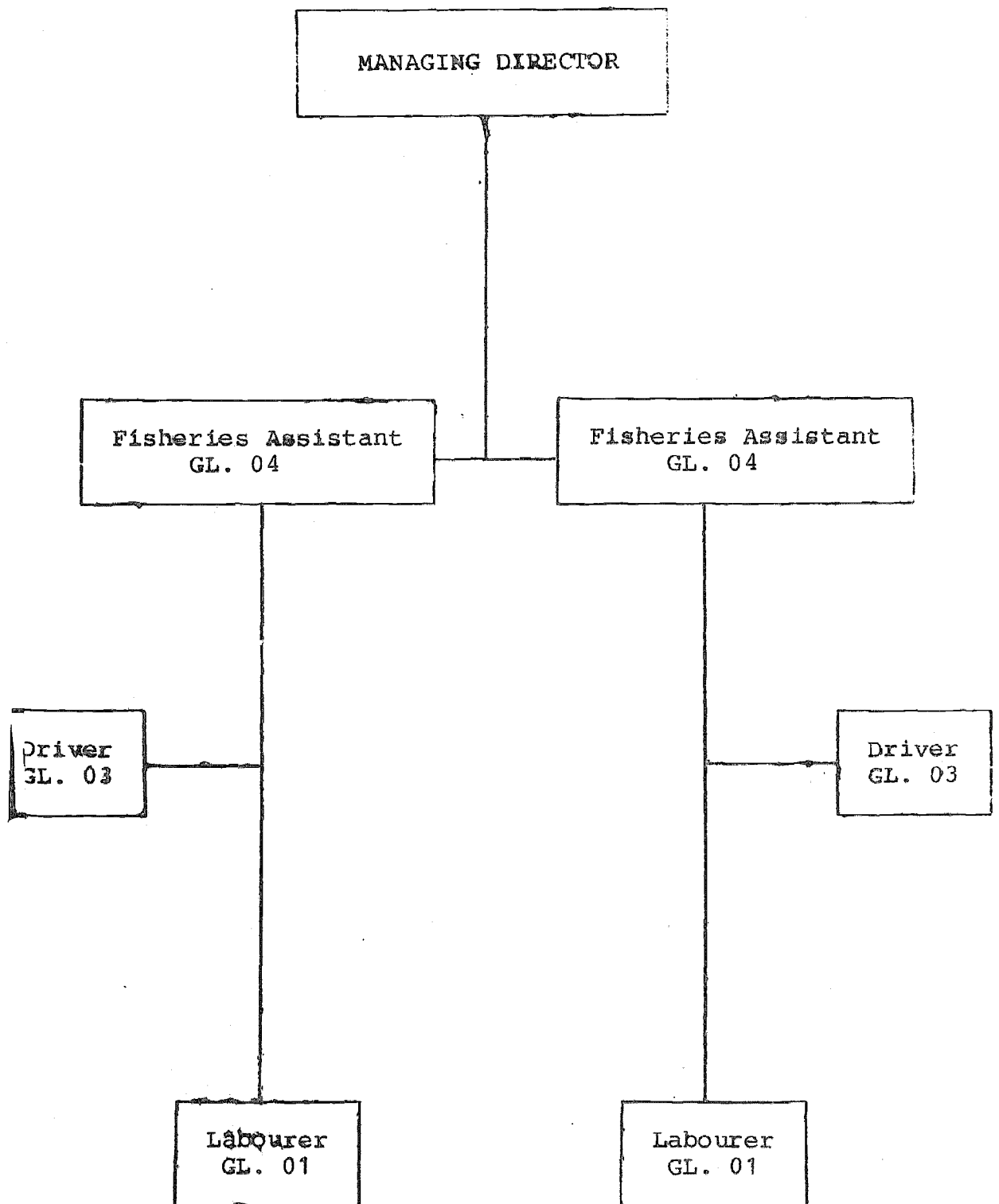


Fig. 4: Organizational Chart of Smoked Fish Marketing Proposal

Table 1 - Cash flow statements

PARTICULARS	Y E A R S				
	1	2	3	4	5
A) <u>Cash Receipts</u>	N	N	N	N	N
Loan from Bank	80,000	-	-	-	-
Revenue from Sale of smoked fish	95,776	95,776	95,776	95,776	95,776
Total =	175,776	95,776	95,776	95,776	95,776
B) <u>Cash Payment:</u>					
<u>Fixed Capital:</u>					
Land and Building	4,000	-	-	-	-
2 Smoking kilns	2,000	-	-	-	-
4 Industrial Gas cylinders	800	-	-	-	-
2 Cold vans	40,000	-	-	-	-
1 Freezer	2,000	-	-	-	-
1 Generator	2,500	-	-	-	-
Total =	51,300	-	-	-	-
C) <u>OPERATING CAPITAL</u>					
Labour	9,800	9,800	9,800	9,800	9,800
Fuel	15,000	15,000	15,000	15,000	15,000
Gas refilling	1,500	1,500	1,500	1,500	1,500
Cartons & Film bags	1,600	1,600	1,600	1,600	1,600
Contingency	800	800	800	800	800
Total =	28,700	28,700	28,700	28,700	28,700
D) <u>Personal Drawings</u>	15,000	15,000	15,000	15,000	15,000
E) <u>Loan Repayment Plus Interest at 14%</u>	27,200	24,960	22,720	20,480	18,240
F) <u>Total Cash Outflow (B + C + D + E)</u>	122,200	68,660	66,420	64,180	61,940
G) <u>Expected Cash Inflow (A - F)</u>	53,576	27,116	29,356	31,596	33,836

Table 2 - Loan repayment schedule

Year	Principal	Interest at 14%	Outstanding Balance
0	-	-	80,000
1	16,000	11,200	64,000
2	16,000	8,960	48,000
3	16,000	6,720	32,000
4	16,000	4,480	16,000
5	16,000	2,240	-

Table 3 - Depreciation

Type of Equipment	Value	Expected Life Span (years)	Depreciation Rate %	Annual Depreciation Value				
				1	2	3	4	5
Building (8m x 6m)	4,000	10	25	400	400	400	400	400
Smoking kilns (2)	2,000	15	10	133	133	133	133	133
Industrial gas Cylinders	800	30	5	26	26	26	26	26
Cold Vans (2)	40,000	5	30	8,000	8,000	8,000	8,000	8,000
Freezer (1)	2,000	5	25	400	400	400	400	400
Generator (1.5 kv)	2,500	10	15	250	250	250	250	250
Total =	51,300	-	-	9,209	9,209	9,209	9,209	9,209

Table 4 - Projected profit and loss account

Particulars	Y E A R S				
	1	2	3	4	5
	N	N	N	N	N
Revenue from sale of smoked fish	95,776	95,776	95,776	95,776	95,776
Less Operating Capital	28,700	28,700	28,700	28,700	28,700
Operating Profit	67,076	67,076	67,076	67,076	67,076
Less Depreciation	9,209	9,209	9,209	9,209	9,209
Gross Profit	57,869	57,869	57,869	57,869	57,869
Less Interest on Loan at 14%	11,200	8,960	6,720	4,480	2,240
Net Profit before Tax	46,667	48,907	51,387	53,387	55,627
Less Company Tax at 45%	21,000	22,008	13,016	24,024	25,032
Net Profit After Tax	25,667	26,899	28,131	29,363	30,595

Table 5 - Economic viability indicators

Year	INCOME		EXPENDITURE		BENEFITS	
	Actual	Discounted value at 14%	Actual	Discounted value at 14%	Actual	Discounted value at 14%
0	-	-	51,300	51,300.00	51,300	51,300.00
1	95,776	84,013.75	70,900	62,192.77	24,876	21,820.98
2	95,776	73,696.76	68,660	52,831.81	27,116	20,864.95
3	95,776	64,645.93	66,420	44,831.51	29,356	19,814.42
4	95,776	56,707.05	64,180	37,999.69	31,596	18,707.36
5	95,776	49,743.18	61,940	32,169.78	33,836	17,573.40

N P V = 47,481.11

Payback period = 2.3 years. IRR = 24%

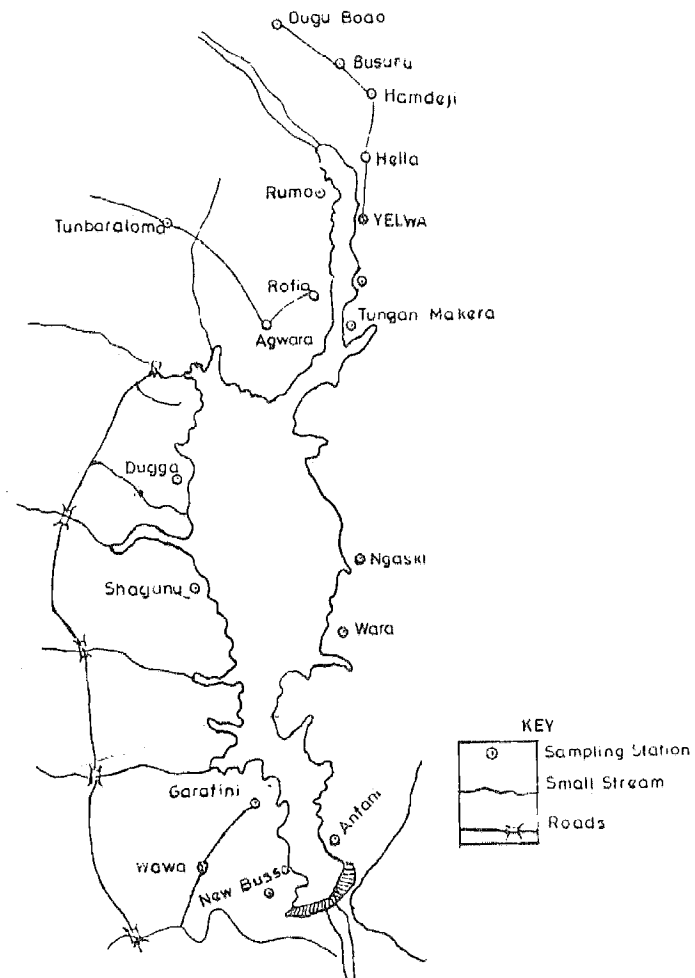


Fig. 1. Map of Kainji Lake Showing Sampling Locations.

Fig. 2 Diagram of the completed medium size Kainji Gas Kiln

