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GHANA TUNA PROCESSING INDUSTRY

Assessment of current situation and analysis
of development proposals

PART C

of the
UNIDO Integrated FIS Development Programme for Ghana

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Programme Development Support Unit

Special Measures and Activities Division

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Preface

In 1989, UNIDO was invited by the government of the Republic of Ghana to send a fish industry sector mission to the country. This initiative was taken in connection with UNIDO's integrated programme approach which was being applied to fish industry development in a number of countries in West Africa.

At the time of the UNIDO programme mission to Ghana the government was itself reviewing the whole fishery sector to see what could be done to reactivate and expand the industry. Government, industry and traditional fishery sector representatives cooperated readily in studies which were carried out to ascertain the development potential of the various sub-sectors. The Programme Development Support Unit, PDSU undertook an MEPS analysis of initial data and, following a second visit to Ghana, a large integrated programme proposal was formulated.

Like indicative programmes for other countries in the region, the proposal included investment, policy and technical assistance components. It embraced the large-scale fishery industries, the traditional and rural fishery sector and related agro- and forestry industries and aquaculture. Sources of investment finance were approached and, in the light of the positive interest expressed in the programme, the package was refined and amended by the UNIDO consultant and senior government officials at meetings in March 1990.

It was evident to both UNIDO and the government that fishery industry development in Ghana would hinge on rehabilitation and reactivation of the tuna industry which had the largest potential of any sub-sector for exports, and for stimulating local support industry. Accordingly, the PDSU studies focussed on establishment of a tuna processing industry.

Industry leaders drew UNIDO's attention to two major goals that had eluded them to date. One was to reduce packaging costs and improve efficiency to make tuna canning operations viable in Ghana. The other was to gain access to the lucrative and expanding European market for tuna which held special opportunities for Ghana as a Lome Convention member country.

Contacts were made with firms marketing tuna worldwide. At least one of them was prepared to offer Ghana a 5 year contract to market all of its tuna production in Europe, and to assist with quality control supervision to meet all EEC requirements.

UNIDO then hired a tuna processing plant consultant to investigate the technical and commercial viability of a canning, can-making, and other processing venture in Ghana, with particular focus on European tuna markets. The consultant worked in Ghana in March and April and his report was completed by early June. PDSU staff analysed the data and the results are included in the second part of the report.

Part 1 deals with the existing situation in Ghana against the background of global markets for tuna products and the availability and cost of various inputs.

Part 2 analyses the specific UNIDO proposals using the most up to date costs, prices and technical data. While not a complete feasibility study in itself, it provides an accurate estimate of the potential of the proposed facility.

The proposal envisages the investment of some US$ 2.0 million in can making equipment and around US$ 5.0 million in processing equipment and facilities. At a throughput of about 13,000 tons/year of whole fish the enterprise would export more than US$ 15 million of tuna product per year and provide direct employment to 550 Ghanaian workers. The investment loan would be repaid over a five year period during which the venture would have an annual surplus of over US$ 0.5 million after all payments. Of the turnover of US$ 15 million, some US$ 6 million would be circulated back through the national economy in payments for fish, wages, materials and services.

In accordance with the terms of reference, parts 1 and 2 deal primarily with the tuna canning industry in Ghana. Part 3 deals with sardine and mackerel canning. The production of cooked, cleaned and frozen tuna loins is briefly touched on, indications are that the production of loins may be an alternative to canning. Therefore, cost, marketing and some technical aspects should be investigated in greater depth during the next phase of this programme.

The successful tuna processing industry would stimulate growth and profitability in the fishing industries, dockyards, workshops and other sub-sectors included in the whole UNIDO F.I.S. programme.

This document has been prepared by PDSU based on the work of consultant R. Stephens and PDSU staff, using data collected by programme missions and in-house analytical methods. Appreciation is expressed to the feasibility studies branch for their cooperation and advice.

REACTIVATION OF THE TUNA INDUSTRY IN GHANA

Summary

Even when it was fully operational, the Ghanaian tuna processing industry canned only some 3,500 metric tons of tuna per year or some 10% of current annual landings of 35,000 tons. The bulk of the remaining fish caught was exported whole to canneries overseas. In terms of added value, it is estimated that this has cost Ghana in excess of US$ 12 million.

This under-utilization of the national resource was due to:

(a) the unwillingness of local or foreign investors to risk any form of long term capital investment, partly because of the uncertain political and economic climate. Hence there was very little investment in the infrastructure necessary to support a processing industry and in particular in facilities for making cans. As a temporary solution, cans and cartons were imported, but this has become uneconomic.

(b) the lack until recently of technologies to produce good quality frozen loins.

The tuna fishing industry expanded rapidly until 1983 when the national fleet was producing some 35,000 metric tons of fish each year. Due to a steep fall in the price of tuna in 1984 and an even greater fall in the value of the local currency, the cedi, the fleet has since suffered badly from lack of cash to fund repairs and renewal of boats, most of which were second-hand when they joined the Ghanaian fleet.

In 1987 the only buyer of tuna for export relocated in Abidjan because of labour disputes, inadequate storage and security in Tema. The tuna fleet then started to land most of their catch in Abidjan. As a result, what infrastructure and tuna processing industry there was in Ghana fell into decline.

Recognizing the problems, the government has recently taken steps to encourage the tuna fleet to return to Ghana. There are signs that the efforts have had some positive effect. Tuna is now being landed in Tema and Starkist/Pioneer are planning to reactivate their processing plant to produce frozen tuna loins.

A great deal of further investment is needed. The commercial fishing industry needs an injection of some US$ 10 million to become really cost-effective: without a fish supply there can be no processing industry. The processing industry itself requires investments of some US$ 8 million, of which just over US$ 1 million has already been spent on new machinery. Of the remaining US$ 7 million, US$ 2 million for a can-making facility and an additional US$ 5 million for a cannery would establish a capacity for processing some 13,200 metric tons of tuna per year, or 35% of the annual catch.

Further investments in equipment amounting to some US$ 1.6 million could financed at a later stage from profits and would include:

(a) a cold storage facility to store the plant's own stocks of frozen raw tuna and frozen tuna products. It would also act as a focal point for any whole fish export operations that may be contemplated. Cost US$ 750.000 approximately.

(b) a fish meal plant to process waste from the fish into high protein feed for agricultural and aquacultural use. Cost US$ 430.000.

(c) a secondary processing line to produce additional canned tuna products which would complement the existing ones. Some of these products would be produced from the red-meat which would otherwise be treated as waste for fishmeal. Cost US$ 450.000.

The basic plant would provide a net return on investment of some 6.7% per year. It would export some US$ 15.9 million of tuna products each year from around $US 9 million dollars worth of imported materials. The value of the activity to the domestic Ghanaian economy would be appoximately US$6 million.

At the end of 5 years' operation, after loan repayment, the venture would be valued as follows:

residual plant value	3.7 million
estimated cash on hand	1.0 million
value of new investment	1.6 million
total	6.3 million

Therefore, from a total investment of some 11.32 million dollars (including interest), a total return of 55.6% averaging 11.3% per year would be earned.

If this is to be achieved, it is essential that:

(a) the fishermen are able to go to sea, catch and deliver the fish for sale in Ghana in accordance with the existing laws;

(b) the protocols in the Lome IV Convention, which provides tariff privileges to participating countries including Ghana, remains unchanged for at least the first five years of the facility's life; and

(c) the can-making and processing plants proposed are well managed and the goods produced and marketed correctly.

The processing facility would employ some 548 Ghanian workers. A further eight foreign technicians and managers would be employed to temporarily operate the plant while they develop the talents of the Ghanians into the skills needed for them to manage the plant for themselves. The duration of this temporary employment would run parallel to the period of the overseas investment loans. It is anticipated that some of these experts would be provided for by the Technical Assistance Support Programme.

The amount of money to be invested is high and there is an element of uncertainty. It is hoped that in the forthcoming in-depth feasibility study, ways to reduce the investment, particularly equipment costs, and the level of uncertainty will be found.

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GHANA TUNA PROCESSING INDUSTRY

PART I - ASSESSMENT OF CURRENT SITUATION

1. THE TUNA FISHERY

1.1 The Catch

Ghana is perhaps the third largest tuna fishing nation on the Eastern Atlantic. Declared catches of tuna and tuna-like species during the 1980s have been as follows:

	1981	1982	1983	1984	1985	1986	1987	1988
	'000 t							
Ghana Flag	18.36	28.88	31.65	29.14	34.40	34.71	33.46	35.43
Foreign Flag	26.80	17.36	8.37	2.12	-	-	-	-
Total	45.17	46.2	40.0	31.26	34.40	34.71	33.46	35.43

There has been a remarkable consistency in the catch since 1984 when foreign flag vessels were either absorbed into the Ghanaian fleet or transferred their operations elsewhere. Reports indicate that the 1989 catch was also about 35,000 t.

Catch breakdown figures were provided by one fishing company. Since all Ghanaian companies use essentially the same techniques and practices, these should be reasonably representative of the whole catch. Better estimates will be necessary at a later stage but the 1989 catch breakdown by type can be provisionally estimated on this basis as follows:

	Yellowfin Tuna	Skipjack Tuna	Other tuna and Damaged	Total
	t			
Exportable Fish	939	20,432	-	21,371
Not exportable but good for canning	2,600	7,334	-	9,934
Not exportable or good for canning			3,695	3,695
Total	3,539	27,766	3,695	35,000

Thus a total of about 10,000 t or 33% of the catch is currently not exportable but is suitable for canning. Virtually all of this is being landed at Tema for supply to the local market. The breakdown by landing point as follows:

	Abidjan	Tema	Total
		t	
Exportable fish	21.371	-	21.371
Not exportable but good for canning	310	9.624	9.934
Not exportable or good for canning	1.612	2.083	3.695
Total	23.295	11.707	35.000
%	66%	34%	

By landing their catch in Abidjan, the fishermen are incurring extra fuel costs of about US$ 730 and fishing time worth around US$ 7,000 each time they call at Abidjan. At an average of approximately 9 trips per year per vessel the total cost to the fleet is estimated at US$ 2.2 million. Virtually all of this is loss of foreign exchange from export earnings (fish) or additional imports (fuel).

In addition, the port of Tema is currently losing about US$ 50,000 per year in port dues from reefer vessels loading export tuna in Abidjan instead of in Tema and about 23 million cedis (US$ 74,000) per year in revenues from fish landings. The cold storage companies have been losing some 3 million cedis (US$ 9,816) per month on cold storage charges paid by Ghanaian fishermen to cold stores in Abidjan.

Starkist - currently the sole buyer of Ghanaian export fish - has recently agreed to take delivery of tuna in Tema once more and this, if fully implemented, will do much to encourage vessels to land there. However, if landing conditions are difficult and costs are high in Tema, Starkist may well seek to relocate to Abidjan again taking the fleet with them.

1.2 The Fleet

Tuna is caught mainly by pole and line bait boats: there are also some large purse seiners, but for the time being they are not operating. Most boats are operated by joint venture companies, principally with Korean and Japanese partners. They are as follows:

Company	< 350 gross tons	350/450 gross tons	> 450 gross tons	Total
Ghana Tuna		6		6
Pioneer Tuna		4		4
Afco Fisheries	3	6		9
Infitco Ghana		3	1	4
Goshen	1	2		3
Central Fisheries	1	1		2
Ghaco		1		1
World Marine	1			1
Cactus	1			1
Nova	1			1
Coast Line	1			1
Total 11 companies		23	1	33

These vessels entered Ghanaian service at various times between 1978 and 1990, with most being registered in the early eighties. Since most of them were already second-hand, the majority of vessels are well past their prime. Owners have encountered severe problems in keeping their vessels operating. Reasons for this are financial, due to the collapse of the tuna market in 1983 and the steep fall in the value of the cedi since exchange restrictions were lifted.

The appearance of some of the fish indicates that poor handling practices are being used aboard the fishing vessels. This is particularly with regard to smaller frozen tuna where relatively high salt concentration has occurred due to a slow reduction in temperature to -6c.

Viewing the vessels one cannot but wonder at the skill and perseverance that has kept some vessels working. There is a great need for finance to rehabilitate and replace the boats and if this is not found soon, then the fleet will shrink. Without it, there will be no tuna industry. It is understood that part of the integrated fisheries programme proposed by UNIDO is to refurbish or replace some of these vessels. This part of the programme should be given priority.

2. CANNING FACILITIES

There are two facilities able to can tuna in the country. They are:

Pioneer Food Canning Corporation
Tema Food Complex.

Neither of the two plants are operating. Pioneer is shut down for refurbishment, and Tema has halted operations due to lack of sufficient working capital. Both plants were visited and some discussions were held with management personnel. The two plants are briefly described below. Fuller details on the Pioneer Food Canning Corporation can be found in Appendix 1.

2.1 Pioneer Food Canning Corporation

This plant was originally built by Nankoadze Fisheries as a sardine and mackerel cannery, equipped with machinery from an old Russian factory ship. When Starkist of USA established a fish procurement operation in Ghana to supply their tuna plants in America during the late seventies, they also obtained a 50% interest in this plant. It was then converted to a tuna cannery with equipment supplied by Starkist. The plant was intended to be labour intensive with low investment, producing canned tuna from unexportable fish.

Until mid 1987 the plant produced about 160,000 cartons of 6.5 oz and 7 oz tuna cans per year (about 3,300 t of whole fish per year). All of this was hand-packed and a major portion was sold through Starkist's outlets in Europe and America. The plant ceased operations in mid 1987 for refurbishment and the installation of new machinery. At the same time Starkist decided to relocate its buying operation in Abidjan.

Starkist are now planning to supply raw whole tuna for Pioneer to produce cooked, cleaned loins and pieces for them. These tuna loins will be vacuum-packed, frozen and cartoned ready for shipment to Starkist's plants in Puerto Rico or Europe where they will be canned. Some modifications have already been made to the cooked tuna cooling equipment

and preparations completed for the installation of vacuum pouch sealing equipment.

The total profit margin on this operation will be substantial: approximately US$ 0.703 per kg of white meat or, assuming 7.2 t per day for 240 days a year, a total of some US$ 1.2 million per year (See Appendix 1).

The canning capacity of the plant depends on several factors and generally varies according to the size of fish being processed. However, as Table 1 indicates, the main bottleneck in the plant, as it stands, is the hand-filling section which would limit output to 15.4 t of fish per 8 hour shift.

The management's view is that "Canning tuna is not currently economically feasible" due to the cost of production, and in particular the cost of importing empty cans. An estimated costing of Pioneer's operations indeed indicates that it is very marginal (See Appendix 1). Any resumption of canning would require additional investment in machinery (US$ 145,000), factory improvements (US$ 70,000) and working capital to cover the first three months operations (US$ 1,530,000). As the shareholders either have not the means or the will to invest further funds in this venture, a decision has been made not to resume canning until conditions are more favourable.

Based on projected income from loins at US$ 1,200,000 per year, Pioneer will have accumulated sufficient capital to be in a position to resume canning some time in 1992 or perhaps early in 1993, but this will depend on a cheaper supply of empty cans: currently the cost of packaging amounts to 34% of the total ex store cost. Management's provisional plans for rehabilitation of the plant include the installation of two new canning lines:

- a complete new line to produce jumble pack 6.5 oz chunks at 200 cans per minute;

- a further line incorporating existing equipment but including a packshaper to produce 7 oz solid packs at 120 cans per minute.

The capacity of these two lines, if worked continuously for 8 hours, would be:
- chunk style: 2,000 cartons 48 by 6.5 oz
- solid style: 1,200 cartons 48 by 7 oz

At a yield of 36% this would amount to 62 t of whole Skipjack tuna per 8 hour shift which is well in excess of current or future planned picking capacity.

The factory's operations are under the direct control of a Starkist representative and all production specifications are prescribed by Starkist USA. Starkist's technical personnel also make frequent "quality audits" of the factory during which they scrutinize every aspect of production to pinpoint anything which may jeopardize product integrity.

The cannery had been in operation for at least 10 years and all the local staff received considerable on the job training. Others have received further training overseas. As a result, despite the recent prolonged closure of the plant, there is a large pool of experienced and trained staff available to the plant.

2.2 Tema Food Complex

The complex, built in 1962, comprises grain stores, a flour mill, an oil extraction plant, facilities for the production of fishmeal, fish oil and smoked fish as well as a fish cannery, cold store and freezing facilities. All the equipment in the cannery is of German origin. The plant is well laid out with plenty of space and well ventilated. The cannery was never designed to can tuna, it was equipped to can

(a) sardines, packed in imported printed aluminium oblong 200 g cans. Total capacity of the two sardine lines is 38,400 cans (768 cartons of 50 cans) per 8 hour day, or approximately 14 t of whole fish per day.

(b) mackerel steaks, packed in imported plain round tin plate approximately 200 g net weight. Capacity of the single mackerel canning line is some 57,000 cans per 8 hour day, or approximately 16.5 t of whole fish.

An interesting feature of the sardine canning line is that the sardine bodies are individually cooked, after hand cutting and before canning, a method which was phased out elsewhere some 20 years ago. Normal modern procedure is to can the raw bodies and precook them in the can.

All the equipment is in poor condition. Although attempts have been made to maintain it, the plant has deteriorated due to a severe lack of spare parts and materials and the current capacity of the plant is about 30% of design capacity. Of the seven retorts available, only two can be used for the sterilization of canned products. There are two others working but they are being used to precook tuna.

Tuna processing has been carried out in an ad hoc manner, but for the time being, the plant has stopped canning all fish principally because it has insufficient funds to import cans or obtain fish supplies for canning. Thus production was not witnessed, but an organoleptic evaluation of the canned product indicates that:

(a) the raw material being used was of low quality, due to poor handling or cold storage, as indicated by the poor taste;

(b) the fish cleaning standard was very poor as indicated by the amount of dark meat, skin and bones found in the product;

(c) indications were that the oil used in the canning was of a low quality, possibly rancid;

(d) the can used was the 200 g mackerel can. This can is not normally used in the tuna industry and is not acceptable in the major American and European markets.

Initially some people received training, overseas in the techniques of canning sardines and mackerel but most of these people have left the organization apparently without passing on their acquired knowledge. The current level of knowledge and experience of canning sardine and mackerel is quite limited. In the case of tuna canning, two people went to Starkist USA for one month's training. One of them has left the company; the other had just returned from a further short period of training in Italy. Nobody in management has any extensive experience in fish canning.

Any attempt to produce canned tuna under the present conditions would result in further financial losses due to the inefficiency of the current production methods and the unacceptable quality of the product for export markets.

The entire Tema Food Complex is the subject of a 10 million dollar refurbishment programme to be financed by OPEC. The future form of the cannery and the extent of its refurbishment is to be studied once necessary finance has been allocated for this purpose. However, the future viability of this cannery, like that of Pioneer, depends on securing a cheaper source of cans.

Given the materials, the engineering staff in the complex have sufficient ability to repair the existing mackerel and sardine equipment. For tuna canning, there is sufficient space to install a small 15 tons per day plant to operate in conjunction with the sardine and mackerel canning lines. Special consideration should be given to this when the proposed study of the plant is made.

There will be a need for training. This should be carried out by competent persons on site so that knowledge and experience can be imparted to more people than is possible by sending individuals overseas.

2.3 Mankoadze Canning Equipment

There is a significant amount of a tuna canning equipment (but not sufficient for a complete cannery) currently in packing cases, stored under bond in Mankoadze's warehouse at African Motors in Tema. It was purchased some three years ago with guarantees from the Bank of Ghana. The value of the plant at time of purchase was 677,386 pounds sterling (equivalent to US$ 1,117,686 at the April 1990 exchange rate of £1 = US$1.65). It is understood that the bank has a lien on this equipment until such time Mankoadze complete payment to the Bank of Ghana.

It was not possible to examine every single item due to the constraints imposed by the local customs and the lack of suitable moving equipment in the storage location, but a major portion was examined and all pieces of equipment were accounted for. In general, the equipment appeared to be in good usable condition. There will be some remedial work required particularlyon the electrical equipment and oil seals.

This equipment should be used in the future development of Ghanaian tuna processing facilities, because it is already in the country and because the Bank of Ghana has still to recover the money, even though it is recognized that there is other equipment available at lower cost, particularly if reconditioned equipment were to be considered.

A list of the equipment in store can be found in Appendix 2 together with comments on its application. Estimates of remedial work and installation costs have been included in the cannery fixed investment costs (local).

Mankoadze have a very large warehouse constructed about 1970 which could be made available for conversion to a cannery. This building is 90 feet wide and 600 feet long and equipped with offices and main drainage. The extra water and power connections needed for the factory are readily available. However, a quotation for the remedial and new civil works (see Appendix 2) needed in this building, to make it suitable to house the processing plant, amounted to US$ 1.6 million, whereas the cost of a

purpose-built building would be around US$ 1.5 million. Other problems with the Mankoadze site are that:

- there is limited space within the confines of the property to install ancillary facilities such as canteens, warehouses etc: there is suitable, vacant land alongside but this would have to be acquired.

- although the property is well connected to the main drainage system for the area, this system unfortunately empties into the main harbour. With the high B.O.D characteristics of the waste produced by the plant, it is feared that this would seriously affect the harbour basin. There is a lack of land for a water treatment facility and, since the site lies in a built up area, there could be adverse social consequences.

A more detailed study could be made, but it would appear preferable to construct a new building.

3. CAN-MAKING FACILITIES

There are no facilities in Ghana capable of producing cans in sufficient volumes or of a quality that would satisfy the needs of the tuna industry.

The Ghana Tin Can Company is the only commercial organization producing metal containers for third parties. The plant is equipped with serviceable but old-fashioned equipment with which the company produces plain and decorated metal non-food containers of various shapes and sizes for the cosmetic, paint and oil industry. The plant is operating at less than 30% capacity because of a fall in demand due to the trend towards use of plastics in the non-food container industry and the free market policy of the government which permits importation of ready-packed goods, but it does not have the means to produce metal food cans required by the tuna industry.

Ghana Industrial Holding Operating Company (GIHOC), a public sector company, produces canned preserves, fruit and juices under the "Astek" label in Nswam, but examination of cans in the shops indicates that the cans used in this plant are imported in a flattened form and reformed at the cannery.

The Carnation Milk Corporation operates in Ghana but normally produces cans only for its own use. The 3 piece evaporated milk cans are not of a size accepted in the tuna industry. Whether Carnation have the means and capacity to produce 3 piece cans for the tuna industry is not clear but experiences in Southeast Asia have shown that the plants built by Carnation to manufacture cans for their evaporated and condensed milk canning lines are tailored to their immediate needs and there is likely to be no capacity available for third party requirements. This can be confirmed during the forthcoming feasibility study.

The Ministry of Industry did not indicate any other potential suppliers of cans, nor any prospect of investment by other parties in equipment to produce cans suitable for the industry.

If the industry is to develop, consideration must be given to establishing a can-making facility.

4. CARDBOARD CARTONS AND LABELS

Until now, the cardboard cartons used to package canned tuna products have been imported along with the empty cans.

There are two paper carton manufacturers in Ghana: GIHOC, which operates a small plant in Nswam, producing cartons for fresh fruit and vegetables for export, and Ghana Carton Box Manufacturing, situated in the northern industrial area of Accra. This latter enterprise has more scope and is more conveniently located. It involves investment from Hong Kong and is managed and operated by expatriate Chinese.

The plant is equipped to manufacture cardboard cartons from board produced at the same plant. The paper and flute used to make the board is imported from the USA and northern Europe. The carton plant can produce various sized printed, stitched or glued cartons. The estimated production capacity is in the region of five million cartons per year, but at the moment it is operating at 40% of capacity.

The plant's major customers are Carnation and Lever Brothers, the two major multinational companies operating in Ghana. Mankoadze Fisheries and Afco also purchase some of their requirements from this company. Sales of cartons have not reached anticipated levels because the major fishing companies find it more convenient to purchase cheaper cartons from Las Palmas in the Canary islands when they deliver fish there.

Mr. Lui, the managing director, was reluctant to commit himself, but indicated that his plant could easily produce the one million or more cartons required by the tuna canning industry. The cost for a carton to hold the standard 48 x 307 x 112 cans, made from 300g per m2 board, would be in the region of 200 cedis. Deducting from this the export sales tax allowance of 22.5%, the effective cost would be 155 cedis (US$ 0.49) per carton.
This is rather high. Normally the tuna industry would expect to pay in the region of US$ 0.35 per carton. As the quoted price was only indicative, perhaps negotiations could bring the figure down, to around US$ 0.40.

Even at the cost quoted by Ghana Carton Box Manufacturing, preliminary investigations indicate that it would still be cheaper to purchase from that plant than to establish another plant producing cartons from imported board to service the tuna industry. (See Table 2.) To import the board-making machinery including boilers to produce the board locally would be uneconomical as this equipment would only be 30% utilized at envisaged canned tuna production levels whereas purchase from the existing plant would give it the opportunity to spread its overheads and reduce total unit costs.

Labels printed in Ghana are not of a standard suitable for tuna cans to be exported to developed countries. When Pioneer Food Canning Corporation was producing canned products, all the labels were printed in Abidjan and freighted to Accra. This made for an expensive label and some difficulty in stock control, but for the time being, or at least until the demand for high quality labels is sufficient to warrant a new labelling facility, this practice of importing labels will have to continue.

5. COLD STORAGE AND FREEZING CAPACITY

5.1 Cold Storage

Total cold storage capacity in Tema is estimated at just over 40,000 tons. Seven stores comprising a total capacity of 29,700 tons were visited and there is reported to be a total of 11,000 tons capacity in a number of small cold stores elsewhere in Tema. Appendix 3 gives details of the stores visited. Space immediately available in the stores visited is estimated at some 13,600 tons and a further 4,300 tons of space should be available later in the year when the current refurbishment programmes have been completed. See Table 3.

Almost all the cold stores are owned by fishing or trading companies and therefore not normally available to third party customers. It must also be said that not many of the cold stores are willing to accept frozen tuna for storage. The brine frozen tuna from the vessels' freezing tanks tends to produce a large amount of drippage. It accumulates on the floors of the stores and results in an unpleasant appearance. None of the stores visited were designed to handle brine frozen fish even though they were intended for this purpose. Ghana State Fishing and Nova Complex do make space available for third party storage but a major portion of the space available is taken by fish traders so space available for third party tuna storage is only some 3,000 t. Since the major fishing companies have their own cold storage facilities, the 3,000 tons space would be shared between some 6 smaller fishing companies catching some 9,000 tons per year. Thus, given reasonable turn round periods, space should be sufficient even allowing for the extra space required for keeping each lot separate.

Typical charges for cold storage are.

- frozen tuna: 150 cedis (US$ 0.48) per ton per week

- cartoned goods: 50 cedis per 20 kg per week
  = 2500 cedis (US$ 7.98) per ton per week

Room rates are calculated at 30 tons per m3 at the cartoned goods rate, or 75,000 cedis (US$ 239.6) per m3 per week. There appear to be no handling charges.

The cartoned goods charge is in line with typical international rates. However, the absence of an inward and outward handling charge represents a substantial saving.

The handling facilities in all the stores, and particularly Ghana State Fishing, are very limited. The main problem is the shortage of storage containers (scows). More will be needed if large quantities of fish are landed. Otherwise it will be necessary to bulk store the fish. A good deal of manual labour will then be needed to empty and fill the few storage bins available and the movement of fish into and out of the store will be slow. Under these conditions it would be difficult to maintain the fish at low enough temperatures: cold air circulation through bulk stored fish is generally poor, and the temperature of the fish will also rise in any prolonged period spent between cold storage on the vessel and the bulk store.

Operational practices are generally poor resulting in comparatively high operating temperatures in the rooms. The prolonged storage of fish or fish products is thus currently somewhat risky.

A new cold store is planned to be built on the fish landing quay as part of a port development plan, but none of the work, which is to be financed by the World Bank, has been fully approved yet and it is estimated that the facilities would not be ready until well into 1995. If the industry is to establish itself in Tema with any degree of permanency in the immediate future, then cold storage facilities, and particularly the cold storage facility in Ghana State Fishing must be improved very quickly.

5.2 Freezing Capacity

For whole round tuna, most of the fish caught is brine frozen aboard the catching vessels. The volume of fresh tuna landed is so small that the fish is readily disposed of on the local market. In case a need for freezing tuna arises in future, freezing capacity in Tema is shown below:

	Blast Freezing	Plate Freezing	Status
	-----t/24 hours------		
Mankoadze	-	56	unassembled equipment
Ghana State Fishing	38	78	out of commission
Tema Food Complex	18	-	out of commission
Nova	10	-	working, booked by Starkist
Pioneer Cooperative	5	-	available, not in use
Total	63	134	Total 197 tons

Most of the capacity was installed to freeze locally-caught sardines but seasonal price variations are such that it would be uneconomical to do so.

If the entire freezing capacity was available it would be sufficient to freeze the entire Ghanaian tuna catch if it were cooked, cleaned and the loins frozen.

6. ENGINEERING SUPPORT

There are at least two engineering works fully equipped with tooling, welding, and electrical equipment, and in one, foundry facilities. The standard of work put out by these workshops is equal to most other countries, in some cases better, and at reasonable cost. These workshops are associated with the various fishing companies. They act in a supporting role to the operators of the various vessels; but they also undertake work for third parties and could carry out much of the engineering work needed in the construction and maintenance of a tuna processing plant.

The main drawback in their current operations is the lack of materials. Very little quality steel or other similar items are imported by the local trading organizations. Most of the engineering material needed for the upkeep of the vessels is therefore imported and stored by the various fishing companies. For example, one reported an inventory of such materials in excess of US$ 2 million.

Improved supply systems for spare parts and engineering materials must be considered in any tuna processing project. Apart from this it is evident that, given the right tools and materials, the engineering skills in Ghana are available to sustain a tuna processing plant.

7. HUMAN RESOURCES

7.1 Unskilled Labour

Discussions with various local employers indicate that there is a large resource of unemployed labour in the Accra/Tema area. The main problem in utilizing this labour resource is that it is spread over a wide area: communications are difficult and public transport is very inefficient. Local authorities are aware of the problem and are endeavouring to ease it. In the meantime, employers would either need to purchase and operate their own vehicles or contract some of the many local licensed minibus owner-operators to transport the workers for them. The latter could be unreliable if the employer did not make a careful choice.

An alternative would be to provide accommodation for some, if not all, of the employees. This would involve a substantial investment cost, some of which could be recovered from allowances paid to the employees. The social implications of such a scheme would have to be carefully considered.

Most of the unskilled labourers are of rural origin. While they generally have a basic education, they are unaccustomed to the discipline required for work in a comparatively crowded and enclosed environment, particularly the very strict discipline required for operating a food processing plant. Careful selection of employees and intensive supervision are therefore essential. A professional personnel manager of the highest qualifications, and ideally of local origin, is recommended.

7.2 Skilled labour

Ghana has several technical institutions, including five Polytechnical colleges and the National Vocational Institution. The country also sends qualified people overseas for further training. In addition, most large organizations operate various apprenticeship and training schemes. As a result there is a large pool of technically trained skilled and semi-skilled people available. Unfortunately, such people often lack practical work experience. Therefore, any institution employing skilled or unskilled people must have a core of experienced employees to act as supervisors at different levels and to train and advise the less experienced employees.

There appears to be a shortage of good supervisors. Many supervisors currently owe their position to factors other than their own skills. The training and selection of senior supervisors and operational management must be improved. Institutions such as the Management Development Institute, the Ghana Institute of Management, the public administration and the University of Ghana provide very good training courses which produce well trained technically skilled people. Due to the lack of opportunity, the people are unable to turn their technical knowledge into management skills.

8. MARKETS AND MARKETING

8.1 Canned tuna

Most of the tuna caught in the world is eventually canned. In 1988 the major tuna importing countries imported some 31 million standard cartons of tuna, equivalent to about 590,000 t of whole tuna. The major importers were:

USA	40.3%
France	18.4%
U.K	16.2%
West Germany	9.4%
Others in Europe	15.7%
Total	100.0%

Table 4(a) shows imports over the period 1984-1988. The underlying trend has been an average overall growth of about 14.0%. American imports have risen by about 13% per year. Trends in Europe vary with an average annual growth of 18.6% in the UK but only 10.0% in West Germany. More recently overall import growth has fallen back to 12%.

Thailand is the world's leading exporter of canned tuna. Other important suppliers are the Philippines and the Ivory Coast but by virtue of the volume of canned tuna produced in Thailand, the Thais control the world market. Table 4(b) shows the breakdown of supply to major importing countries.

Prices for Thai and Indian Ocean products, C & F Europe, in April 1990 are given below, alongside estimated prices for equivalent products from a new facility in Ghana.

	Thai 24 % duty paid	Maldives Seychelles duty free	New facility prices duty free
	----------	US$/carton	----------
7 oz solid oil	28.63	28.00	27.25
7 oz solid water	27.59	27.00	26.25
6.5 oz chunk oil	27.59	27.00	24.80
6.5 oz chunk water	26.35	26.00	23.80
6.5 oz flake oil	16.12	16.00	-
6.5 oz flake water	14.90	15.00	-
66.5 oz chunk oil	27.70	-	27.70
66.5 oz chunk water	26.20	-	26.00

In the past prices have shown significant variations: for example, between US$ 20 and US$27 per carton (66.5 oz chunk water) C & F USA, and between US$ 17 and US$ 26 per carton (6.5 oz chunk) C & F Europe. However, there are indications that the markets are stabilizing at around US$ 21.00 in the USA and about US$ 22.80 in Europe. In the U.K. the market is paying about US$ 1.20 per carton more than the rest of Europe. However, the quality guarantees demanded by the U.K. buyers are much more stringent than USA and the rest of Europe.

8.2 Frozen cooked tuna loins

Now that the technological problems of freezing cooked loins have been overcome (1), an intermediate market is emerging for frozen tuna loins. These loins are normally purchased by the large tuna canning operations in the developed countries and used to supplement their own canning operations. More frozen loins will become available in due course as countries with large tuna resources, but without can-making facilities, try to extract some added value from their resource. Therefore, it is expected that current prices may become unstable in the near future.

8.3 The Lome Convention

Under the provisions of the Lome Convention, canned tuna and frozen loins from member states of Africa, the Caribbean and Pacific (ACP) may be imported to EEC countries duty free provided that:

(a) the fish used was caught and landed by a vessel of the member state(Article 2); and

(b) the canned product is made up of materials originating in the member state. i.e.the can must be "sufficiently worked or processed" in the member state. (Article 1).

Privileges may be withdrawn if the importation of the product causes harm to a member state of the EEC or on health grounds.

Lome IV will be ratified later this year and will remain in force until the year 2000.

8.4 Ghanaian Exports

The only buyer operating for the export market in Ghana represents Starkist, one of the largest multinational tuna processors in the world. According to available records, Starkist purchase all the exportable whole frozen fish for shipment to their cannery in Puerto Rico. Shipments have totalled some 200,000 t since 1974, when Starkist started operations in Ghana. The company has been a major force in developing the tuna fishing industry in Ghanaian waters. Starkist have given guarantees to financial institutions in order to assist fishermen in obtaining finance for new boats. On other occasions they have advanced money to fishermen so that they may continue fishing.

In 1987 the company moved its purchasing operations from Tema to Abidjan, principally because of the poor operating conditions in Tema's fishing harbour. Conditions have improved and they have resumed their operations in the port; but in doing so they have imposed new buying conditions whereby fishermen deliver to local cold stores in return for part payment; cold storages are met by the fishermen; a further part payment is made when the fish is loaded onto a reefer vessel; and final payment is not made until the fish has been processed in Puerto Rico. Using this procedure, the fishermen thus incur a heavy financing burden.

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(1) Oxidation causing discolouring of the white meat and short storage life, both resolved by use of new packaging techniques.

Being the only buyer of frozen tuna in Ghana, Starkist have a great deal of control over the price of export fish. Frequent minor fluctuations in Ghanaian prices indicate that they depend on Starkist's international buying operations. This may also explain why the Ghanaian prices are occasionally around 16% lower than those being paid on the West Coast of America (See Table 5).

Table 6 gives prices for each category of tuna exported. Since the depressed prices of 1983, prices have risen by about 3% overall. In the year to March 1990 prices have risen more sharply but it remains to be seen whether this is a short term fluctuation or part of an underlying trend.

8.5 Local Market

The main reason for the development of the Pioneer Food Canning Corporation was the absence of a market for unexportable tuna. Since 1987, the local market has shown an increasing interest in non-exportable tuna. Market prices vary according to availability of more popular species (the highest prices are obtained when there is a shortage of Sardinella) but are generally attractive to the fishermen. Prices in 1989 were as follows:

	August	December
	------US$/t------	
Yellow fin	605	445
Skipjack	573	414
Black Skipjack	541	382
Damaged fish and others	461	318

In any case as any processing facility wishing to utilize unexportable tuna will have to compete with the local market. To obtain fish suitable for export as whole frozen fish, the processor will need to pay the equivalent of the export price.

Before any large investment is made in the tuna processing industry, fish landings, prices and conditions affecting supply should be more carefully examined.

PART II - DEVELOPMENT PROPOSALS FOR AN INTEGRATED TUNA PROCESSING FACILITY

1. RATIONALE

Since 1981 Ghana has exported some 216.000 t of whole frozen tuna to Puerto Rico for canning at an average price of around US$ 600 per ton. Canning locally would return a gross added value equivalent to approximately 100% of the fish, giving a total value of around US$ 1200 per ton of fish processed. Importation of plate and other materials used in canning account for between 80% and 85% of the added value leaving a domestic added value of around US$ 100 per ton on canning fish currently exported. However, in the first instance, non-exportable fish could be canned. There is estimated to be around 10.000 tons per year of tuna which is non-exportable but suitable for canning. This would earn around US$ 700 per ton in foreign exchange if canned for export.

The main constraint to the development of a Ghanaian tuna processing industry to date has been the high cost of imported cans. By producing cans locally, the production costs could be reduced by about US$ 2.10 per carton of 48 against that of importing cans.

Some of the equipment necessary for establishing a cannery has already been imported and is being held by the Bank of Ghana. There are plentiful human resources for staffing a cannery and there is some experience of canning in tuna in existing plants. There is also already some international interest in providing finance, technical assistance and marketing services for the establishment of a new tuna cannery in Ghana.

Moreover Ghana can benefit from the Lome Convention tariff agreements which do not apply to the major Asian producers. Provided that a sufficiently high quality product could be produced, Ghana could target the growing U.K. market and other European markets with the exception of France which imports virtually all of the Ivory Coast and Senegal production.

The establishment of a Ghanaian canning industry would also break the current monopoly of Starkist.

However, if a processing industry is to be established in Ghana, much more fish of processing quality must be landed in Tema. Under the Fisheries Decree of 1979 all nationally licensed tuna vessels are required to land their catches in Ghana prior to transshipment or export. In enforcing this law, the Government should also:

(a) assist the Tema Port Authority to improve the flow of frozen fish through the port, either to the cold stores or to the reefer vessels; and

(b) assist the State Fishing Corporation's cold stores which are adjacent to the fishing harbour in Tema to upgrade part or all of the unused 5,500 t capacity, so that it can be used for the storage of frozen tuna for export.

Since the establishment of a canning industry in Ghana depends upon the existence of a can-making facility, this report sets out proposals to establish an integrated tuna processing plant incorporating the minimum feasible size of can-making plant.

2. CAN-MAKING FACILITY

2.1 Demand

There are two basic sizes of can used in the tuna canning industry:

(a) the 185/200 g can (83 x 46 mm) - 6.5/7 oz can (307 x 113)

(b) the 2 kg can (152 x 105 mm) - 66.5 oz can (608 x 403)

but by far the largest volume of cans used is the smaller (307 x 113) can.

Potential demand for the 307 x 113 can in Tema has been estimated as follows:

New Plant		- 10,600 tons per year	= 26 million cans
Pioneer Food Canning	(max)	- 4,800 tons per year	= 12 million cans
Tema Food Cannery	(max)	- 3,000 tons per year	= 7 million cans
Total	(max)	17,600 tons per year	= 45 million cans

By contrast the expected demand by the new plant for 603 x 408 cans is only 280,000 cans/year.

2.2 Type of Can

Cans can be constructed from 3 or 2 pieces of plate.

(a) 3 piece cans are fabricated from the bottom, the body and the top end. The technology of producing this type of can at high speed has improved rapidly since the development of high speed welding techniques. The equipment provided for manufacture cans at speed of up to five hundred cans per minute and, with change parts produce 3 or 4 different sizes of can. However, the nature of this equipment requires integration of all the different component operations and makes this type of plant expensive: approximately 5 million dollars, possibly more depending on requirements.

Because of the complexity of the system, starting a plant of this nature without prior basic experience could expose the end users, and ultimately the manufacturer, to severe problems, unless sufficient foreign technical experience were also to be imported. This, in turn considering the initial limited market and volume of the products required would be barely cost effective.

(b) 2 piece cans are fabricated from the drawn body, which includes the bottom end, and the top end. The equipment is easier to operate and cheaper: investment costs are between US$ 1.5 and US$ 2.5 million.

The main drawbacks for a plant of this nature are that it can produce only cans of a limited height (depth); and the rate of production per line is much lower than three piece systems. Normally they produce 200 cans per minute (cpm) although some more modern machines produce 300 cpm.

It is recommended that, in order to minimize initial investment costs, the type of can making system installed should produce two piece cans of a common size namely 307 x 112. To cater for the small volume of 603 x 408

cans required, the reform line already in store as part of the Mankoadze equipment should be installed to produce cans from imported flattened bodies.

2.3 The Proposed Can-Making Plant

2.3.1 Plant capacity

The plant would produce the maximum calculated requirement of 45 million 307 x 113 cans for the three plants within two shifts.

300 cpm at 80 % efficiency 240 cans per minute 14400 per hour
45 million cans ÷ 3,125 hours.

At 2 shifts totalling 14 hour work per day.
3,125 hours 223 working days per year.

The maximum working time per year is 240 days. The 26 million cans required for the new plant alone could be produced within a single 8 hour shift. Allowing for a modest supply to the other two plants, costings have been based on a production of 30 million cans, which would require 2,083 hours work, equivalent to 8.7 hours per day for 240 days.

2.3.2 Type of Plant

There is a wide range of equipment available for making two piece cans. Some of the cheaper plants have a record of repeated failure and the cost of repairing the equipment by the purchasers has increased the overall cost to that of the more expensive types. Because the new plant will be the only one in Ghana capable of supplying the tuna plant, it is essential that the equipment installed is reliable. Thus it is recommended that proven equipment is purchased from organizations who can provide technical backup. The costings for the plant are based on this assumption and prices are therefore higher than others available.

Local manufacture of ends would only be feasible if demand for cans (2 piece) reached 90 million. In the first instance it will be more cost-effective to import the required ends for the 307 x 113 cans. The cost would be about US$ 0.15 per carton of 48 cans.

2.3.3 Can-making materials

Plate used in food cans must be lacquered

(a) externally, to protect the metal from the environmental and processing conditions (except where the tin content in the plate is high which make it very expensive); and

(b) internally, to act as a barrier between the product and the metal to prevent chemical reactions. This chemical reaction must be prevented in order to safeguard the quality and shelflife of product in the can.

In view of the critical nature of the lacquering, the precise technology required to achieve a successful result and the large investment required (some US$ 400,000 on equipment which would only be 10% utilized), all materials used for can making should be purchased lacquered ready for use.

There is in any case no capacity to produce steel plate in Ghana at

present. Aluminium is produced in Ghana but it is not known it it can be produced to the precise technical requirements necessary for food can manufacture. This, and perhaps the lacquering, can be considered at a later stage in the development of the can making industry.

At least to start with, the plant would thus need to import steel plate or coated tin plate. Electrolytically-coated tinplate is perhaps the most practical for the initial stages of the plant. Despite being slightly more expensive, tinplate is less susceptible to corrosion when the lacquer coating is damaged, and it subjects the tooling in the equipment to less wear that tin free steel.

The flattened bodies for the 603 x 408 can could be imported along with the tinplate.

2.4 Staffing

Overall responsibility for the can-making plant would lie with the main administration office but day to day operational management together with the purchase of materials would be the responsibility of the can-maker and his assistant. These two people will also be responsible for the routine maintenance, the training of personnel and the selection of future management personnel from local candidates.

Details of the manning budget, salaries, labour and equipment are given in Appendix 6. Briefly, the can-making plant will employ 1 foreign can-maker and a foreign assistant can-makers and 20 local employees to operate the can-making plant, the reform equipment and the quality control procedure.

2.5 Costs

Estimated costings for both sizes of can are given in Table /. The cost of the plate used to make the cans is 90% of the total cost. The cost of plate varies considerably throughout the world. For example:

U.K. quote - US$ 1,604 F.O.B per 1,000 sheets
U.S. quote - US$ 1,018 F.O.B per 1,000 sheets
(U.S.A. quote provided in C.O.C report)

a difference of US$ 586 or 36.5% of the higher cost. Using the lower figure, Table / shows that at a throughput of 30 million cans the cost of cans per carton would be US$ 3.55 including imported ends. This cost could be reduced if two shifts were worked and overheads could be spread over the maximum number of cans. Tema Food Complex and Pioneer Food Canning should both be encouraged to can tuna in cans produced by the proposed can-making complex.

Freight is another important cost. The cost for transporting one year's supply of plate and ends to Ghana amounts to some US$ 297,000, equivalent to US$ 0.47 per carton of tuna produced.

Some saving could be made by reducing the level of investment in equipment, but the equipment is likely to have less safety devices, require more people to operate it, be 30% slower and more prone to breakdown.

3. INTEGRATED TUNA PROCESSING PLANT

The proposed plant will produce both canned products and frozen tuna loins with emphasis given to canned products. It will contain the canning equipment already in Ghana, including the refrigeration plant, supplemented with additional equipment.

3.1 Capacity

The machinery already in Ghana has a capacity ranging between 40 and 60 tons per day depending on whether the plant works a single or two shift system. (See Table 8.) The plant as a whole has been designed to utilize this existing equipment close to its maximum capacity. A full two shift system is not considered practical because government requires that women, who are employed to clean the fish, must finish work in time to be home by 10 pm. Furthermore, it is anticipated that, even though reserve quantities of frozen fish are kept in cold storage, deliveries of fish will depend upon catch rates and market conditions and therefore be variable. The plant would thus need to have sufficient flexibility to cater for the variation in deliveries, and avoid losses through unproductive fixed shifts. A basic 12 hour work day giving 10.5 hours actual work has thus been recommended. The extended working period can be reduced to a normal 8 hour shift when the volume of fish supplied is reduced and at other times some employees will work some 4 hours overtime per day. Employees working in the cooking and retorting areas will need to work 2 shifts because the retort and cooking overruns will exceed the 12 hour working day.

The 20 cleaning tables already in Ghana can accommodate 120 cleaners. This number of fish cleaners could produce some 37 tons of whole fish in 12 hours, based on an average size of fish of 1.5 kg. (See Table 9.) In order to achieve higher throughputs, either larger fish would have to be processed, with higher costs, or the fish cleaning staff would have to be increased. With 220 cleaners, some 55 tons of whole fish could be processed per extended shift. (See Table 10.) This would allow the canning machinery to operate efficiently and provide around 5 ton excess which can be processed as frozen loins.

At 240 working days per year, the plant would process 13,200 tons of whole fish per year.

3.2 Fish utilization

Wherever possible, smaller fish which bring lower returns in the export whole frozen market will be used. There will be a proportion of the larger fish used in order to assist throughput. The following mix is anticipated:

Skipjack	size R1 1.8 - 3.4kg,	40%
	size R2 1.4 - 1.8kg,	10%
	size R3 1.4kg,	50%
Average size:	1.39kg per fish	

In order to maintain efficiency, the plant will can only one species per day. Of the two species available, it is estimated that skipjack will provide for not less than 85% of the production.

The plant will be equipped with two canning lines: one for 307 x 113 size cans and the other for the 603 x 408 size can packed by hand. (At a later stage a secondary 307 x 112 line would be introduced to be able to pack tuna steaks, flaked tuna or any other specialty packing, which may

recover higher overall returns.) Projected output is as follows:

6.5 oz tuna SJ chunks in oil	- 332,000 cartons
6.5 oz tuna SJ chunks in water	- 221,000 cartons
66.5 oz tuna chunks in water	- 46,600 cartons
2 x 10kg frozen tuna loins	- 22,000 cartons

The cooked viscera, skin, bones, red meat and scrapings are marketable items in some countries: the red meat may be canned as pet food and the scrapings may be canned as a sandwich spread. However, the currently deflated market for these products resulting from oversupply from Thailand, together with the absence of equipment to produce them in Ghana, precludes the production of these items for the time being. It is thus anticipated that these materials together with the skins, bones, and cooked viscera would be sold for fish meal. Local poultry farmers might also purchase the material direct from factory but the potential of this market is unknown.

3.3 The Process Flow

The whole frozen tuna will be brought to the cannery by truck from the rented cold storage space in their storage containers. The containers will be unloaded directly into the defrosting area, where the fish will be defrosted by water sprays.

The defrosted fish will then be moved to the butchering (eviscerating) tables so that the guts can be removed and the eviscerated fish can be placed into the aluminium cooking trays according to the size of fish. The cooking trollies containing the fish trays are then placed in the cooking vessels and steamed for a period which varies according to the size of the fish being cooked. Once the cooking cycle is complete the fish in the cooker undergo a cooling cycle. This cycle is under vacuum and is assisted by a continuous spray of cold water over the fish. The time taken to cool the fish to 38 C is quite short: not much more than 30 minutes even for the larger fish.

After cooling, the trollies are removed from the cooker and the trays transferred to other trollies for temporary storage in the cooked fish holding room. The temperature and humidity of this room are carefully controlled at about 36 C and 95% so that yield and throughput can be kept to the optimum.

As required, the fish are distributed to the cleaners, who separate the desirable white meat (tuna loins) from the skin, bones and dark meat. This operation is carefully monitored for quality and productivity. After cleaning the tuna loins are transferred to an inspection area where each loin is inspected and any faults rectified. This operation is known as recleaning.

After recleaning, the loins (and pieces, if chunk style products are being produced) are transferred to the fish filling machines in the canning area. The filling machines form the loins into a solid cylinder of white meat with a diameter equal to the size of the can to be filled. At the same time, the empty cans are transferred from the storage area to the filling machine by overhead conveyor. The end of the cylinder of white meat is inserted into the can and cut to fill the can. The two filling machines fill the cans at a rate of 90 cans per minute which is equivalent to 52 t of whole fish in 12 hours.

After filling, the cans pass by conveyor to the automatic check weigh system, which rejects any can of fish that does not conform to the preset weight range.

The cans are again transferred by conveyor to a vacuum assisted liquid filler which removes any air trapped in the can and at the same time injects sufficient hot water, broth or vegetable oil to fill the can to the required net weight, ensuring that sufficient head space (the space between the top of the product and the lid of the can) is maintained.

Operating at 40 - 200 cans per minute depending upon the can size, the seaming machine places the lid onto the filled can and, by means of a series of rollers, hermetically seals the can. Immediately prior to the seaming operation, the seamer injects steam into the head space which expels any air. The condensing steam then forms a vacuum in the sealed can. This vacuum is important for the storage life and integrity of the product. During this operation a batch identification code is also embossed onto the lid.

Once sealed, the full cans are transferred to a can washing machine which removes all residual fish, oil, etc from the outer surface of the can.

The washed cans are then automatically loaded into retort crates with layer pads between each layer of cans. The crates are then placed and shut into a retort. Live steam is then injected into the retort and all air is expelled. The pressure and temperature inside the retort gradually increase to that required for processing. The process time and temperature vary according to the process adopted and the size of can. Usual process conditions are 116.7 C at 10.5 psi for 75 minutes for the 307 x 113 can and for 180 minutes for the 603 x 408 can.

On completion of the cycle, the retort temperatures and pressures, together with those of the can, are reduced to under 40 C at normal atmospheric pressure. This is achieved by the injection into the retort of cold water for cooling and compressed air for pressure control.

After cooling the full crates of cans are removed from the retort, tipped to drain off the excess moisture and left to stand for 12 hours. This standing period allows the can to cool gradually to atmospheric temperature, allowing the product to stabilize and develop any signs indicating serious faults.

The sterilized cans are removed from the crates and placed in storage under quarantine for an incubation period of 10 - 14 days. This is to allow for the development of indicators which would signal the presence of less obvious dangerous faults in the product.

The cans then pass through an automatic labelling line fitted with an automatic vacuum tester, which will reject cans with vacuums outside the programmed parameters, and a faulty label detector which automatically rejects cans on which the labels are misplaced. An automatic cartoning machine arranges the cans into the correct configuration so that they can be automatically placed into cardboard cartons which are then automatically sealed. The automatic labelling line has a capacity for labelling 307 x 113 cans at a rate of 300 cpm. For labelling 603 x 408 cans, the degree of automation is much less, due to the lower volume of production and numbers of cans. Thus the feeding of cans to the labeller and packing of cardboard cartons can be done manually. The operational speeds of this line are in

the region of 60 cpm.

Loin Freezing

The cleaned loins from the cleaning tables are taken to the loin packing area where they are packed into plastic vacuum pouches, each containing 10 kg of loins. The pouches then pass into the vacuum pouch sealing machine which removes the air from the pouch and simultaneously heat-seals it. The machine is capable of sealing 5 x 10 kg pouches per minute.

Once sealed, the pouches are packed into two inch deep freezer trays which are placed into a horizontal plate freezer capable of holding up to 140 trays. The freezing time in the plate freezer is around 3 hours after which the trays are removed and the frozen pouches are packed into master cartons, 2 per carton. The carton is then sealed and transferred to the cold store for temporary storage pending shipment.

3.4 Plant Layout

The proposed plant layout is given in detail in Appendix 4. In summary, the integrated tuna processing plant will consist of:

1. A small packaged cold store with a storage capacity of about 40 t. This will act as temporary storage for whole frozen tuna and processed frozen tuna loins. Initially, it is intended that outside cold storage space will be rented to store the major portion of the frozen fish needed for the factory. In the second phase, a purpose built cold store with a capacity of some 3,000 t will be built.

2. Two fish processing rooms. Room 1 will be where the frozen raw fish are defrosted, eviscerated, sized into cooking trays and cooked. Room 2 will be where the cooked fish is cleaned by some 220 women. From this room the white meat will be sent to the canning area or frozen loin packing area. Between these two processing rooms will be a temperature controlled area in which the cooked fish will be temporarily stored before cleaning and the returned empty cooking trays will be mechanically washed.

3. Fish canning area which will contain the two 307 x 113 and 603 x 408 canning lines. It will also contain the five retorts. Provision will also be made for a third canning line and one additional retort to be installed in the second phase of development.

4. Retort crate unloading and quarantine area. This area is where the warm retorted cans of tuna are held in the retort crates. Here too, the crates will be unloaded and the cans stored on pallets for incubation.

5. Warehouse which will be used to store all the dry materials needed for the cannery's operations i.e. salt, empty cartons, labels etc and canned products. It will also contain a bonded store for the storage of imported items such as vegetable oil, tinplate and the can ends. These items will be issued when required by local customs authorities. The labelling lines will also be located in the warehouse.

6. Cooked loin packing area which will contain the pouch sealer and the horizontal freezers and also the carton packing area.

7. Can-making plant. This will be situated close to the main cannery so that the manufactured cans can be delivered to the packing machines by conveyor. This plant will also contain its own administration and storage facilities, together with the necessary can-making equipment.

8. Inspection, administration and supervision facilities will be provided in all of the main processing areas. There will also be provision for employees' amenities which will include canteen, changing rooms and toilets.

9. The site will also contain the boiler-house, together with the requisite fuel oil and factory water storage tanks, including treatment systems. The engineering workshops will be sited close to the boiler-house.

10. The main administration will be contained in a purpose-built block which will also include a first aid room.

11. Waste water treatment. This area will contain equipment that will remove the suspended solid materials from the factory waste water prior to disposal.

12. Additional space. It is anticipated that there will be sufficient space available to allow for the expansion of the can-making plant and cold storage facilities. At the same time sufficient space should be made available for the provision of a secondary waste water treatment plant and employees' accommodation if and when needed.

13. Further space will be needed for a fish meal plant in Phase 2. This plant will produce high protein meal from the fish waste to be marketed in that form or to be used in the manufacture of fish food pellets. (The local manufacture of this fish food would greatly assist in the development of the local aquaculture.)

3.5 Investment Costs

Estimated total investment costs amount to US$ 8.25 million, of which US$ 6.91 would be for investment associated with imported items. The local component includes the value of equipment already in Ghana. Costs are detailed in Appendix 5 and summarized below.

	Foreign	Local	Total
Cannery and Freezing	US$ million		
Processing plant and equipment	2.983	1.332	
Inventory and cash	1.048	-	
Pre-operating expenses /0%	0.193	-	
Subtotal	4.224	1.332	5.556
Can making			
Can making plant and equipment	2.146	0.016	
Inventory and cash	0.744	-	
Pre-operating expenses	0.083	-	
Subtotal	2.973	0.016	2.989
Total	7.197	1.348	8.545

(Pre-operating costs are detailed in Table 11.)

It has been assumed that financing would be met by local equity for the local component and a loan for imported items. Loan repayments have been calculated below assuming an 8% interest rate and a 5 year repayment period following 1 year's grace.

Year	Capital payment	Interest	Total
1	-	575.760	-
2	1.439.400	575.760	-
3	1.439.400	460.608	-
4	1.439.400	345.456	
5	1.439.400	230.304	-
6	1.430.400	115.152	-
Total payment	7.197.000	2.303.040	9.500.040
5 year average			1.900.008

Total investment:	Cash -	Foreign including interest	9.500.040
		Local equipment and services	1.823.448
		Total	11.323.488

3.6 Employment

The plant will employ a total of 548 local people as follows:

Departments	Male	Female	Total
Fish room 1 and 2	68	270	338
Canning	29	18	47
Warehouse	9	5	14
Freezing	5	12	17
Ancillary workers including maintenance and security	28	42	70
Cannery engineers and hygiene	20	1	21
Can making	16	4	20
General administrative			21
Total	175	352	548

To be viable, the plant will have to be managed by experienced and dedicated people who have:

(a) detailed operational knowledge of a modern tuna plant;

(b) first hand experience of plant operations and management;

(c) general knowledge of market conditions and requirements.

Unfortunately, there are few people in Ghana with the requisite knowledge and they are unlikely to be available for employment in the new plant. Therefore, for the initial phase of the factory's life and in order to accelerate the development, it is proposed that the plant will be largely managed by a team of foreign personnel comprising of general manager, plant manager, 2 assistant managers, financial controller, production manager and quality assurance manager.

It will be the responsibility of these people to manage the plant through the first five years of the plant's life and to train the local staff to replace them at the end of that period. Ghana has the talent: all that is required is experience and acquired skills. It will thus be important that all Ghanaian personnel appointed as supervisors have future management potential. To gain practical knowledge, all local personnel selected as production supervisors and assistant managers will administration be required to undergo practical training as general employees on the factory floor.

Where detailed knowledge of tuna processing is not required, local managers will be appointed, for example in administration, personnel, security manager and stock controller.

Details of staffing and staff costs are given in Appendix 6.

3.7 Returns on investment

The estimated annual return from the plant is given in Table 12 which gives a costing per carton of each product and is accompanied by extensive notes. In summary, the operating margin is as follows:

6 1/2 chunk in oil 332,000 cartons at 3.963	US$	1,315,716
6 1/2 chunk in water 221,000 cartons at 4.343		959,803
66 1/2 chunk in water 46,600 cartons at 4.421		206,018
20kg tuna loin/pieces 22,000 cartons		243,132
Sale of waste products 5,280 tons at 0.0367kg		193,776
Total operating margin	US$	2,918,445
Gross operating profit on investment(8.545 mill)		34.14%
Financing and marketing costs	US$	2,423,261
Net profit before tax		495,184
Net profit on investment		5.79%

Since, under the investment code, this processing facility will not be liable for tax for the first five years, the net profit will be US$ 528,679 per year.

Applying the depreciation rates given below, the residual value of the plant after 5 years has been calculated as .

buildings and civil works	5% over 20 years
fixed plant and machinery	12.5% over 8 years
office equipment	12.5% over 8 years
motor vehicles	20% over 5 years
baskets, racks, fish scows, plastic containers and pallets.	33.3% over 3 years

3.8 Returns to the Economy

Overall returns of the Ghanaian economy over the first five years have been calculated as follows:

	US$ million/year
Exports and sale of waste	16.097
Import and foreign expenses	9.770
Margin for local disbursement	6.327
Local expenditures	5.831
Surplus	0.496

Thus the equivalent of US$ 6 million will be generated in the local economy.

The following revenues will accrue to government:

	US$ million
Plant social security contributions (12.5%)	0.35
Employee social security contributions (5%)	0.14
Tax paid by employees (taken as 8% average)	0.90
Total	US$ 1.39 million
	c 453.07 million

3.9 Special Considerations

3.9.1 Plant viability

The plant's viability is vulnerable to a number of factors. The most important are:

(a) the costs of manufacturing cans, especially imported plate, and of vegetable oil;

(b) the ability of the plant to obtain sufficient quantities of fish at the budgeted prices to enable it to produce the volumes required;

(c) market conditions.

These points should be considered more closely during the following in-depth feasibility study.

The loan repayments absorb some 65% of the gross margin. This is a considerable burden which should be reduced if possible. This too must be considered in the next study: further examination into equipment costs may reduce the level of investment required.

3.9.2 Factory design

If the plant's products are to penetrate European markets, the design, construction and materials used must conform to forthcoming EEC regulations. This is particularly important in the fish room, canning and packing areas and in relation to hygiene in general. Details of the future EEC regulations are not yet known; therefore, in the absence of any EEC inspectors to provide guidelines, the opinion of the technical representatives of the the major UK importers should be sought. (These importers account for some 90% of the tuna imported into the UK.)

In any case, employees will be spending a considerable part of their time in the plant and it is important to create the right environment in order to obtain the best efficiency. The factory should be bright, spacious and well ventilated.

3.9.3 Quality assurance

Of late quality assurance has become an important part of any food

processing operation. The customer must be assured that the product purchased will always conform to specific quality standards. This is why there is provision in the manning budget for so many supervisors and inspectors. However, the concept of quality assurance must not be limited to those whose task it is to carry out inspections. Every person must be made aware of its implications and become involved with the application of the genuine quality assurance programmes.

3.9.4 Future expansions

The plant outlined is a basic tuna processing facility. The equipment provided for in the plant does not allow for the smaller details with can extract further value from the fish.

They have been omitted in order to minimize the investment and borrowings. The following expansions should be considered as soon as financial constraints permit:

(a) installation of a secondary tuna canning line to produce tuna steaks, flakes and pet food when necessary or produce fish balls from the red meat not used in the standard tuna packs;

(b) installation of a fish meal plant to convert all the unusable material into concentrate protein meal. With further equipment, this plant would produce pelletised fish for the local fish farm.

(c) installation of a sustained cold storage facility incorporating additional freezing capacity. With this facility additional tuna products for the frozen markets could be produced. These include cutlets, fillets, and Individually quick frozen loins for the retail trade.

The tuna plant could then produce a complete range of tuna based products.

PART III NOTE ON THE FEASIBILITY OF SARDINE AND MACKEREL CANNING

The cannery at Tema Food Complex is designed specifically for these products. It is plant is due for refurbishment in the immediate future but was originally equipped to produce products of a high quality which the local market could not afford: the canned sardines in 200g oblong cans which were being sold in the market at some 280 cedis. Considering that the average daily wage before allowances amounts to some 300 cedis, the average working person in Ghana could purchase one can per day and have nothing else left to pay for rent, schooling, clothes etc. One 200g can of sardines would not go far in a Ghanaian family. The Thai-produced jitry can was also being sold in the local market at 150 cedis each. This, too, was expensive when related to the average basic salary of the people.

The canned sardine industry is based on producing and selling large volumes. In order to do so in Ghana, the product must be in the market at a price of not more than 100 cedis. A factory to produce the volumes necessary would have to be purpose-built and include a can-making facility. The cans provided for sardines are 2 piece drawn cans which can be made in the same manner as the tuna can. For mackerel, the can is a 3 piece can which requires specialized equipment. In view of this mackerel canning and perhaps sardine canning should be reconsidered after the decision as to the type of can-making facility has been made.

Provisionally the total cost is estimated as:

can making	US$ 0.8 million
factory	4.5 million
total	US$ 5.3 million

The sardinella species found in Ghanaian waters have very hard scales and therefore must be scaled individually by hand as mechanical scaling will seriously damage the fish. This then doubles the labour cost and at the same time, the local costs.

The locally caught sardinella range in price from US$ 191 to US$ 320 per metric ton. Frozen fish average US$ 450 per metric ton.

The following basic cost structure emerges:

22 tons of fish per day x 240 days per year			5,280 t
of which 1,700 t is purchased fresh			US$ 510,000
3,580 t is purchased frozen			US$1,432,000
Total			US$ 1,942,000
Average cost:			US$ 367 per ton
Yield sardinella:	50% of	1,700 t	850 t
imported:	53% of	3,580 t	1,969 t
Total usable meat:			2,819 t
Cost of finance per year			US$ 1,399,200
Cost of finance per kg usable meat			US$ 0,496

Conclusion: Mackerel and Sardine canning is just feasible provided that:

(a) the investment in plant and equipment is kept to the minimum so as to reduce repayment costs:

(b) at least 60% of the fish meat used is imported fish. It will save some US$ 50 per metric ton if frozen fish were used instead of the fresh locally-caught high-priced out of season fish:

(c) the exchange rate of the cedi to the dollar remains constant or changes in an inverse ratio to the rate of disposable income. This will then keep the price of the imported materials, which amount to 60% of the product cost, at manageable levels.

There was insufficient time to go deeper into the canning of these two types of fish. However, further investigation in the follow up study would be useful.

It is suggested that UNIDO and the authorities responsible for the refurbishment of the canning plant in the Tema Food Complex cooperate to provide for a plant that would be much more economically viable than the existing one.

SARDINE AND MACKEREL CANNING

PRODUCT COSTING AND ESTIMATED RETAIL PRICE FOR CANNED SARDINE AND MACKEREL (US$)

PRODUCT	CANNED PRODUCT SARDINE 50x155 G	MACKEREL 50x155 G
Whole fish cost	367	475
Yield	54,40	70
Kg.per Can	7,50	7,50
Cans/ton	72,53	93,33
Overhead cost per kg 90%	,046	,046
Utilities cost per kg 5%	,031	,031
Labour cost per kg 80%	,064	,064
Variable overhead cost per kg	,038	,038
Loan repayment cost per kg	,490	,490
Overhead cost per carton	,345	,345
Utilities cost per carton	,233	,233
Labour cost per carton	,480	,480
Variable overhead cost/carton	,285	,285
TOTAL PER CARTON	1,343	1,343
Fish cost per carton	5,060	5,089
Can cost per carton	3,400	3,400
Carton cost	,510	,510
Label per carton	,620	
Condiment cost per carton	-	-
TOTAL COST EX STORE PER CARTON	10,932	10,342
Loan repayment per carton	3,670	3,670
Cannery margin per carton	,540	,540
Selling price per carton	15,142	14,552
Sales tax per carton	3,407	3,407
Distribution per carton	,300	,300
Retail price per carton	18,849	18,259
Retail price margin 15%	2,827	2,739
TOTAL COST PER CARTON	21,677	20,998
Cedis	6619,900	6619,900
Per Can	132,30	132,30

NOTE: Assuming cans made locally

Table 1 Pioneer Food Canning Corporation - Throughput capacities (mt/8 hour shift)

(a) Current

Fish size	Cooking (12 hour shift) 14 racks	(including 10 mt precooked)	Picking (96)	Hand Packing/ Filling	Seaming (120 cpm)	Retort
Small (1 kg)	23.5	33.5	18.0			
Medium (1.5 kg)	20.5	30.5	19.5			
Large (2.5 kg)	19.5	29.5	23.5			
All sizes				15.4	23.0	57.0

Comment: Currently constrained by hand-packing on an 8 hour shift. Hand-packing and seaming periods must be extended to accommodate maximum picking capacity. Total number of cooking racks is 35, sufficient for only 2 cooking cycles of 14 racks each.

(b) Future after re-equipment as planned by Starkist staff

Small	23.5	33.5	22.5			
Medium	20.5	30 5	24.5			
Large	19.5	29.5	29.0			
All sizes				23.0	23.0	57.0

Comment: Introduction of 120 cpm packshaper increases filling capacity. Extra cooking capability (i.e. extra shift) would be required together with extra racks (35 + 35 70). The space saved by using the machine to pack instead of hand will allow for a further 24 pickers. Total number of pickers after reequipping: 120.

Table 2

Carton Making - indicative manufacturing costs from imported board.

cost of machinery	L 59.000		
cost of freight	1.418		
C & F price equipment	60.418	US$	99.689
installation expense			9.735
building cost 75 sq m			6.000
working capital in one month			40.000
investment total		US$	155.424
Say			156.000

to produce 1.000.000		
loan repayment p.a.	38.687	
operating cost at 10% of investment	15.600	
technical aid and supervision	25.000	
total	79.287	
cost per carton	0.972	

Material cost

	L 167.5/1000	
1 fcl	11.000 pcs	
1 fcl	L 1.842.5	
Freight	1.583.65	
Total	3.354.65	
US$ 1.65/L -	US$ 5.535	0.0531
Total cost		0.582/pc

Table 3 Cold Storage Space in Tema

	Capacity 1987 (1)	Total Capacity April 1990	Operational April 1990	Capacity after refurbish	Available for tuna
Pioneer Cold Store	6.000	2.600	1.300	2.600	2.600
Mankoadze Cold Store		3.000		3.000	3.000
AFKO Fisheries	4.000	3.000	3.000		3.000
Ghana State Fishing Corp.	11.500	6.000	6.000		2.000
Tema Food Complex	5.000	5.000	1.300		
Nova	4.200	2.500	2.500		2.500
Pioneer Cooperative Cold Store	2.100	2.100	2.100		
Togbe Company Ltd.	3.500	3.500			
Kaas Fisheries Ltd.	2.500	2.500			
Tema Cold Storage	1.500				
Atlantic Ice Company	1.500				
Attok Fisheries Ltd.	1.000				
Kaleavo Enterprises Ltd.	800				
	44.600				

(1) National Marine Fisheries Association. Ghana Chamber of Commerce

Table 4 Structure of Imports of Canned Tuna (Major Importers and Suppliers)

(a) Imports 1984-1988

	1984	1985	1986	1987	1988	Annual Growth 1988/1984	Annual Growth 1988/1986
	t					%	
U.S.A.	7,733	10,296	10,761	10,077	12,570	12.9	8.1
U.K.	2,530	3,898	3,727	3,651	5,010	18.6	15.9
France	3,421	2,504	3,842	4,936	5,760	13.9	22.4
West Germany	2,011	2,087	2,672	3,310	2,944	10.0	5.0
Others Europe	2,665	2,803	3,590	5,053	4,898	16.4	16.8
Total	18,498	21,588	24,556	27,027	30,882	13.7	12.1

(b) Origin of imports

	Asia	West Africa	Pacific	Indian Ocean	Others	Major supplier
	%					
U.S.A.	93.3				6.7	Thai 73%
United Kingdom	68.7	3.3	13.7	6.6	7.7	Thai 59%
France		91.9			8.1	Cote d'Ivoire 64%
West Germany	81.7			2.8	15.5	Thai 82%

Source: Foodnews

Table 5: Comparative tuna prices

		F.O.B California March 90	F.O.B. Ghana March 90	Difference Ghana - California
		US$/t		%
Yellowfin Large	10 kg +	1,180	1,268	+7
Yellowfin Round 1	3.4 - 10 kg	970	824	-15
Yellowfin Round 2	1.8 - 3.4 kg	845	698	-17
Skipjack Jumbo	3.4 kg +	940	769	-18
Skipjack Round 1	1.8 - 3.4 kg	845	698	-17
Skipjack Round 2	1.4 - 1.8 kg	620	520	-16
Skipjack Round 3	1.4 kg -	375	294	-22

		F.O.B. Abidjan June 1987	F.O.B. Ghana May 1989	Difference May 89 - June 1987	Difference March 90 - May 1989
		US$/t		%	
Yellowfin Large	10 kg +	-	969		+31
Yellowfin Round 1	3.4 - 10 kg	630	661	+ 5	+25
Yellowfin Round 2	1.8 - 3.4 kg	621	528	-16	+17
Skipjack Jumbo	3.4 kg +	630	704	+12	+ 9
Skipjack Round 1	1.8 - 3.4 kg	621	528	-15	+32
Skipjack Round 2	1.4 - 1.8 kg	41.6	348	-16	+49
Skipjack Round 3	1.4 kg -	no quotes	126		

Table 6: Price Variations for Ghanaian Tuna Exported to Puerto Rico, May 1987 to March1990, F.O.B. Abidjan/Tema

Month / Year		July 1987	July 1988	March 1989	May 1989	Sept. 1989	Nov. 1989	Dec. 1989	Jan. 1990	March 1990
		US$/t								
Yellowfin Large	10kg +	1025	1282	1079	969	1174	1390	1393	1521	1438
Yellowfin Round 1	3.4-10 kg	891	908	771	661	809	905	920	941	906
Skipjack Jumbo	3.4kg +	824	992	704	704	72	808	813	813	769
Yellowfin/Skipjack	1.8-3.4 kg	838	823	639	528	649	729	736	743	687
Yellowfin/Skipjack	1.4-1.8 kg	771		458	348	466	536	547	545	487
			598							
Yellowfin/Skipjack	1.4 kg -	544		236	126	260	303	311	317	278

Comparative prices for Maldive exports to Thailand, July 1988 and November 1989

Month / Year		July 1988	Nov. 1989
		US$/t	
Yellowfin Large	10 kg +	990	1000
Yellowfin Round 1	3.4 - 10 kg	860	900
Skipjack Jumbo	3.4 kg +	840	825
Yellowfin/Skipjack	1.8 - 3.4 kg	770	780
Yellowfin/Skipjack	1.4 - 1.8 kg	640	675
Yellowfin/Skipjack	1.4 kg -		

Sources: Telexes from Starkist to Ghanaian fishing companies.
Maldive State Trading Organization.

Table 7 Estimated can-making and reforming costs

(a) Can-making: 307 x 112 can - production 240 days x 8.7 hours:
300 cans per min at 80% - 125,280 per day
240 days = 30 million

	US$
Plate (per 1000 sitra)	
F.O.B. USA:	129.852
Ins and freight	34.650
Total C & F Tema	164.502
Clearing	198
Landed. Tema	164.700

4.59 million cans/1000 sitra gives a cost of plate per can of US$ 0.0358

Ends (container of 1.1 million)

	L sterling
F.O.B. UK	20.790
Freight	1.370
Currency adjustment (freight)	46
Total C & F Tema	22.206
Clearing	120
Landed Tema	22.326

= US$ 36.838

1.1 million cans per container gives cost per end of US$ 0.0334

Total material cost per can US$ 0.0692

Production Cost (30 million cans per year)
(= 1,008,000 cartons x 48 cans)

	US$
Power cost	6,536
Labour cost	17,866
Managements	35,532
Overheads	81,095
Total	141,029

30 million cans gives a cost per can of US$ 0.0047

Total Cost per Can	US$
Materials	0.0692
Production	0.0047
	0.0739
Cost per carton (48 cans)	3.55

(b) 603 x 408 can reforming costs

Materials (per 1000 cans)

	L sterling	US$
Flats, F.O.B. UK	170.60	281.50
Ends, F.O.B. UK	123.62	203.95
Freight		31.55
Total		517.00

Production Cost (280,000 cans/year)

Salaries	3.464
Power, fuel, consumables (19%)	16.179
Management (19%)	6.750
Total	26.393

280,000 cans gives cost per can of US$ 0.094

Total cost per can US$ 0.611

Total cost per carton of 6 cans US$ 3.67

Table 8 Capacity of Equipment

Shift (1)	Size of fish	Cooking	82 racks (approx)	180 cpm 307 x 113 Seamer (no breaks)	Retorting 307 x 113 only	Retorting 603 x 307 and 307 x 113
Single (9 hours)	small	41.5	6.0 (28)			
	medium	38.5	19.0 (52)			
	large	33.6	32.8 (82)			
	all sizes			38.19	36.4	40.9
Extended shift (12 hours)	small	56.7	10.0 (28)			
	medium	55.6	16.5 (82)			
	large	42.0	32.8 (82)			
	all sizes			51.9	48.40	55.27
2 shift (16 hours)	small	68.5	14.0 (38)			
	medium	68.48	25.0 (60)			
	large fish	50.40	32.8 (82)			
	all sizes			69.2	56.00	65.00

(1) Machinery working hours exceed hours effectively worked by individual staff members.
Hours worked by fish cleaners in single, extended and double shifts are given in following tables.

Table 9 Capacity of Fish Cleaning Tables (20 tables x 6 cleaners 120 cleaners)

Fish Size	Weight (kg)	Number per tray	Picking Standard (pieces/hr)	Shift	Total Working Hours	Throughput max	Throughput min
Small	1	18 - 25	22 - 27	Single	7.5	24.3	19.8
				Extended	10.25	33.2	30.7
				2 Shifts	14	45.3	42.0
Medium	1.5	10 - 14	17 - 20	Single	7.5	27.0	24.3
				Extended	10.25	36.9	33.2
				2 Shifts	14	50.4	45.4
Large	2.5	6 - 8	12 - 15	Single	7.5	32.6	28.3
				Extended	10.25	46.5	39.9
				2 Shifts	14	64.0	54.6

Table 10 Capacity of Fish Cleaning Table (220 cleaners)

Fish Size	Weight (kg)	Number per tray	Picking Standard (pieces/hr)	Shift	Total Working Hours	Throughput max	Throughput min
Small	1	18 - 25	22 27	Single	7.5	40.5	37.5
				Extended	10.25	55.4	51.3
				2 Shifts	14	75.6	70.0
Medium	1.5	10 - 14	17 - 20	Single	7.5	49.0	40.5
				Extended	10.25	67.7	57.3
				2 Shifts	14	92.4	78.5
Large	2.5	6 - 8	12 - 15	Single	7.5	56.3	48.8
				Extended	10.25	76.9	66.6
				2 Shifts	14	105.0	91.0

Table 11 Pre-Operating Costs

(a) General Expenses

	Work months	Techn. grant	Investment	Total
		----------US$----------		
Design plant/equipment			50.000	
Design civil works			45.000	
Project management	15		50.000	
General manager	15	50.000	14.000	
Plant manager	15	50.000	14.000	
Financial controller	12	15.000	18.350	
Personnel manager	6		1.712	
Local engineering	6			
Clerical	6		815	
Travel & communications			35.000	
Miscellaneous expense			25.000	
Can maker	6	20.000	15.000	
Production manager	3	10.000	35.000	
Administration	15		4.280	
Total		145.000	308.157	453.157

(b) Cannery/freezing

Material	Stock on hand days	Quantity	Value in stock	+ Value in transit	Total
			----------US$----------		
Frozen Fish	15	750 mt	450.000	nil	
307 x 113 cans	10	1.2 million	72.000	72.000	
307 ends	10	1.2 million	40.000	40.000	
603 x 408 cans	10	18.500	1.550	1.550	
603 ends	10	18.500	1.500	1.500	
loin cartons	10	12.600	12.000	12.000	
307 cartons	10	25.000	12.750	12.750	
603 cartons	10	6.000	2.500	2.500	
307 labels	20	2.4 million	25.000	25.000	
603 labels	20	40.000	2.000	2.000	
vegetable oil		30 t	35.000	35.000	
consumables			15.000	15.000	
Total			667.850	717.850	885.700
Wages 7 months					113.000
Misc cash expenses					50.000
Total					1.048.700

Table 11 continued

(c) Can-making

Material	Stock quantity	Value in stock	+	Value in transit	Total
		----------US$----------			
plate	1.000 sitra	164.700		164.700	
307 ends	4.59mill	153.300		153.300	
603 bodies	13.000	4.000		4.000	
603 ends	26.000	3.000		3.000	
Total		325.000		325.000	650.800
Wages 2 months					39.000
Misc cash					5.000
Total					744.000

TABLE 12
GHANA TUNA PROCESSING FACILITY

ESTIMATED PRODUCT COSTING AND ANNUAL RETURN (US$)

	CANNED PRODUCT - Tuna Chunks				FROZEN COOKED CLEANED TUNA		
CANS/CARTON	48	48	6	6			
PRODUCT (in oz)	6 1/2 OIL	6 1/2 WATER	66 1/2 OIL	66 1/2 WATER	2X10 Kgs Loins	2X10 Kgs Pieces	
Cost of raw tuna (US$ per mt)	600	600	600	600	600	600	
Kg of white meat per mt of tuna	350	350	350	350	400	400	
White meat per carton (kg)	6,96	6,96	8,25	8,25	20	20	
Carton per ton of whole fish	50,29	50,29	42,42	42,42	15	5	
Overhead cost/kg of whole fish	,066	,066	,066	,066	,074	,074	
Utilities cost/kg of whole fish	,066	,066	,066	,066	,193	,193	
Labour cost/ kg of whole fish	,080	,080	,080	,080	,100	,100	
Variable overhead cost/kg w. f.	,043	,043	,043	,043	,043	,043	
Loan repayment cost/kg of w. f.	,406	,406	,406	,406	,406	,406	
Overhead cost per carton	,459	,459	,545	,545	1,474	1,474	
Utilities cost per carton	,459	,459	,545	,545	3,860	3,860	
Labour cost per carton	,557	,557	,660	,660	2	2	
Variable overhead cost/carton	,299	,299	,355	,355	,860	,860	
TOTAL COST PER CARTON	1,775	1,775	2,104	2,104	8,194	8,194	
Fish cost per carton	11,931	11,931	14,143	14,143	30	30	
Can cost per carton	3,700	3,700	3,670	3,670			
Plastic bag per carton					,200	,200	
Straps per carton					,020	,020	
Carton cost	,510	,510	,430	,430	,960	,960	
Label cost per carton	,612	,612	,229	,229	,010	,010	
Condiment cost per carton	1,380	0	2,080	0	0	0	
Cold Storage (1 week)					,160	,160	
TOTAL COST EX STORE PER CARTON	19,908	18,528	22,656	20,576	39,544	39,544	
Shipping cost per carton	,048	,048	,048	,048	,048	,048	
FOB cost per carton	19,956	18,576	22,704	20,624	39,592	39,592	
Freight per carton	,882	,882	,955	,955	2,880	2,880	
C&F Cost per carton	20,838	19,458	23,659	21,579	42,472	42,472	
Selling price per carton	24,800	23,800	27,500	26	57,500	45,390	
Margin per carton	3,962	4,342	3,841	4,421	15,028	2,918	
Loan repayment per carton	2,826	2,826	3,350	3,350	8,120	8,120	
	1,136	1,516	,492	1,072	6,908	-5,202	
Marketing Costs (4.0 %)	,834	,778	,946	,863	1,699	1,699	
NET PROFIT (RETURN)	,302	,738	-,454	,209	5,209	-6,901	
Income per ton	1247,126	1196,839	1166,667	1103,030	862,500	226,950	
Gross Margin per ton	199,227	218,336	162,968	187,574	225,420	14,590	
Return Per Ton FISH	15,211	37,096	-19,280	8,856	78,137	-34,504	
Estimated Production (Cartons)	332000	221000	No production	46600	16500	5500	TOTAL
Margin on Selling price	1315308,11	959531,49	-	206036,91	247962	16049	2744887,51
Loan Repayment	938152,32	624492,96	-	156086,70	133980	44660	1897371,98
Marketing fees/costs	276731,675	172010,741	-	40222,524	28031,520	9343,840	526340,30
TOTAL PROFIT	100424,12	163027,79		9727,68	85950,48	-37954,84	321175,23

NOTE: Ton refers to one ton of whole fish unless stated otherwise.

Notes to Table 12

1. Whole Fish. Prices for tuna in Tema vary considerably according to the prices paid by Starkist and the demands of the local markets. The following have been taken as typical:

Species	Size	US$/t
Yellowfin	R1 3.4 - 10kg	850
	R2 1.8 - 3.4kg	680
	R3 1.8kg minus	540
Skipjack	Jumbo 3.4kg plus	725
	R1 1.8 - 3.4kg	680
	R2 1.4 - 1.8kg	540
	R3 1.4kg minus	540

Using these prices, the average price can be calculated as follows:

SJ/YF	R1 40% at US$ 680	= 22 t	= US$ 14,960
	R2 10% at US$ 540	= 5.5 t	= 2,940
	R3 50% at US$ 540	= 27.5 t	= 14,850
Total		55 t	= US$ 32,740

Average US$ 595, say US$ 600/ton

(Average size of fish = 1.39 kg)

Notes: (i) More SJ R2 should be used but there seems to be an uncommonly low proportion of the size in the catch statistics available. Were it available, then the average size, and therefore the volume throughput, would increase without any increase in the average price.

(ii) The high price paid for the SJ R3 size is due to local market conditions which fluctuate according to the availability of Sardinella and other more popular fish.

2. Yields. Average yields of white meat are estimated as follows:

Skipjack 35%
Yellowfin 40%

It was not possible to get accurate yields from Pioneer Food Canning as this was considered confidential information. The above yields are based on previous experience in other countries.

The use of hydrolysed protein to supplement yields is well known throughout the industry. However, the use of this is expected to be banned or severely limited by the forthcoming EEC regulations. As a result, major buyers in Europe are discouraging the use of this aid. For the purposes of this study the use of the hydrolysed proteins has not been considered.

It is expected that yields will gradually improve as the skill of the work force develops.

3. Overheads. Administrative overheads are based on figures gleaned from the local administrative employees and salaries according to the proposed manning rates. Annual costs are estimated as follows:

	US$
administrative labour cost	49.653
administrative labour cost	126.900
ancillary staff costs including engineering	62.322
operational costs stationery etc.	10.000
communications	15.000
land lease (estimated)	9.585
presentation	5.000
representation	4.500
plant maintenance and spares at 1.5% of purchase	60.440
insurance: plant and maintenance	45.794
employees	13.552
motor vehicles	2.728
Total US$	405.474

Overhead costs have been allocated as follows:

can making	20%	US$ 81.095	
fish room	55%	US$ 223.010	= US$ 0.0482 per kg white meat
canning	20%	US$ 81.095	= US$ 0.0178 per kg white meat
freezing	5%	US$ 20.273	= US$ 0.0255 per kg white meat

Administrative overhead factors used:

canning = US$ 0.066 per kg canned
freezing= US$ 0.0747 per kg frozen

4. Utilities. The prices used for boiler fuel, electric power and water have been based on invoices dated December 1989. They are as follows:

boiler fuel	- c 68.860	= US$ 220 per ton
electric power	- c 17.05	= US$ 0.0544 per kwh
water	- c 720 per 1.000 gallons	= US$ 0.505/mt

The total estimated annual consumption per year of each cost is allocated to fish room, canning and freezing sections according to the amount of white meat each section produces or uses each year.

(a) Fuel: estimated consumption = 1.161./ @ US$ 220/t = US$ 255.582
US$ 0.0353 per kg white meat

fish room	50%	= US$ 0.0276 per kg white meat
canning	50%	= US$ 0.0276 per kg white meat

(b) Power: estimated consumption = 706.022 kwh @ US$ 0.0544 per kwh
= US$ 38.407
= US$ 0.00831 per kg white meat

fish room	18%	= US$ 0.0015 per kg white meat
canning	54%	= US$ 0.0045 per kg white meat
freezing	28%	= US$ 0.0023 per kg,
		+ peak loading US$ 0.1627

the peak demand caused by the compressor loadings will trigger higher charges. This has been taken as US$ 0.165 per kg of fish frozen less the calculated usage. Power consumption for the can making plant has been kept separate.

(c) Water: estimated consumption 72.000 tons @ US$ 0.527 per ton
US$ 37.944
US$ 0.0081 per kg white meat

fish room/freezing	US$ 0.0028/kg white meat
canning	US$ 0.0053/kg white meat

Fish rooms and freezing have been combined in this case as the cost per kg used in the freezing sections is negligible compared to the rest of the plant.

Summary of utility cost factors (US$/per kg of white meat):

canning		freezing	
fuel	0.0553	fuel	0.0276
power	0.0060	power	0.1627
water	0.0053	water	0.0028
total	0.066	total	0.1931

5. Labour. Salaries and allowances used in the calculation are those proposed by the Pioneer Food canning, administrator as of 29//1/89, they are as follows.

Basic salaries

	Gross monthly pay	Hourly rate
	US$	
Senior managers	105.02	0.656
Managers	83.50	0.521
Assistant managers	67.65	0.422
Supervisors	55.91	0.349
Skilled personnel	35.36	0.221
Clerical staff	31.91	0.199
Security staff	23.96	0.149
Night watchmen	25.53	0.159
Factory hands	22.42	0.140
Labourers	20.70	0.129

The hourly rate is calculated on a basic 160 hour month (20 x 8 hrs).

Allowances. % of basic salary

Company social security	12.5
Transport allowance	50
Rent allowance	20
Leave allowance	10
Medical allowance	6.3
Food allowance	2.2
Soap allowance	2.5
Night allowance (factory only)	1.3

These have been costed into the payroll budget even though some allowances will be paid in kind. Some modifications to the allowances have been made for foreign personnel. Details of these and other allowances can be seen in the Appendix . Manpower budget and salary costs. All overtime has been calculated at basic plus 50%.

Labour costs have been calculated by department and expressed as a total in dollars per kg of meat produced, frozen or canned. It is estimated that the departments will utilize the fish as follows:

fishroom 1 & 2 = 4,673,330 kg white meat
warehouse/canning = 4,233,330 kg white meat
freezing = 440,000 kg white meat

Departmental labour costs are estimated as follows:

fishroom 1 & 2 = US$ 309,169 - US$ 0.0661/kg of white meat
warehouse/canning = US$ 61,062 - US$ 0.0144/kg of white meat
freezing = US$ 15,124 - US$ 0.0343/kg of white meat

Summary cost factors are therefore:

canned products = US$ 0.0805/kg of white meat
frozen loins = US$ 0.1004/kg of white meat

6. Variable overheads (consumable stores)

uniforms = US$ 12,360
detergents = US$ 4,756
total US$ 17,116

cannery	90%	US$ 15,404
can making	10%	US$ 1,712

Reserve frozen fish kept in stock to ensure supply when landings are intermediate.

Reserve frozen fish cold storage charges 750 at US$ 4.79/t/week
US$ 186,900

cannery total US$ 202,304
US$ 0.0437 per kg white meat

7. Cartons. The prices used are those provided by the Ghana Carton Box Manufacturing Company.

8. Labels. Cost based on a batch shipped from Abidjan late 1987 allowing for inflation at 5% per year.

			C.F.A.
Labels:	327,500	costing	917,000
Air freight		at C.F.A	100,960
Total			1,017,960

at C.F.A. 282/per dollar US in 1987 - US$ 3,609
after adjustment for inflation 1990 price - US$ 4,177
327,500 labels - US$ 0.012 each
US$ 0.612/carton

603 x 408 can labels calculated pro rata - US$ 0.229/carton

9. Vegetable oil (condiment). Based on quotes from a supplier to canneries in the U.K.

	L Sterling/ton	
Safflower oil ex refinery UK	341	
Drums	90	
Transport	128	
Total F.O.B. UK	559	- US$ 922.35
Freight (based on 10 ton container)	135.0	
Clearing "	4.6	
Cartons	2.2	
Total	141.8	- US$ 233.9
Total		- US$1156.25

Usage:	6.5 oz	66.5 oz
	25g/can	300g/can
	1.20kg/carton	1.8kg/carton
	US$ 1.38/carton	US$ 2.80/carton

10. Shipping and freight. Costs obtained from a shipping company and Mankoadze Fisheries shipping department staff:

Loading, based on previous experience
1,500 cans 48 x 6 1/2 - US$ 0.882 per carton
1,385 cans 6 x 66 1/2 - 0.955 per carton

Freight Tema to Northern Europe - DM 2,250 per 20 foot FCL
at 1./DM/1US$ - US$ 1,323 per 20 foot FCL

11. Selling price. The products will be targeted for the European market, particularly the United Kingdom. The following C & F prices have been taken:

Canned products	Oil	Water
	------US$/carton-----	
48 x 7 oz Skipjack solid	27.25	26.25
48 x 6.5 oz Skipjack chunk	24.80	23.80
48 x 6.5 oz Skipjack flake	15.00	14.00
6 x 66.5 oz Skipjack chunk	27.50	26.00

Frozen products for canning, based on prices current in Europe:

2 x 10kg block	Skipjack loins	US$ 2,875 per ton
2 x 10kg block	Skipjack pieces	2,269.5 per ton

It was not possible to obtain the prices Starkist were paying Ghana for these frozen tuna loins as it was a closely guarded secret. Discussions with various marketing organizations indicate that frozen tuna loins for canning are priced some 20% below the frozen yellowfin loin priced for catering in Southern Europe. There was insufficient time available for a complete market investigation.

12. Marketing costs. The 4% marketing estimate covers all routine marketing costs. Commissions range from 3% to 5% depending upon the outcome of negotiations between the parties concerned. It is envisaged that any marketing agreement formed will run parallel to the loan agreements and will terminate at the same time as the loans. By which time Ghanian canned tuna will have established itself on the world market.

13. Loan repayment. US$ 7,197,000 repaid over 5 years at 8% interest with 1 year's grace. (See Section 3.5).

The loan repayment is based on the total annual repayment against the anticipated amount of white meat produced each year.

Average annual payment - $1,900,008[1/]

Anticipated white meat production 13200 MT at 35.45% Yield 4,679,400kg

Therefore, repayment $0.406 per kg white meat

Table 12 Conclusions

The net return from this table provides a net return of some $0.301 million. That is after paying all operating costs and loan repayment of $1.89 million together with $0.526 million in marketing costs.

Therefore, when the marketing agreements have been completed the anticipated net return to the Ghanaian owners should be in the region of $2.2 million.

The return per ton or per unit produced indicate that, with the exception of 48 x 6.5 ounce tuna in brine (water) production, frozen loins and pieces produce returns greater than the other canned products. This would indicate that frozen loin production may be an alternative to canning. Further investigation into investment marketing, and some technical aspects should be carried out in the next phase of this programme.

1/ Refer investment costs 3.5

Table 13 Foreign and Domestic Resource Use

Foreign Exchange Costs:	US dollars (million)		Cedis ('000 million)
packaging (labels)	0.349		
plate	1.074		
ends	1.002		
4lb cans	0.145		
vegetable oil	0.458		
exportable fish	4.322		
loans and marketing	2.42		
Total	9.770	9.770	3.058
Exports	15.904		
Local sales	0.193		
Total Sales	16.097	16.097	5.038
Available for local expenses		6.327	
Local expenses:			
Admin. operations	0.025		
cold stores	0.189		
salaries	0.678		
cartons	0.323		
uniforms	0.012		
fuel	0.255		
water	0.038		
power	0.038		
insurances	0.062		
ports	0.030		
land	0.009		
fish purchases	3.568		
shipping (freight)	0.556		
R & R miscellaneous	0.075		
consumable stores	0.011		
Total	5.831	5.831	1.825
Surplus		0.496	0.155

N.B. Exportable fish is considered a foreign exchange cost as this fish purchases locally in cedis at exchange rate values.

Exchange rate used 313 cedis $1.00

APPENDIX 1 - PIONEER FOOD CANNING CORPORATION

Capacity

Until mid 1987 the plant produced about 165,000 cartons of 6.5 oz and 7 oz tuna per year. The capacity of the different sections of the plant depend on a number of factors and the size of the fish being processed. These are discussed below and summarized in Table 1.

(a) Cooking: The plant has one double cooker capable of cooking 14 racks per batch. Based on an average cooking time of around 45 minutes and a total turn round time for the cooker of 2 hours, current capacity is between 20 and 25 mt per 12 hours, depending upon the size of the fish. With the current 35 cooking racks the factory can cook about 10 tons of fish prior to the start of production. Thereafter the cooking rate will depend upon the release of racks from the picking.

(b) Picking (The separation of skin, bone and red meat from the white meat use for canning): The number of pickers that can be comfortably accommodated in the picking area is approximately 96. Output is estimated at 18 - 23.5 mt per 12 hours.

(c) Hand packing: This operation, which includes the guillotining of cleaned meat, the supply of empty cans, handfilling, weighing of each can, the adding of other ingredients and seaming, employs some 67 people of which 36 are actually packing cans. The 36 packers work in 4 lines of 9 people and each line packs an estimated 20 cans per minute, giving a total of 80 cans per minute. In 8 hours these packers are therefore capable of packing 38,500 cans equivalent to 15.4 mt of fish. This is rather low. The canning lines are constrained by the hand filling operation, and there is little room to increase the number of packers.

(d) Can seaming (closing the filled cans): There are two 3B6 steam flow can seamers to seal 307 x 113 cans. Each seamer is capable of seaming at a rate of 60 cans per minute. This gives a total capacity of 120 cans per minute.

Capacity per 8 hour shift 57,600 cans
1,200 cartons by 48 cans
23 mt of whole fish

There is also a single head 603 x 408 seamer for seaming the filled, reformed 4 pound tuna cans for the US market. But this does not seem to have been used since 1985.

(e) Retorts: There are currently 15 manually-operated vertical retorts of considerable vintage. Each retort is connected to a time and a temperature recorder. Individual retort capacities are:

- 3 large retorts each holding 10,368 307 x 113 cans 216 cartons
- 2 small retorts each holding 7,200 307 x 113 cans 150 cartons

It is difficult to gauge the throughput capacity accurately. Theoretically, based on an average filling time per retort of 30 minutes, plus Pioneer's process time of 90 minutes and a 30 minute can cooling period, giving a total cycle time of 2 hours and 30 minutes, the retort capacity in an 8 hour retort filling period would be:

- small retorts - 7 cycles by 150 cartons 1,050 cartons
- large retorts - 9 cycles by 216 cartons - 1,944 cartons
Total - 2,994 cartons

At 52 cartons per mt 57 mt of whole fish.

Therefore, the retorting capacity of this plant is well in excess of the cooking and packing capacity.

Modifications required in order to sell canned tuna in Europe after 1992

(a) Machinery: Canned tuna will have to be handlaved into a mechanical can filling machine (Parkshaper).

Approximate machinery costs:

- Reconditioned packshaper rated at 120 cans per minute installed	US$ 60,000
- Reconditioned 307 x 113 seamer at 150 cans per minute	50,000
- Locally built can washer including pumps	20,000
- Empty can supply equipment to packshaper including empty can washer	15,000
Total for the new line	US$ 145,000

(b) Factory building and layout:

(i) A suspended ceiling fixed approximately 12 feet high over the fish cooling and cleaning areas.

(ii) The rusty steel panels around the cooking area will have to be completely replaced.

(iii) The ventilation and air circulation throughout the factory will have to be improved, especially considering the dusty environment in Tema during the hot season. This may require installation of some form of mechanical air filtration.

(iv) All ledges, corners and joints between floors and walls, will have to be modified to facilitate better cleaning.

(v) All wooden surfaces will have to be replaced with impervious materials.

Total estimated cost for these modifications US$ 70,000.

Working capital sufficient for 12 weeks (60 days) work

Say 20 tons, or 1,040 cartons per day: 62,400 cartons at current cost of US$ 24.5 per case US$ 1,528,800

Effluent treatment

All the waste water from the plant, including the cook water, passes through a system of "manually" controlled screens to remove most of the larger particles before it is discharged into the canoes harbor.

There is no enforced legislation regarding effluent water treatment. But the environmental issue is becoming a major concern for most developing nations and eventually Pioneer will be required to consider this problem. Unfortunately, there is no vacant land within close proximity of the plant on which to construct a suitable water treatment facility.

Table 1 Pioneer Food Canning Corporation - Throughput capacities (mt/8 hour shift)

(a) Current

Fish size	Cooking (12 hour shift) 14 racks (including 10 mt precooked)		Picking (96)	Hand Packing/ Filling	Seaming (120 cpm)	Retort
Small (1 kg)	23.5	33.5	18.0			
Medium (1.5 kg)	20.5	30.5	19.5			
Large (2.5 kg)	19.5	29.5	23.5			
All sizes				15.4	23.0	57.0

Comment: Currently constrained by hand-packing on an 8 hour shift. Hand-packing and seaming periods must be extended to accommodate maximum picking capacity. Total number of cooking racks is 35, sufficient for only 2 cooking cycles of 14 racks each.

(b) Future after re-equipment as planned by Starkist staff

Small	23.5	33.5	22.5			
Medium	20.5	30.5	24.5			
Large	19.5	29.5	29.0			
All sizes				23.0	23.0	57.0

Comment: Introduction of 120 cpm packshaper increases filling capacity. Extra cooking capability (i.e. extra shift) would be required together with extra racks (35 + 35 70). The space saved by using the machine to pack instead of hand will allow for a further 24 pickers. Total number of pickers after reequipping: 120.

Table 2 Pioneer Food Canning - estimated canning costs

Pioneer were reluctant to provide full details of costs. However, a reasonably accurate cost structure can be formulated from information gained elsewhere. The approximate cost of resuming canning 4,800 mt per year (240 days x 20 mt/day) of whole fish would be:

	US$/carton (7.2 kg white meat)
Cans and cartons - various prices quoted range from US$ 6.50 to US$ 7.19 per carton of 48 cans	7.190
Fish - cost of whole round small fish unsuitable for export varies. Estimated average price to assure constant supplies: US$ 580/mt. Yield: 52 cartons per mt.	11.154
Vegetable oil - current world prices. US$ 924/mt at 24 gm per can	1.064
Labels: (1) US$ 0.61 per carton	0.610
Fuel: (1) US$ 220 per mt	0.308
Water: (1) US$ 2.29 per mt	0.114
Power: (1) US$ 0.054/kwh	0.053
Labour: (1) US$ 0.312 (new basic rate and allowances)	0.312
Fixed Overheads	0.776
Total Cost	21.029
Freight to Europe	0.920
Cost C & F Europe	21.949
Wholesale price Europe	24.80
Sales Margin	2.851
Loan repayment (2)	2.32
Net profit (loss)	0.531
Marketing expenses (if charged) @ 4% of C & F.	0.878
Net profit (loss) including marketing expenses	(- .347)

(1) Source: Mankoadze accounts.
(2) US$ 1.53 million @ 8% over 3 years (working capital)

Table 3 Estimated production costs and returns from production of frozen tuna loins

	US$ per mt of loins
Fish - whole round loins @ US$ 610 per mt (US$ 650/mt for whole round fish less sales of waste US$ 40/mt) at 36% yield white meat	1,694.4
Labour taken as 85.5% of canning costs (Table 2)	37.1
Fuel: 50% of canning cost	22.1
Water: 30% of canning cost	4.0
Electricity: 40% of canning cost	6.5
Packaging: carton and plastic bags @ US$ 1.16 per 20 kg carton	58.0
Blast freezing @ US$ 165 per mt	165.0
Fixed Overheads (as canning costs)	31.4
Total cost of production	2,018.5
Cold storage: 1 week	7.9
Ex store cost	2,026.4
Sea freight to Puerto Rico US$ 2,045.8 per 20 foot container, 14 tons load	146.0
Cost C & F Puerto Rico	2,172.4
Estimated price C & F Puerto Rico	2,875.0
Estimated margin	702.6

20 mt whole tuna 7.2 tons of white meat at US$ 703 US$ 5,062 per day.

Assuming 240 days work per annum, total returns US$ 1,215,000

APPENDIX 2 MANKOADZE CANNING EQUIPMENT AND BUILDING

Eviscerating and Precooking Equipment

1. 2 cylindrical type 321 stainless steel vessels with internal diameter 2 metres and 10 metres length, with controls;

2. 20 heavy gauge aluminium trolleys with perforated trays.

Capacity: Using average size (1.5 kg) fish, 30 t per 8 hour shift.

Comments: This equipment, which incorporates a cooling system under vacuum, was the first of its type to be produced. Later versions are rectangular, not cylindrical and can therefore use the more conventional type of cooking trolley and tray. There are not enough trolleys for holding a surge stock of cooked tuna. This is necessary because the rate of picking varies according to the size of fish.

There is no equipment for eviscerating and sizing the fish before cooking. This will be needed.

Steam Generating Equipment

1. Vee Chieftain boilers to produce 6170 lb/hour steam at 212 C with working pressure of 150 p.s.i;

2. Set boilerhouse equipment, tubes, fittings and spares;

3. Set of layout and tank fabrication drawings.

Comment: This equipment is sufficient to supply the steam requirements of the cookers and retorts provided, but there are no feedwater and boiler fuel tanks.

Picking Tables

1. 20 stainless steel 18 gauge 2.4 m x 1.2 m sheets for table top manufacture.

Comment: These table tops would have to be fitted with stainless steel bases in Ghana. The material for these bases will also have to be imported as very few stainless steel items are available. The 20 tables can accommodate 120 fish cleaners. While fish could be supplied to and removed from the tables by manual labour, it would be better to use the table tops as part of a mechanized picking line to minimize the handling of the fish and improve flow to the packing lines.

Canning Equipment

1. 20 head vacuum assisted rotary liquid filler for 307 x 113 (83 x 46 mm) cans;

2. 4 head automatic can seamer with steam flow for 307 x 113 cans;

3. Set drive and convevor parts, base frame for hook up of filler/seamer including, assembly and test run;

4. Set of electrical controls and operators panel for filler/seamer;

5. 4 head vacuum assisted rotary filler for 603 x 408 (152 x 105 mm) cans;

6. Automatic single head can seamer with steam flow for 603 x 408 cans;

7. Set cannery measuring and testing equipment;

8. Electronic metal detection unit for any metal contamination;

9. Empty can convevors with floor supports, empty can rinser and changeparts twists for 307 x 113 cans;

10. Empty can convevor, empty can rinser and changeparts twist for 603 diameter cans;

11. In-line check weigher with rejection unit and weight recorder;

12. Filler inter-connection convevor;

13. Seamer discharge convevor with filled can spray washer;

14. Elevator from can unloader.

Comments: The inclusion of changeparts indicates that the original concept was for a single basic canning line on which two different sized cans could be filled depending upon market requirements. The diversity of products demanded from canneries nowadays calls for much more flexibility than could be efficiently catered for by a single line, where production would have to be interrupted to adjust the equipment for each separate product. Any future cannery in Ghana should incorporate at least two separate lines each designed for a specific sized can. Thus more equipment is needed, particularly with regard to automatic weighing systems, fish filling equipment, empty and filled can moving equipment.

The 307 x 113 filling line has a canning rate of over 200 cans a minute and would need to be complemented by either

(a) a single high speed rotary filler

or (b) two moderate speed shaper machines working in tandem.

Option (a) produces a jumble style chunk product which is not always acceptable in Europe. Option (b) produces solid style chunks and tuna steaks but would be 15% more expensive because of the additional convevor equipment required.

In the future the installation of a second 307 x 113 line should be considered to allow the simultaneous production of chunks, steak or flake which would enable the plant to obtain higher returns from the fish being processed.

(a) Tuna steak (solid style) must be made from a specific size of whole loin but not broken loins or the smaller pieces of tuna meat. It sells at a price some 20% higher than chunk but would only utilize some 10% of the usable meat. The remaining 90% would have to be processed as chunk in order to utilize all the pieces and broken loins.

(b) Flake or shredded tuna is produced from the trimmings of the loin inspection tables. This can amount to some 3% of the white meat recovered from the fish. With a single line fully utilized packing chunk, this material would be sold as waste.

No liquid heating equipment has been provided. This will be necessary to ensure good vacuums in both size cans.

Retorting Equipment

1. Horizontal four-crate retorts with valves, pipework and gauges;

2. Recording controller sets with modulating valves, air sets and pipework;

3. 40 retort crates 85 x 85 x 85 cm;

4. Transporters for retort crates;

5. Polypropylene perforated layer pads;

6. Retort crate can loader;

7. Retort crate can unloader.

Capacity: 40 t of 307 x 113 cans per 8 hour shift.

Comments: The retorts provided are rectangular, which is quite uncommon in modern canneries. In Europe, Australia and USA rectangular retorts have been replaced by horizontal cylindrical retorts which have better steam circulation. The retorts provided also have manual controls and will therefore require constant supervision during the heating and cooling cycles. The number of retort crates and layer pads is insufficient: modern product safety standards require that there is at least a 12 hour period between retorting and crate unloading to allow for product stabilization and identification of any faults. The retorts provided have only one door. Some customers are already demanding that retorts be double-ended to avoid the possibility of unsterilized cans being mixed with sterilized cans and this requirement is likely to be included in new EEC regulations for imported canned products from 1992.

Labelling and Cartoning Equipment

1. Filled can conveyors and changeparts;

2. Roll through can labeler set for 307 x113 cans with changeparts and label plates for 603 x 408 cans;

3. Rolling can "f" style case packer with over conveyor to pack 3 x 4 configuraton of 307 x 113 cans.

Comment: There is insufficient equipment to handle the volume of cans from the 307 x 113 canning line. The labeler would need to be complemented by filled can feed and discharge conveyors, flow control switches, missed label detectors, a low vacuum detector and carton sealer. The 603 x 408 cans could be labeled on a much slower machine with manual feed and manual carton packing.

Miscellaneous

1. 600 litre stainless steel oil tank with feed pump.

2. Set of recommended first line spares.

Comment: The tank is not necessary as vegetable oil can be pumped direct to the filling equipment from the drums in which it is supplied.

Can Reforming Equipment

1. Reforming equipment for flattened 603 (153 mm) diameter cans, nominal output 12 cpm:

2. Model rl flat can body reformer with reforming roll and anvil to suit 603 diameter open top cans with machine stand.

3. Model fl flanger:

4. Model sa single head can seamer:

5. Set of recommended spares for above, toolkit and instruction/maintenance manual.

Comment: This is standard, satisfactory equipment.

Building - Remedial Works

Items requiring attention if the building were to be used to house a canning plant:

(a) The main supports are prestressed concrete pillars. It seems that the salty atmospheric moisture has penetrated the concrete and attacked the steel reinforcements. Some steel rods have almost completely corroded.

(b) The entire aluminium sheet roof would have to be replaced.

(c) The entire floor would have to be relaid to allow adequate fall to cater the new drainage systems and special provision would have to be made for the machinery to be installed. The load bearing characteristics of the floor are also in doubt due to possible corrosion of the steel reinforcements.

APPENDIX 3 - COLD STORAGE IN TEMA: Notes on visits to seven cold storage facilities and equipment in store

1. Pioneer Cold Store: Storage space 2,600 mt of which 1,300 mt operational. This plant was built in 1967 and consists of 4 storage rooms, two of 500 mt capacity and two of 800 mt. All rooms open into a refrigerated corridor which open at one end to the working area. All doors are manually operated and invariably left open during room operation. The room temperature of the two rooms in operation were observed at -5 C and the fish temperature was noted at -12 C. Temperatures of the fish at the wharf where it was being loaded into a reefer vessel were -9 C. Storage temperatures for tuna should not exceed -18 C. Prolonged storage of tuna at the temperatures observed would therefore result in deterioration in the quality of the fish.

The refrigeration was provided by 3 x 100hp Sabro compressors through floor mounted evaporators in each room. The original condensors and electrical installations are still in position although superseded by new equipment some years ago. The block ice making plant is no longer in use. Insulation of the rooms is provided by 16 inch cork in the walls and ceilings, supplemented by polystyrene blocks in the ceilings. In the two rooms not in use the insulation in the ceiling has collapsed.

2. Mankoadze Cold Store: Storage space 3,000 mt. This is quite a new complex built alongside Tema's original cold store which is now in disuse. The plant consists of three rooms each able to hold 1,000 tons. These rooms open into a central corridor through manually operated doors. Refrigeration is provided by 2 x 100kw Sabro 8-cylinder compressors. A third compressor is installed but has never been used. The evaporators are ceiling mounted and the condenser on the roof needs to be renewed. Thelogbook shows that that temperatures vary between -5 C and -2 C even when the rooms are closed. The insulation in the ceilings of all rooms had recently collapsed and the store itself was being emptied in preparation for repair.

Note: The Pioneer and Mankoadze cold stores had recently been awarded a refurbishment grant from Denmark valued at US$ 230,769. The refurbishment is scheduled to commence in June 1990 and to be completed before September 1990. The stores should then be fully operational.

3. AFKO Cold Store: Storage space - 3,000 mt (not 4,000 mt as previously reported). AFKO is a Ghanaian joint venture with a Korean partner. The complex, which also includes electrical and mechanical workshops, is designed to service their fishing fleet which includes tuna vessels. The cold store consists of 5 x 600 ton rooms serviced by a refrigeration plant consisting of 2 x 100 kw Sanhawa two stage compressors. There are floor mounted air coolers in each room roof mounted condensers.

All rooms open through air locks and manual doors onto a loading bank. At the time of the visit only 4 rooms were operating; the other two rooms were empty. Temperatures were ranging between -23 C and -13 C through the day depending on the work load in each room. The general operational design appeared to be good as was maintenance.

4. Ghana State Fishing: Storage space 11,500 tons of which only 6,000 tons is operational. The facility is public sector owned and is by far the largest in the country. It is situated adjacent to the harbour. The plant is in two sections: the section currently being used had recently been rehabilitated with money provided through Danaid. This area is therefore in good operational condition and operational disciplines are good. However, all but 2,000 tons of this space is taken up by the local fish traders. The remaining space is available for tuna storage but there are very few storage containers available.

The disused section of about 5,500 mt is on the wharf itself, but the insulation has completely degenerated and most of the refrigeration machinery has been cannibalized to keep other equipment working. Due to its ideal location for transshipment of frozen cargo, this facility should be given first priority in any rehabilitation plans but because the government is trying to sell the cold store to the private sector as part of its disinvestiture programme, little thought has been given to rehabilitating the disused section.

5. Tema Food Complex: Storage space 5,000 mt of which 1,300 mt is operational. Built in 1962, this too is a public sector facility and is situated on the floor above the canning plant. It consists of 6 rooms of which 4 are currently unused due to a complete collapse of the insulation. The two other rooms have recently been switched off for temporary repairs. The amount of condensation seeping through the floor to the cannery below indicates that there has been a failure in the floor seals.

This facility is part of the Tema Food Complex rehabilitation project which is currently awaiting appraisal. All the refrigeration machinery appears to have been well maintained.

6. Nova Complex: Storage capacity 2,500 mt. This is a new complex. At the time of the visit all major rooms were turned off as they were empty. The refrigeration for the complex was supplied by 4 x 75 hp compressors of Brazilian origin. Logbook temperatures were not recorded on a regular basis but those that were, indicated a range of -15 C to -25 C depending upon the time of day and whether work was in progress in the rooms.

Starkist has reserved some space for storing their frozen tuna loins which will also be frozen and packaged in these premises.

7. Pioneer Cooperative Cold Store: Storage space 2,100 mt. This is the only cold store where all space has been occupied, either by local trading cooperatives or by third parties. It is comparatively small and quite new. It is efficient and temperatures are well maintained.

8. Cold storage equipment in store. While investigating equipment at Mankoadze, a complete refrigeration plant was found in wooden cases. The machinery was supplied by APV Hall of U.K.and is designed to provide refrigeration for a 15,000 ton cold store. The equipment appeared to be in good condition, especially considering that the plant had been in storage for some four years. The plant and fittings cost US$ 162,000 C & F and have a current value of around US$ 220,000. The Bank of Ghana has a lien on this machinery pending full payment.

APPENDIX 4 PLANT LAYOUT

Legend

1. Cold storage plant, investment part I
   1A cold storage and freezing machinery
   1B cold store expansion, investment part II

2. Defrosting area

3. Box dumper and butchering table
   3A pack storage area
   3B cooking tray and plastic box washer

4. Vacuum cookers

5. Cooked fish storage and conditioning unit

6. Picking tables
   6A additional tables needed

7 & 7A Quality assurance and productivity monitoring station

8. Roller conveyor systems

9. Cleaned meat surge area

10. Packing line 307 x 113 cans

11. Packing line 603 x 408 cans

12. Additional tuna packing line investment part III

13. Unretorted canned product surge area

14. Retorts including proposed additional one retort

15. Retorted can cooling and stabilization area

16. Crate unloading

17. Quarantine/incubation area

18. Labelling area

19. Finished product and packaging store

20. Secondary tuna packing line and poultry area. Investment phase II
   20A 603 x 408 empty can delivery area
   20B 307 x 112 empty can delivery area

21. Canning, quality control and production office

22. Canning, quality control and production area

23. Can-making area
   23A can-making workshop, store and compressor room
   23B expansion can-making area

24. Loin packing area

25. Loin freezing

26. Loin cartoning area

27. Fish cleaning and quality control administration area

28. Men's wash rooms

29. Ladies wash rooms

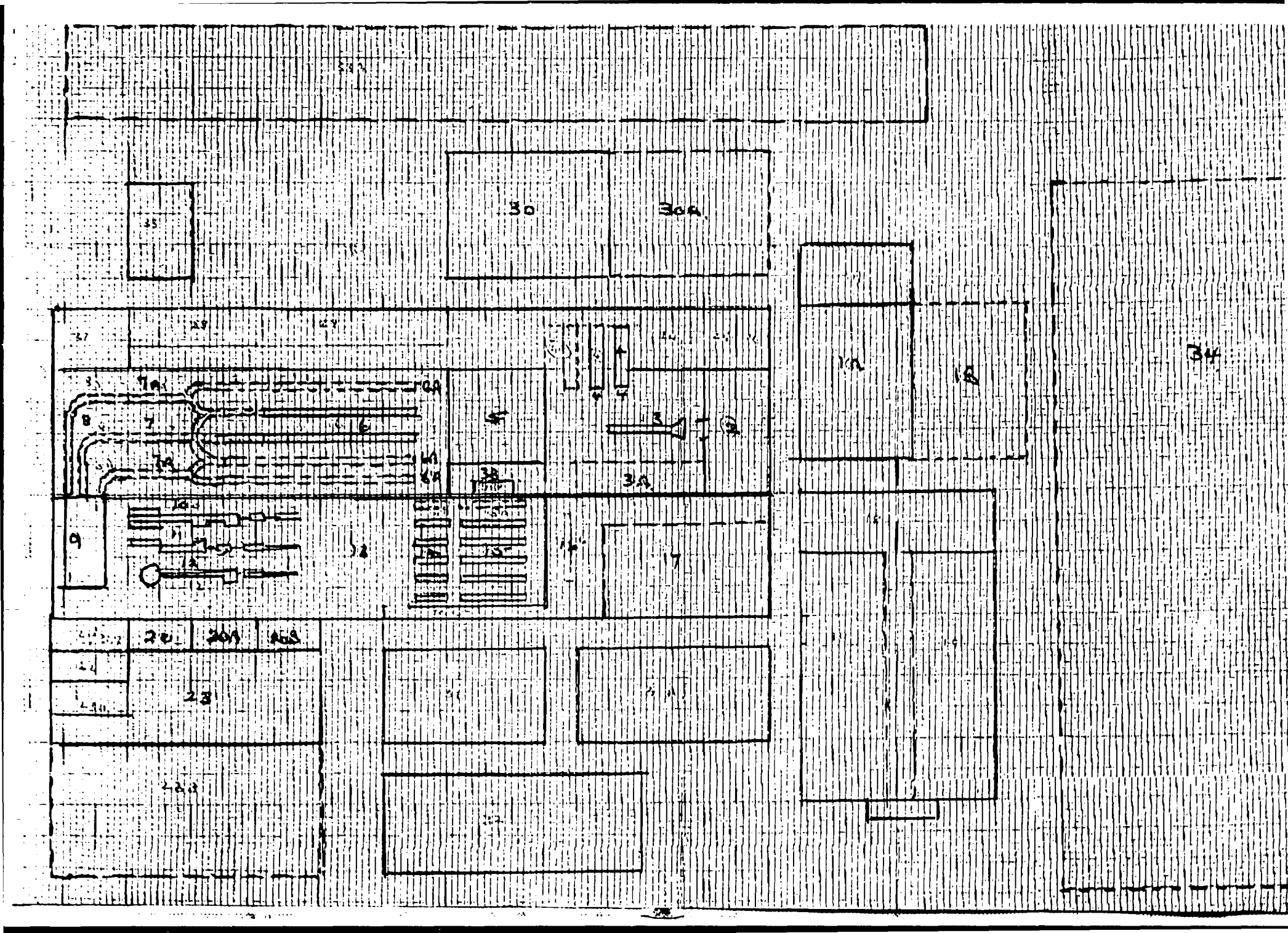
30. By products fish meal. Investment part II

31. Boiler house and workshop
    31A Tank storage area. Oil and water

32. Administration office

33. Space reserved for waste water treatment
    Investment phase IV

34. Employees living accommodation, if needed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30A
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20A
20B
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APPENDIX 5

PLANT AND EQUIPMENT

FOREIGN AND LOCAL INVESTMENT COST.

INSTALLATION AND DEPRECIATION

Appendix 5: Explanation

The tables have been laid out in terms of anticipated foreign and local equity. At the same time they have been sectionalized according to the work area in the plant, in some cases in detail down to the equipment in specific areas to be used by the employees. The number in brackets after each heading refer to the area or equipment indicated in the plant layout diagram.

CANNERY FIXED INVESTMENT
LOCAL II UTILITIES

	F.O.B	Estimated Freight	C&F Price	Installation Cost Local	Installation Cost Foreign	TOTAL COST	Depreciation rate %	Depreciation (after 5 years)	Residual Value
Boilers Complete Spares	102737	5800	108537	7191,59	6164	121892,59	12,50	59372,79	62519,80
Vegetable Oil Storage Tank Vegetable Oil Feed Pump	3630	205	3835	254,10	-	4089,10	12,50	1991,76	2097,34
TOTAL	106367	6005	112372	7445,69	6164	125981,69		61364,56	64617,13

CANNERY FIXED INVESTMENT
LOCAL 5. EQUIPMENT 1. FISH ROOM 1

	F.O.B	Estimated Freight	Estimated in GHANA	Installation Cost Local	Installation Cost Foreign	TOTAL COST	Depreciation rate %	Depreciation (after 5 years)	Residual Value
Par Freeze Cooker/Cooler	213345	12160,67	225505,67	14934,15	-	240439,82	12,50	117116,09	123323,73
3 Sets trollies/trays	65340	3724,38	69064,38	-	-	69064,38	12,50	33640,64	35423,74
TOTAL	278685	15885,05	294570,05	14934,15	-	309504,20		150756,73	158747,47

CANNERY FIXED INVESTMENT
LOCAL 6. EQUIPMENT CANNING 1. 307X113 (Location 10)

	F.O.B	Estimated Freight	Estimated in GHANA	Installation Cost Local	Installation Cost Foreign	TOTAL COST	Depreciation rate %	Depreciation (after 5 years)	Residual Value
In Line Metal Detector	10510	599,07	11109,07	735,70	-	11844,77	12,50	5769,48	6075,29
In Line Auto Check Weight	21719	1237,98	22956,98	1520,33	-	24477,31	12,50	11922,68	12554,63
Vac. Filler Liquid 307x115	79959	4557,66	84516,66	5597,13	-	90113,79	12,50	43893,62	46220,17
Direct Drive Filler/Seamer	22770	1297,89	24067,89	1593,90	-	25661,79	12,50	12499,63	13162,16
Electrician Controls	22918	1306,33	24224,33	1604,26	-	25828,59	12,50	12580,87	13247,71
4 Hemo M.B. Seamer 200 par	95460	5441,22	100901,22	6682,20	-	107583,42	12,50	52402,92	55180,50
Empty Can Delivery System	17061	972,48	18033,48	1194,27	-	19227,75	12,50	9365,66	9862,08
Retort Crate Loader	20121	1146,90	21267,90	1408,47	-	22676,37	12,50	11045,46	11630,91
Spares Mechanical	533	-	533	-	-	533	-	-	-
Spares Electrical	1350	-	1350	-	-	1350	-	-	-
TOTAL	292401	16559,53	308960,53	20336,26	-	329296,79		159480,33	167933,46

CANNERY FIXED INVESTMENT
LOCAL 5. EQUIPMENT FISH ROOM 2 (Location 5-8)

	F.O.B	Estimated Freight	Estimated in GHANA	Installation Cost Local	Installation Cost Foreign	TOTAL COST	Depreciation rate %	Depreciation (after 5 years)	Residual Value
Cleaning Tables 20	1967	112,12	2079,12	137,69	-	2216,81	12,50	1079,79	1137,02
Cleaning Tables Legs	2050	116,85	2166,85	143,50	-	2310,35	12,50	1125,35	1185,00
TOTAL	4017	228,97	4245,97	281,19	-	4527,16		2205,14	2322,02

CANNERY FIXED INVESTMENT
LOCAL 6. EQUIPMENT CANNING 2. 603X403 (Location 11)

	F.O.B	Estimated Freight	Estimated in GHANA	Installation Cost Local	Installation Cost Foreign	TOTAL COST	Depreciation rate %	Depreciation (after 5 years)	Residual Value
Empty Can Supply System	7306	416,44	7722,44	511,42	-	8233,86	12,50	4010,64	4223,22
Vac. Filler Liquid	39897	2274,13	42171,13	2792,79	-	44963,92	12,50	21901,52	23062,40
603x408 Single Head Seamer	37933	2162,18	40095,18	2655,31	-	42750,49	12,50	20823,38	21927,11
Seamer out Conveyor/washer	11462	653,33	12115,33	802,34	-	12917,67	12,50	6292,08	6625,59
Spares Mechanical	1750	-	1750	-	-	1750	-	-	-
Spares Electrical	1325	-	1325	-	-	1325	-	-	-
Can Conveyor	5065	288,71	5065	354,55	-	5419,55	12,50	2639,81	2779,74
TOTAL	104738	5794,79	110244,09	7116,41	-	117360,50		55667,44	58618,05

CANNERY FIXED INVESTMENT

LOCAL 6. EQUIPMENT CANNING 3. RETORT (Location 13-14)

	F.O.B	Estimated Freight	Estimated in GHANA	Installation Cost Local	Installation Cost Foreign	TOTAL COST	Depreciation rate %	Depreciation (after 5 years)	Residual Value
Horizontal 4 crate retorts	99041	5645,34	104686,34	6932,87	-	111619,21	12,50	54368,72	57250,49
Taylor Retort Control\Record	28132	1603,52	29735,52	1969,24	-	31704,76	12,50	15443,11	16261,66
Retort Crate Transporter	3996	227,77	4223,77	-	-	4223,77	12,50	2057,36	2166,41
Retort Crates	27120	1545,84	28665,84	-	-	28665,84	12,50	13962,87	14702,97
Polyuritheano Layer Pads	7260	413,82	7260	-	-	7260	12,50	3536,28	3723,72
Spares	155	-	155	-	-	155	-	-	-
TOTAL	165704	9436,29	174726,47	8902,11	-	183628,58		89368,34	94105,24

TUNA PROCESSING
LOINS FREEZING- LOCAL FIXED COSTS (Location 24 to 26)

	F.O.B	Estimated Freight	Estimated in GHANA	Installation Cost Local	Installation Cost Foreign	TOTAL COST	Depreciation rate %	Depreciation (after 5 years)
Plate Freezers	168520	9605,64	178125,64	11796,40	-	189922,04	12,50	92509,33
TOTAL	168520	9605,64	178125,64	11796,40	-	189922,04	12,50	92509,33

CAN MAKING FIXED INVESTMENT COST
LOCAL 3. 603X408 REFORMER EQUIPMENT (Location 23)

	F.O.B	Estimated Freight	Estimated in GHANA	Installation Cost Local	Installation Cost Foreign	TOTAL COST
Flat Body Reformer	5412	308,48	5720,48	378,84	-	6099,32
Body Flanger	3145	179,27	3324,27	220,15	-	3544,42
Semi Auto Seamer	4834	275,54	5109,54	338,38	-	5447,92
Spare Parts	1575	89,78	1664,78	110,25	-	1775,03
Foreign Tech. Rep.	-	-	-	-	1815	1815
TOTAL	14966	853,06	15819,06	1047,62	-	18681,68

CANNERY FIXED INVESTMENT

LOCAL 6. EQUIPMENT CANNING 4. CRATE UNLOAD (Location 15 and 16)

	F.O.B	Estimated Freight	Estimated in GHANA	Installation Cost Local	Installation Cost Foreign	TOTAL COST	Depreciation rate %	Depreciation (after 5 years)	Residual Value
Retort Crate Unloader	30079	1714,50	31793,50	2105,53	-	33899,03	12,50	16511,92	17387,12
TOTAL	30079	1714,50	31793,50	2105,53	-	33899,03		16511,92	17387,12

CANNERY FIXED INVESTMENT

LOCAL 7. EQUIPMENT 5. WAREHOUSE 307 Labeling and 603 Labeling (Location 17-19)

	F.O.B	Estimated Freight	Estimated in GHANA	Installation Cost Local	Installation Cost Foreign	TOTAL COST	Depreciation rate %	Depreciation (after 5 years)	Residual Value
"F" Style Carton	27413	1562,54	28975,54	1918,91	-	30894,45	12,50	15048,41	15846,04
307 Elevator	6418	365,83	6783,83	449,26	-	7233,09	12,50	3523,17	3709,91
603 Can Labeler	15221	867,60	16088,60	1065,47	-	17154,07	12,50	8355,59	8798,47
Can Conveyor out	6996	398,77	7394,77	489,72	-	7884,49	12,50	3840,47	4044,03
Spares Mechanical	1685	-	1685	-	-	1685			
Spares Electrical	270	-	270	-	-	270			
TOTAL	33831	1928,37	35759,37	2368,17	-	38127,54		18571,58	19555,95

CAN MAKING FIXED INVESTMENT COSTS

FOREIGN CAN MAKING EQUIPMENT 107X113

	F.O.B	Quoted Freight	Estimated in GHANA	Installation Cost Local	Installation Cost Foreign	TOTAL COST	Depreciation rate %	Depreciation (after 5 years)	Residual Value
Automatic Press Praline	600319								
Lubricant Coating	18793								
3 Channel Air Conveyor	49383								
Pallet Loader	16483								
Drawing Cushions	24675								
Air Conditioning	6676								
Tooling	41819								
Turned Sheet Safety	21103								
Redraving Molding Press	445955								
Redraving Cushions	23392								
Air Conditioning	6676								
Remold/trimming tooling	124047								
Conveyor Systems	82500								
Palletiser Semi-auto	92400								
Paking and Boxing	99000								
TOTAL	1644721	15750	1660471		-	1660471	12,50	808800,59	851670,41
Spares	89574	-	89574		-	89574			
Project Manager				4851	123750	128601			
Electrical Instalation				8662	69300	77962			
Mechanical Instalation				3118	44550	47668			
Comissioning				1848	26400	28248			
Training and Manuals				635	9075	9710			
TOTAL	1734295	15750	1750045	19114	273075	2042234		808800,59	851670,41

CANNERY FIXED
FOREIGN- 2. UTILITIES

	F.O.B	Estimated Freight	C&F Price	Installation Cost Local	Installation Cost Foreign	TOTAL COST	Depreciation rate (%)	Depreciation (after 5 years)	Residual Value
Water Supply Water Tanks 100mt	41250	2351,25	43601,25	2687,50	7112,50	53601,25	12,50	26108,69	27492,56
Pumps Water Services	2872	163,70	3035,70	201,04	-	3236,74	12,50	1576,59	1660,15
Treatment	14500	826,50	15326,50	1015	-	16341,50	12,50	7959,80	8381,70
Installation-Distr.	33000	1881	34881	2310	-	37191	12,50	18115,40	19075,60
Air Compressor -Fiting	14700	837,90	15537,90	1029	-	16566,90	12,50	8069,59	8497,31
Distribution	6600	376,20	6976,20	462		7438,20	12,50	3623,08	3815,12
Electric Installation	8500	450	8950	595	-	9545	12,50	4649,28	4895,72
Electric Installation Local Purchased Parts				93950		93950			
Hygiene Pressure Washers	13000	741	13741	910	-	14651	12,50	7136,37	7514,63
Fly Control	1320	75,24	1395,24	92,40	-	1487,64	12,50	724,62	763,02
Wash Down Houses	15000	855	15855	1050	-	16905	12,50	8234,27	8670,73
Boiler Feed Water Tank	1375	78,38	1453,38	96,25	-	1549,63	12,50	754,81	794,82
Boiler Fuel Tank	3437	195,91	3632,91	240,59	412	4285,50	12,50	2087,43	2198,07
Utility Equipment Spares	3210	182,97	3392,97	224,70	-	3617,67	12,50	1762,13	1855,54
TOTAL	158764	9015,05	167779,05	105063,48	7524,50	280367,03		90802,07	95614,96

CANNERY FIXED INVESTMENT
FOREIGN- 3. ROLLING STOCK AND TRANSPORT EQUIPMENT

	F.O.B	Estimated Freight	C&F Price	Installation Cost Local	Installation Cost Foreign	TOTAL COST	Depreciation rate %	Depreciation (after 5 years)	Residual Value	
Diesel Fork Truck 2x250 m.	n/a	n/a	n/a	30600	-	30600	20	20572,99	10027,01	
Diesel 5 ton Truck	n/a	n/a	n/a	30000	-	30000	20	20169,60	9830,40	
Diesel 1/2ton Utility (2)	n/a	n/a	n/a	27000	-	27000	20	18152,64	8847,36	
Diesel Shuttle Bus 2x20	n/a	n/a	n/a	17000	-	17000	20	11429,44	5570,56	
Diesel Shuttle Bus 2x20	n/a	n/a	n/a	13500	-	13500	20	9076,32	4423,68	
Company Car/Jeep (2)	n/a	n/a	n/a	29000		29000	20	19497,28	9502,72	
Elec. 3 Hand Pallet Trucks	n/a	n/a	n/a	15000	-	15000	33	3074,81	11925,19	*
Manual 6 Hand Pallet Trucks	n/a	n/a	n/a	15000	-	15000	33	3074,81	11925,19	*
Vehicle Spares Tools	n/a	n/a	n/a	2500	-	2500	20	1660,80	819,20	
Tuna Conditioning Racks (2)	8659	493,56	9152,56	3936	-	13088,56	12,50	6375,32	6713,24	
TOTAL	8659	493,56	9152,56	183536	-	192688,56		113104,02	79584,54	

* This includes the replacement of the equipment depreciated within the five year period. Total replacement cost: US$ 15000

CANNERY FIXED INVESTMENT

FOREIGN- 5. EQUIPMENT 1. FISH ROOM (Location 2-4)

	F.O.B	Estimated Freight	C&F Price	Installation Cost Local	Installation Cost Foreign	TOTAL COST	Depreciation rate %	Depreciation (after 5 years)	Residual Value
Defrost- Scows 140	14280	813,96	15093,96	999,60	-	16093,56	12,50	7839,03	8254,53
Pipe/Sprays 500	4250	242,25	4492,25	297,50	-	4789,75	12,50	2333,04	2456,71
U/G Water Supply	6835	389,60	7224,60	478,45	-	7703,05	12,50	3752,08	3950,96
Butchering Table Complete	5250	299,25	5549,25	367,50	-	5916,75	12,50	2882,00	3034,75
Band Saw	3500	199,50	3699,50	245	-	3944,50	12,50	1921,33	2023,17
Scow Dumper	10230	583,11	10813,11	716,10	-	11529,21	12,50	5615,78	5913,43
Cooking Apv. Vac Cook/Cooler	-	-	-	-	-	Local			
Cooking Trollies	5031	286,77	5317,77	352,17	-	5669,94	12,50	2761,78	2908,16
Cooking Trays	11515	656,36	12171,36	806,05	-	12977,41	12,50	6321,18	6656,23
Conditioning Racks 82	8659	493,56	9152,56	606,13		9758,69	12,50	4753,37	5005,32
Tracks 1640	15360	875,52	16235,52	1075,20		17310,72	12,50	8431,90	8878,82
Box Washer/Tray Washer 1	23000	1311	24311	1610	-	25921	12,50	12625,89	13295,11
Heavy Duty Scale	20350	1159,95	21509,95	1424,50	-	22934,45	12,50	11171,17	11763,28
Equipment Spares and tools	6300	359,10	6659,10	441		7100,10	12,50	3458,40	3641,70
TOTAL	134560	7669,92	142229,92	9419,20	-	151649,12		73866,93	77782,19

* This includes the replacement of the equipment depreciated within the five year period. Total replacement cost: US$ 15000

CANNERY FIXED INVESTMENT

FOREIGN- 5. EQUIPMENT 2. FISH ROOM (Location 5-8)

	F.O.B	Estimated Freight	C&F Price	Installation Cost Local	Installation Cost Foreign	TOTAL COST	Depreciation rate %	Depreciation (after 5 years)	Residual Value
Cleaning Tables 44	5060	288,42	5348,42	510	-	5858,42	12,50	2853,58	3004,84
Leg Bases 41	3650	208,05	3858,05	1604	-	5462,05	12,50	2660,52	2801,53
Bin Racks	1815	103,46	1918,46	798	-	2716,46	12,50	1323,16	1393,29
Roller Conveyors	1265	72,11	1337,11	891	-	2228,11	12,50	1085,29	1142,81
Productivity Scales 3	6315	359,96	6674,96	-	-	6674,96	12,50	3251,31	3423,64
Metal Tallies 2200	2200	125,40	2325,40	-	-	2325,40	12,50	1132,68	1192,72
Cleaned Met. Containers	2165	123,41	2288,41	-	-	2288,41	12,50	1114,66	1173,74
Red Meat Containers	2165	123,41	2288,41	-	-	2288,41	12,50	1114,66	1173,74
Waste Meat Containers	1450	82,65	1532,65	-	-	1532,65	12,50	746,54	786,11
TOTAL	26085	1486,85	27571,85	3803	-	31374,85		15282,41	16092,44

* This includes the replacement of the equipment depreciated within the five year period. Total replacement cost: US$ 15000

CANNERY FIXED INVESTMENT
FOREIGN- 6. EQUIPMENT CANNING 1. 307x113 PACKING (Location 10)

	F.O.B	Estimated Freight	C&F Price	Installation Cost Local	Installation Cost Foreign	TOTAL COST	Depreciation rate %	Depreciation (after 5 years)	Residual Value
Packing Machine 2.	120000	6840	126840	8400	-	135240	12,50	65874,20	69365,80
307 Can Races	800	45,60	845,60	56	-	901,60	12,50	439,16	462,44
307 Can Conveyor	5500	313,50	5813,50	385	-	6198,50	12,50	3019,23	3179,27
307 Can Conveyor	5500	313,50	5813,50	385		6198,50	12,50	3019,23	3179,27
307 Traffic Cont.	3000	171	3171	210	-	3381	12,50	1646,85	1734,15
307 Can Washing	17500	997,50	18497,50	1225	-	19722,50	12,50	9606,65	10115,85
Spares	12000	684	12684	-	-	12684	12,50	6178,26	6505,74
TOTAL	164300	9365,10	173665,10	10661	-	184326,10		89783,60	94542,50

CANNERY FIXED INVESTMENT
FOREIGN- 6. EQUIPMENT CANNING 2. 603 PACKING (Location 11)

	F.O.B	Estimated Freight	C&F Price	Installation Cost Local	Installation Cost Foreign	TOTAL COST	Depreciation rate %	Depreciation (after 5 years)	Residual Value
603 Hand packing Table 1	200	11,40	211,40	14	-	225,40	12,50	109,79	115,61
Chunk Equipment	-	n/a	n/a	800	-	800	12,50	389,67	410,33
Compression Equ.	-	n/a	n/a	800	-	800	12,50	389,67	410,33
Water Fill Equip.	-	140	2450	1050		3500	12,50	1704,82	1795,18
Hand Press Scales 2	10000	570	10570	-	-	10570	12,50	5148,55	5421,45
Full Can Washer 1	15520	884,64	16404,64	1086,40	-	17491,04	12,50	8519,73	8971,31
[illegible]yors	2840	161,88	3001,88	198,80	-	3200,68	12,50	1559,02	1641,66
[illegible]chased on Materials				7190		7190			
TOTAL	28560	1767,92	32637,92	11139,20	-	43777,12		17821,26	18765,86

CANNERY FIXED INVESTMENT
FOREIGN- 6. EQUIPMENT CANNING 3. RETORT (Location 13-14)

	F.O.B	Estimated Freight	C&F Price	Installation Cost Local	Installation Cost Foreign	TOTAL COST	Depreciation rate %	Depreciation (after 5 years)	Residual Value
Retort Craters 25	13175	750,98	13925,98	922,25	-	14848,23	12,50	7232,44	7615,79
Basilers Dividers 250	4990	284,43	5274,43	-	-	5274,43	12,50	2569,13	2705,30
4 Crates Transporters	2664	151,85	2815,85	186,48	-	3002,33	12,50	1462,41	1539,92
Retort 4 Crate w. Fitting	23000	1311	24311	1610	-	25921	12,50	12625,89	13295,11
Taylor Retort Instruments	1300	74,10	1374,10	91	-	1465,10	12,50	713,64	751,46
Retort Crate Tipper	4125	235,13	4360,13	288,75	-	4648,88	12,50	2264,43	2384,45
TOTAL	49254	2807,48	52061,48	3098,48	-	55159,96		26867,92	28292,04

CANNERY FIXED INVESTMENT
FOREIGN- 6. EQUIPMENT CANNING 4. CRATE UNLOAD (Location 15-16)

	F.O.B	Estimated Freight	C&F Price	Installation Cost Local	Installation Cost Foreign	TOTAL COST	Depreciation rate %	Depreciation (after 5 years)	Residual Value
Can Cooling Racks 10	3830	218,31	4046,31	268,10	-	4316,41	12,50	2102,48	2213,93
2 Crate Transporters	2332	132,92	2464,92	-	-	2464,92	12,50	1200,64	1264,28
Elevator Can Race	5004	285,23	5289,23	350,28	-	5639,51	12,50	2746,95	2892,55
Semi Auto 307x113 Pallotizer	24000	1368	25368	1680	-	27048	12,50	13174,84	13873,16
Dividers Sheet				9240					
Pallets 200 Wooden 4 Way	n/a	n/a	n/a	1650	-	1650	12,50	803,70	846,30
TOTAL	35166	2004,46	37170,46	13188,38	-	41118,84		20028,62	21090,22

CANNERY FIXED INVESTMENT

FOREIGN- 7. EQUIPMENT CANNING 5. WAREHOUSE (Location 17-18-19)

	F.O.B	Estimated Freight	C&F Price	Installation Cost Local	Installation Cost Foreign	TOTAL COST	Depreciation rate %	Depreciation (after 5 years)	Residual Value
Wooden 4 way Pallets 200	n/a	n/a	n/a	1650	-	1650	12,50	803,70	846,30
Depalletizer 307x113	22560	1285,92	23845,92	1579,20	-	25425,12	12,50	12384,35	13040,77
Elevator	3526	200,98	3726,98	246,82		3973,80	12,50	1935,60	2038,20
Can Race and Fittings	1873	106,76	1979,76	131,11	-	2110,87	12,50	1028,19	1082,68
Inline Auto Vac. tester	18450	1051,65	19501,65	1291,50		20793,15	12,50	10128,16	10664,99
Roll thorough Labeller	16500	940,50	17440,50	1155		18595,50	12,50	9057,70	9537,80
Misplaced Label Detector	6550	373,35	6923,35	458,50	-	7381,85	12,50	3595,63	3786,22
Carton Gluer	8750	498,75	9248,75	612,50		9861,25	12,50	4803,33	5057,92
TOTAL	78209	4457,91	82666,91	7124,63	-	89791,54		43736,66	46054,88

CANNERY FIXED INVESTMENT

FOREIGN- 8 FOREIGN TECHNICAL SUPERVISION 1. Local Equipment Instalation

	F.O.B	Estimated Freight	C&F Price	Installation Cost Local	Installation Cost Foreign	TOTAL COST	Depreciation rate %	Depreciation (after 5 years)	Residual Value
Suppliers Rep. Technician	-	-	-	-	23000	23000			
Local Expenses	-	-	-	2875					
Air Fares	-	-	-	-	3950	3950			
TOTAL	0	0	0	2875	-	26950			

TUNA PROCESSING
FOREIGN FIXED COSTS - LOINS FREEZING (Location 24 to 26)

	F.O.B	Estimated Freight	Estimated in GHANA	Installation Cost Local	Installation Cost Foreign	TOTAL COST	Depreciation rate %	Depreciation (after 5 years)	Residual Value
Package Cold Store Complete	75000	4275	79275	5250	-	84525	12,50	41171,37	43353,63
Refrigeration Equipment	48000	2736	50736	3360	-	54096	12,50	26349,68	27746,32
Mechanical Instalation	9498	541,39	10039,39	664,86	-	10704,25	12,50	5213,94	5490,30
Electrical Instalation	8475	483,08	8958,08	593,25	-	9551,33	12,50	4652,37	4898,96
Vaccum Pouch Machine	611055	34830,14	645885,14	42773,85	-	688658,99	12,50	335439,64	353219,35
TOTAL	752028	42865,60	794893,60	52641,96	-	847535,56		412827,00	434708,56

CAN MAKING FIXED INVESTMENT COST
FOREIGN 12. PACKING EQUIPMENT (Location 23)

	F.O.B	Estimated Freight	Estimated in GHANA	Installation Cost Local	Installation Cost Foreign	TOTAL COST	Depreciation rate %	Depreciation (after 5 years)	Residual Value
Wooden 40×40 4 way pallets	-	-	-	5570	-	5570	12,50	2713,10	2856,90
Plastic Skirts	18150	1034,55	19184,55	-	-	19184,55			
Card Board Layer Pads	-	-	-	19800	-	19800			
TOTAL	18150	1034,55	19184,55	25370		44554,55		2713,10	2856,90

CANNERY FIXED INSTALLATION COSTS

FOREIGN 1. CIVIL WORKS

	F.O.B	Estimated Freight	C&F Price	Installation Cost Local	Installation Cost Foreign	TOTAL COST	Depreciation rate %	Depreciation (after 5 years)	Residual Value
Land Acquisition (40.000 sq. m)	n/a	n/a	n/a						
Site Preparation	n/a	n/a	n/a	58000	-	58000			
Fencing 830mX2.5m	n/a	n/a	n/a	11412	-	11412	5	2581,61	8830,39
Power Conection	n/a	n/a	n/a	8000	-	8000			
Transformers 2X1000	n/a	n/a	n/a	71500	-	71500			
Water Connection	n/a	n/a	n/a	9800	-	9800			
Sewarage Exterior drains	n/a	n/a	n/a	9000	-	9000	5	2035,97	6964,03
Pre-treatment	12000	684	12684	1200	-	13884	12,50	6762,77	7121,23
Desposal	5500	313,50	5813,50	3000	-	8813,50	12,50	4292,98	4520,52
Building Warehouse (1500sq.m)	135000	7695	142695	135000	-	277695	5	62819,90	214875,10
Cannery (5600 sq. m)	530200	0	530200	140000	-	670200	5	151612,02	518587,98
Boiler house(300 sq.m)	n/a	n/a	n/a	255000	-	255000	5	57685,86	197314,14
Admin. Block	n/a	n/a	n/a	60000	-	60000	5	13573,14	46426,86
Area Surfacing General (1278m2)	n/a	n/a	n/a	21300	-	21300	5	4818,47	16481,53
Utilities	n/a	n/a	n/a	6300	-	6300	5	1425,18	4874,82
Internal Construction W/C's	n/a	n/a	n/a	3060	-	3060	5	692,23	2367,77
Fish Conditioning	n/a	n/a	n/a	22500	-	22500	5	5089,93	17410,07
Offices	n/a	n/a	n/a	3840	-	3840	5	868,68	2971,32
TOTAL	682700		691392,50	818912	-	1510304,50		314258,74	1048745,76

APPENDIX 6

MANPOWER BUDGETS, SALARIES AND ALLOWANCES

LABOUR COSTS

CANNERY-VARIABLE COST

SUMMARY TOTALS

MANPOWER BUDGET + SALARY P. A.

	Male Employees	Female Employees	Total	Overseas Salary per year USD	Salary per year Hrs 2080 USD	Estimated Overtime Per year Hrs 960 at 1.5 USD	Total Estimated Income per year USD	Allowances USD	Social Security 12.5% of Basic Salary	Total Salary & Allowances per Year USD	Total Cost Per Year in USD	Income TAX (8%) USD
FISH ROOM 1&2 (2-9)	68	270	338		102953,76	61623,36	164577,12	94017,37	12869,22	271463,71	271463,71	13166,17
CANNING (10-14)	29	18	47		17049,76	11803,68	28853,44	77927,08	2131,22	46631,34	46631,34	2308,28
WAREHOUSE (15-19)	9	5	14		5285,28	3659,04	8944,32	75636,17	660,66	14431,50	14431,50	715,55
FREEZING (24-26)	5	12	17		5539,04	3834,72	9373,76	75683,92	692,38	15124,39	15124,39	749,90
ANCILLARY ADMINISTRATION	28	42	70		27042,08	7205,33	34247,41	79730,80	3380,26	62322,50	62322,50	2739,79
CANNERY GENERAL SERVICES	20	1	21		13800,80	9554,40	23355,20	77261,67	1725,10	37706,08	37706,08	1868,42
CANMAKING (23)	16	4	20		8765,95		8765,95	76291,23	1095,74	17866,76	17866,76	701,28
CANMAKER TECHNICIAN (23)			2	50000	14000,00					35532,00	35532,00	1120,00
GENERAL ADMINISTRATION (32)												
LOCAL			21		19757,00			27426,67	2469,63	49653,29	49653,29	1580,56
FOREIGN			7	147000	50000,00			95816,67	6250,00	126900,00	126900,00	4000,00
TOTAL	175	352	557	197000	264193,67	97680,53	278117,20	679791,58	31274,21	677631,57	677631,57	28949,94

CANNERY-VARIABLE COST

1. FISHROOM
1. RAW FISH
2. COOKED FISH
LOCAL LABOUR

MANPOWER BUDGET - SALARY P. A.

	Male Employees	Female Employees	Total	Estimated Work Hours	Basic Salary per Hour USD	Yearly Salary per year Hrs 2080 USD	Estimated Overtime Per year Hrs 960 at 1.5 USD	Total Estimated Income per year USD	Allowances Transport 50% Rent 20% Soap 2.5% Total at 72.5%	Social Security 12.5% of Basic Salary	Allowance Food 2.29% Holiday 10% Medical 6.3% Total at 18.82%	Total Salary & Allowances per Year USD	Total Cost Per Year in USD	Income TAX (6%) USD
Supervisor 2	2		2	8	,349	725,92		725,92	526,29	90,74	136,62	1479,57	2959,14	136,15
Super-Assistant 2	2		2	8	,221	459,68		459,68	333,27	57,46	86,51	936,92	1873,84	73,55
Factory Hands (2)	26		26	8	,140	291,20		291,20	211,12	36,40	54,80	593,52	15431,52	605,70
Cooks (3)	3		3	8	,221	459,68		459,68	333,27	57,46	86,51	936,92	2810,76	110,32
Labour (3)	9		9	8	,140	291,20		291,20	211,12	36,40	54,80	593,52	5341,71	209,66
Total Cooking	12		12											
TOTAL FISH ROOM 1	42		42											
Supervisor	1		1	12	,349	725,92	502,56	1228,48	526,25	90,74	136,62	1982,13	1982,13	98,23
Super-Assistant		10	10	12	,221	459,68	318,24	777,92	333,27	57,46	86,51	1255,16	12551,60	622,34
Cleaning Factory Hands		220	220	12	,140	291,20	201,60	492,80	211,12	36,40	54,80	795,12	174927,24	8673,28
Labour	15	5	20	12	,129	268,32	185,76	454,08	194,53	33,54	50,50	732,65	21979,49	1089,79
Checkers		35	35	12	,159	330,72	228,96	559,68	239,77	41,34	62,24	903,03	31606,17	1567,10
TOTAL	15	260	275											
TOTAL FISH ROOM 2	15	270	295											
TOTAL FISH ROOM 1&2	57	270	337		49,50	102853,76	71223,35	174077,12	74641,18	12869,22	19375,80	281163,71	281163,71	13956,37

CANNERY-VARIABLE COST

2. CANNING LOCAL LABOUR

MANPOWER BUDGET - SALARY P. A.

	Male Employees	Female Employees	Total	Estimated Work Hours	Basic Salary per Hour USD	Yearly Salary per year Hrs 2080 USD	Estimated Overtime Per year Hrs 960 at 1.5 USD	Total Estimated Income per year USD	Allowances Transport 50% Rent 20% Soap 2.5% Total at 72.5%	Social Security 12.5% of Basic Salary	Allowance Food 2.29% Holiday 10% Medical 6.3% Total at 18.82%	Total Salary & Allowances per Year USD	Total Cost Per Year in USD	Income TAX (8%) USD
Supervisor	1		1	12	,349	725,92	502,56	1228,48	526,29	90,74	136,62	1982,13	1982,13	98,28
Super-Assistant	2		2	12	,221	459,68	318,24	777,92	333,27	57,46	86,51	1255,16	2510,32	124,47
307 Machine Operator		2	2	12	,221	459,68	318,24	777,92	333,27	57,46	86,51	1255,16	2510,32	124,47
Packing Labour	2	2	4	12	,129	268,32	185,76	454,08	194,53	33,54	50,50	732,65	2930,60	145,31
Labour		2	2	12	,140	291,20	201,60	492,80	211,12	36,40	54,80	795,12	1590,25	78,85
Total	2	6	8											
603 Machine Operator		1	1	12	,221	459,68	318,24	777,92	333,27	57,46	86,51	1255,16	1255,16	62,23
Packing Labour	1	7	8	12	,140	291,20	201,60	492,80	211,12	36,40	54,80	795,12	6360,99	315,39
Labour	1	0	1	12	,129	268,32	185,76	454,08	194,53	33,54	50,50	732,65	732,65	36,33
Total	2	8	10											
Filling +Seaming Total	7	14	21											
Retort Supervisor	2		2	8	,349	725,92	502,56	1228,48	526,29	90,74	146,13	1991,64	3983,28	196,56
Operator	2		2	8	,221	459,68	318,24	777,92	333,27	57,46	92,53	1261,18	2522,36	124,47
Labour	12		12	8	,140	291,20	201,60	492,80	211,12	36,40	58,62	798,94	9587,26	473,09
TOTAL	16		16											
Crate Unloading Labour	5		5	12	,129	268,32	185,76	454,08	194,53	33,54	50,50	732,65	3663,25	181,63
Supervisor	1		1	12	,349	725,92	502,56	1228,48	526,29	90,74	136,62	1982,13	1982,13	98,28
Total	6		6											
Quality Assurance		4	4	12	,221	459,68	318,24	777,92	333,27	57,46	86,51	1255,16	5020,64	248,93
TOTAL CANNING	29	18	47		3,??	17049,75	11301,58	28853,44	12251,33	2131,27	3285,50	46631,34	46631,34	2323,33

CANNERY-VARIABLE COST

1. WAREHOUSE\LABELLING LOCAL LABOUR

MANPOWER BUDGET, SALARY P. A. AND COST

	Male Employees	Female Employees	Total	Estimated Work Hours	Basic Salary per Hour USD	Yearly Salary per year Hrs 2080 USD	Estimated Overtime Per year Hrs 960 at 1.5 USD	Total Estimated Income per year USD	Allowances Transport 50% Rent 20% Soap 2.5% Total at 72,5%	Social Security 12.5% of Basic Salary	Allowance Food 2.29% Holiday 10% Medical 6.3% Total at 18,82%	Total Salary & Allowances per Year USD	Total Cost Per Year in USD	Inc TA (8% US
Supervisor	1		1	12	,349	725,52	502,56	1228,48	526,29	90,74	136,62	1982,13	1982,13	98,2
Super-Assistant	1		1	12	,221	459,68	318,24	777,92	333,27	57,46	86,51	1255,16	1255,16	62,2
FORK LIFT DRIVER	1		1	12	,221	459,68	318,24	777,92	333,27	57,46	86,51	1255,16	1255,16	62,2
General labour	3		3	12	,129	268,32	185,76	454,08	194,53	33,54	50,50	732,65	2197,95	108,
Labelling Machine operator	1	2	3	12	,221	459,68	318,24	777,92	333,27	57,46	86,51	1255,16	3765,48	186,
Labour	2	3	5	12	,140	291,20	201,60	492,80	211,12	36,40	54,80	795,12	3975,62	197,
Total	3	5	8	12										
TOTAL WAREHOUSE	9	5	14		2,54	5285,23	3659,04	8944,32	3831,83	660,66	994,69	14431,50	14431,50	715

CANNERY-VARIABLE COST

4. FREEZING LOCAL LABOUR

MANPOWER BUDGET, SALARY P. A. AND COST

	Male Employees	Female Employees	Total	Estimated Work Hours	Basic Salary per Hour USD	Yearly Salary per year Hrs 2080 USD	Estimated Overtime Per year Hrs 960 at 1.5 USD	Total Estimated Income per year USD	Allowances Transport 50% Rent 20% Soap 2.5% Total at 72.5%	Social Security 12.5% of Basic Salary	Allowance Food 2.29% Holiday 10% Medical 6.3% Total at 18.82%	Total Salary & Allowances per Year USD	Total Cost Per Year in USD	Income TAX (8%) USD
Supervisor	1		1	12	,349	725,92	502,56	1228,48	526,29	90,74	136,62	1982,13	1982,13	98,28
Super-Assistant		2	2	12	,221	459,68	318,24	777,92	333,27	57,46	86,51	1255,16	2510,32	124,47
Loin Packing\Sealing		6	6	12	,140	291,20	201,60	492,80	211,12	36,40	54,80	795,12	4770,74	236,54
Labours	3		3	12	,129	268,32	185,76	454,08	194,53	33,54	50,50	732,65	2197,95	108,98
Cartons Packers	1	4	5	12	,129	268,32	185,76	454,08	194,53	33,54	50,50	732,65	3663,25	181,63
Loin Total	4	10	14											
TOTAL	5	12	17		2,66	5539,04	3834,72	9373,76	4015,80	692,38	1042,45	15124,39	15124,39	749,90

CANNERY-VARIABLE COST

5. ANCILLARY ADMINISTRATION LOCAL LABOUR

MANPOWER BUDGET, SALARY P. A. AND COST

	Male Employees	Female Employees	Total	Estimated Work Hours	Basic Salary per Hour USD	Yearly Salary per year Hrs 2080 USD	Estimated Overtime Per year Hrs 416 at 1.5 USD	Total Estimated Income per year USD	Allowances Transport 50% Rent 20% Soap 2.5% Total at 72.5%	Social Security 12.5% of Basic Salary	Allowance Food 2.29% Holiday 10% Medical 6.3% Total at 18.82%	Total Salary & Allowances per Year USD	Total Cost Per Year in USD	Income TAX (8%) USD
Security Petrolman	9	9	18	8	,221	459,68	137,90	597,58	333,27	57,46	86,51	1074,82	19346,83	860,52
Commanders	3		3	8	,375	780,00	234,00	1014,00	565,50	97,50	146,80	1823,80	5471,39	243,36
Transport Drivers	9		9	8	,221	459,68	137,90	597,58	333,27	57,46	86,51	1074,82	9673,41	430,26
Canteen Manager	1		1	8	,422	877,76		877,76	636,38	109,72	165,19	1789,05	1789,05	70,22
Cooks		8	8	8	,140	291,20	87,36	378,56	211,12	36,40	54,80	680,88	5447,07	242,28
Workers		12	12	8	,129	268,32	80,50	348,82	194,53	33,54	50,50	627,39	7528,63	334,86
Paramedics	2	2	4	8	,221	459,68	137,90	597,58	333,27	57,46	86,51	1074,82	4299,30	191,23
Laundry workers		8	8	8	,129	268,32		268,32	194,53	33,54	50,50	546,89	4375,12	171,72
Hygiene General	1	3	4	8	,129	268,32	80,50	348,82	194,53	33,54	50,50	627,39	2509,54	111,62
Grounds Men	3		3	8	,129	268,32	80,50	348,82	194,53	33,54	50,50	627,39	1882,16	83,72
TOTAL	38	42	79		13,09	27042,08	7895,33	34247,41	19605,51	3380,26	5089,32	62322,50	62322,50	2719,79

CANNERY-VARIABLE COST

6. CANNERY GENERAL SERVICES LOCAL LABOUR

MANPOWER BUDGET, SALARY P. A. AND COST

	Male Employees	Female Employees	Total	Estimated Work Hours	Basic Salary per Hour USD	Yearly Salary per year Hrs 2080 USD	Estimated Overtime Per year Hrs 960 at 1.5 USD	Total Estimated Income per year USD	Allowances Transport 50% Rent 20% Soap 2.5% Total at 72.5%	Social Security 12.5% of Basic Salary	Allowance Food 2.29% Holiday 10% Medical 6.3% Total at 18.82%	Total Salary & Allowances per Year USD	Total Cost Per Year in USD	Income TAX (8%) USD
Cannery Engineer	1		1	12	,422	877,76	607,68	1485,44	636,33	109,72	165,19	2396,73	2396,73	118,84
Cannery Electrician	1		1	12	,422	877,76	607,68	1485,44	636,33	109,72	165,19	2396,73	2396,73	118,84
Canning Engineer	1		1	12	,422	877,76	607,68	1485,44	636,33	109,72	165,19	2396,73	2396,73	118,84
Boiler Operater	3		3	12	,221	459,68	318,24	777,92	333,27	57,46	86,51	1255,16	3765,48	186,70
General Fitter	3		3	8	,221	459,68	318,24	777,92	333,27	57,46	86,51	1255,16	3765,48	186,70
Total	9		9	8	,221	459,68	318,24	777,92	333,27	57,46	86,51	1255,16	11296,44	560,10
Hygiene Supervisor	2		2	8	,349	725,92	502,56	1228,48	526,29	90,74	136,62	1982,13	3964,26	196,56
WC Attendant	1	1	2	12	,129	268,32	185,76	454,08	194,53	33,54	50,50	732,65	1465,30	72,65
Factory Cleaners	6		6	8	,140	291,20	201,60	492,80	211,12	36,40	58,62	798,94	4793,63	236,54
Production Cleaners	2		2	12	,129	268,32	185,76	454,08	194,53	33,54	50,50	732,65	1465,30	72,65
Total	11		11											
TOTAL	20	1	21		6,64	13900,80	9554,40	23355,20	10005,59	1725,10	2620,20	37706,08	37706,08	1868,42

CANNERY-VARIABLE COST

7. GENERAL ADMINISTRATION LOCAL LABOUR

MANPOWER BUDGET, SALARY P. A. AND COST

	Total	Yearly Salary per year	Allowances Transport 50% Housing 80% Total at 130%	Social Security 12.5% of Basic Salary	Allovance Food 2.29% Holiday 10% Medical 6.3% Total at 18.82%	Total Salary & Allowances per Year	Total Cost Per Year in	Income TAX (8%)
		USD				USD	USD	USD
Security Manager	1	1364	1636,50	170,50	256,70	3428,00	3428,00	109,12
Shift Manager	2	1085	1302,00	135,63	204,20	2726,82	5453,64	173,60
Production Manager	2	1085	1302,00	135,63	204,20	2726,82	5453,64	173,60
Administrative Manager	1	1364	1636,80	170,50	256,70	3428,00	3428,00	109,12
Personnel Manager	1	1364	1636,80	170,50	256,70	3428,00	3428,00	109,12
Assistant Females	1	1085	1302,00	135,63	204,20	2726,82	2726,82	86,80
Assistant Males	1	1085	1302,00	135,63	204,20	2726,82	2726,82	86,80
Assistant Qc Manager	2	1085	1302,00	135,63	204,20	2726,82	5453,64	173,60
Stock Controler	1	877	1052,40	109,63	165,05	2204,08	2204,08	70,16
G.M. Secretary	1	1000	1200,00	125,00	188,20	2513,20	2513,20	80
Gen Secretary	2	877	1052,40	109,63	165,05	2204,08	4408,15	140,32
Shipping coordinator	1	877	1052,40	109,63	165,05	2204,08	2204,08	70,16
General Clerks	2	400	480,00	50,00	75,28	1005,28	2010,56	64
Account Clerks	2	400	480,00	50,00	75,28	1005,28	2010,56	64
Cashier	1	877	1052,40	109,63	165,05	2204,08	2204,08	70,16
TOTAL GENERAL ADMINISTRATIO	21	19757,90	23708,40	2469,63	3718,27	49653,29	49653,29	1580,56

GINERY-VARIABLE COST FOREIGN LABOUR

B. GENERAL ADMINISTRATION

MANPOWER BUDGET, SALARY P. A. AND COST

	Total	Overseas Salary per year	Local Salary per year	Allowances Transport 50% Housing 85% Total at 135%	Social Security 12.5% of Basic Salary	Holiday Month + Air travel	Allowance Medical 6.3% Total	Total Salary & Allowances per Year	Total Cost Per Year in	Income TAX (8%)
		USD	USD	USD	USD	USD	USD	USD	USD	USD
General Manager	1	40000	10000	13500,00	1250,00	3833,33	630,00	25380,00	25380,00	800
Production Manager	1	30000	8000	10800,00	1000,00	3666,67	504,00	20304,00	20304,00	640
Plant Manager	1	40000	10000	13500,00	1250,00	3833,33	630,00	25380,00	25380,00	800
Financial Manager	1	15000	6000	8100,00	750,00	3500	378,00	15228,00	15228,00	480
QC Manager	1	10000	4000	5400,00	500,00	3333,33	252,00	10152,00	10152,00	320
Assistant Plant Manager	2	12000	6000	8100,00	750,00	3500	378,00	15228,00	30456,00	960
TOTAL GENERAL ADMINISTRATION	7	147000	50000,00	67500,00	6250,00	25166,67	3150,00	126900,00	126900,00	4000,00

CANNERY-VARIABLE COST

5. CANNING LOCAL LABOUR

LOCAL EMPLOYEES MANPOWER BUDGET - SALARY P. A.
FOREIGN EMPLOYEES

	Male Employees	Female Employees	Total	Estimated Work Hours	Basic Salary per Hour USD	Yearly Salary per year Hrs 2080 USD	Estimated Overtime Per year Hrs 960 at 1.5 USD	Total Estimated Income per year USD	Allowances Transport 50% Rent 20% Soap 2.5% Total at 72.5%	Social Security 12.5% of Basic Salary	Allowance Food 2.29% Holiday 10% Medical 6.3% Total at 18.82%	Total Salary & Allowances per Year USD	Total Cost Per Year in USD	Income TAX (8%) USD
Stock Controler	1		1	8	,199	414,75		414,75	300,70	51,84	78,06	845,35	845,35	33,18
Maintenance Engineers	1		1	8	,421	875,68		875,68	634,87	109,46	164,80	1784,81	1784,81	70,05
Fitter	1		1	8	,221	459,68		459,68	333,27	57,46	86,51	936,92	936,92	36,77
Fork Lift Driver	1		1	8	,221	459,68		459,68	333,27	57,46	86,51	936,92	936,92	36,77
Skilled Labour	3		3	8	,221	459,68		459,68	333,27	57,46	86,51	936,92	2810,76	110,32
Unskilled Labour	3		3	8	,129	268,32		268,32	194,53	33,54	50,50	546,89	1640,67	64,40
QC	1		1	8	,221	459,68		459,68	333,27	57,46	86,51	936,92	936,92	36,77
Engineer	1		1	8	,421	875,68		875,68	634,87	109,46	164,80	1784,81	1784,81	70,05
Electrician	1		1	8	,221	459,68		459,68	333,27	57,46	86,51	936,92	936,92	36,77
Supervisor (Man)	1		1	8	,421	875,68		875,68	634,87	109,46	164,80	1784,81	1784,81	70,05
603 Reformer	1		1	8	,140	291,20		291,20	211,12	36,40	54,80	593,52	593,52	23,30
Beader		1	1	8	,140	291,20		291,20	211,12	36,40	54,80	593,52	593,52	23,30
Flanger		1	1	8	,140	291,20		291,20	211,12	36,40	54,80	593,52	593,52	23,30
Seamer		1	1	8	,140	291,20		291,20	211,12	36,40	54,80	593,52	593,52	23,30
Stacker		1	1	8	,129	268,32		268,32	194,53	33,54	50,50	546,89	546,89	21,47
Labour	1		1	8	,129	268,32		268,32	194,53	33,54	50,50	546,89	546,89	21,47
TOTAL CANNING	16	4	2[illegible]		4,21	8765,95		8765,95	6355,32	1095,74	1645,75	17866,76	17866,76	701,28

CANNERY-VARIABLE COST FOREIGN LABOUR

10. GENERAL ADMINISTRATION CANMAKING

MANPOWER BUDGET, SALARY P. A AND COST

	Total	Overseas Salary per year	Local Salary per year	Allowances Transport 50% Housing 85% Total at 135%	Social Security 12.5% of Basic Salary	Holiday Month + Air travel	Allowance Medical 6.3% Total	Total Salary & Allowances per Year	Total Cost Per Year in	Income TAX (8%)
		USD	USD	USD	USD	USD	USD	USD	USD	USD
Can Maker	1	40000	10000	13500,00	1250,00	3833,33	630,00	25380,00	25380,00	800
Assistant	1	10000	4000	5400,00	500,00	3333,33	252,00	10152,00	10152,00	320
TOTAL	2	50000,00	14000,00	18900,00	1750,00	7166,67	882,00	35532,00	35532,00	1120,00

SUMMARY TABLE

CANNERY FIXED INSTALLATION COSTS

	F.O.B	Estimated Freight	C&F Price	Installation Cost Local	Installation Cost Foreign	TOTAL COST	Depreciation (after 5 years)	Residual Value
FOREIGN- 1. CIVIL WORKS	682.700	8.693	691.393	818.912	-	1.510.305	314259	1048746
FOREIGN- 2. UTILITIES	158.764	9.015	167.779	105.063	7.525	280.367	90.802	95.615
FOREIGN- 3. ROLLING STOCK AND TRANSPORT EQUIPMENT	8.659	494	9.153	183.536	-	192.689	113.104	79.585
FOREIGN- 4. FURNITURE AND FITTINGS	0	0	0	106.100	-	106.100	71.333	34.767
FOREIGN- 5. EQUIPMENT 1. FISH ROOM (2-4)	134.560	7.670	142.230	8.733	-	150.963	73.533	77.430
FOREIGN- 5. EQUIPMENT 2. FISH ROOM (6-8)	26.085	1.487	27.572	3.803	-	31.375	15.282	16.092
FOREIGN- 6. EQUIPMENT CANNING 1. 307x113 PACKING (10)	164.300	9.365	173.665	10.661	-	184.326	89.784	94.543
FOREIGN- 6. EQUIPMENT CANNING 2. 603 PACKING (11)	28.560	1.768	32.638	11.139	-	43.777	17.821	18.766
FOREIGN- 6. EQUIPMENT CANNING 3. RETORT (13-14)	49.254	2.807	52.061	8.600	-	60.662	26.868	28.292
FOREIGN- 6. EQUIPMENT CANNING 4. CRATE UNLOAD (15-16)	35.166	2.004	37.170	15.203	-	52.374	20.029	21.090
FOREIGN- 7. EQUIPMENT CANNING 5. WAREHOUSE (17-19)	78.209	4.458	82.667	7.125	-	89.792	43.737	46.055
FOREIGN- 8. SUPERVISION	0	0	0	2.875	24.075	26.950		
FOREIGN- 9. EQUIPMENT LOIN FREEZING (25)	152,028	8,665	160,629	10,685	-	171,314	83,476	87,901
FOREIGN-10. EQUIPMENT CAN MAKING 307X112 (23)	1.644.721	15.750	1.660.471	19,114	273,075	1,952,560	951,123	100,153
FOREIGN-11. CAN MAKING BUILDING AND FITTINGS (23)	38.956	2.220	41.176	108.551		149.727	44.727	92.568
FOREIGN-12. CAN MAKING PACKAGING COSTS	18,150	1,034	19,184	-	-	19,184	19,184	-
CAN MAKING LOCAL PURCHASES	-	-	-	25,370	-	25,370	25,370	-
TOTAL FOREIGN INVESTMENT EQUIPMENT	3,220,112	75,430	3,297,788	1,445,471	304,675	5,047,934	2,000,431	3,047,503
INSTALATION COSTS OF LOCAL EQUIPMENT				76.334	6.164	82.498		
TOTAL FOREIGN INVESTMENT LOAN PLANT EQUIPMENT	3,220,112	75,430	3,297,788	1,521,805	310,839	5,130,432	2,000,431	3,047,503
LOCAL 11 UTILITIES	106.367	6.005	112.372	7.446	6.164	125.982	61.365	64.617
LOCAL 5. EQUIPMENT 1. FISH ROOM 1 (2-4)	278.685	15.885	294.570	14.934	-	309.504	150.757	158.747
LOCAL 5. EQUIPMENT FISH ROOM 2 (6-8)	4.017	229	4.246	281	-	4.527	2.205	2.322
LOCAL 6. EQUIPMENT CANNING 1. 307X113 (10)	292.401	16.560	308.961	20.336	-	329.297	159.480	167.933
LOCAL 6. EQUIPMENT CANNING 2. 603X403 (11)	104.738	5.795	110.244	7.116	-	117.360	55.667	58.618
LOCAL 6. EQUIPMENT CANNING 3. RETORT (13-14)	165.704	9.436	174.726	8.902	-	183.629	89.368	94.105
LOCAL 6. EQUIPMENT CANNING 4. CRATE UNLOAD (15-16)	30.079	1.715	31.794	2.106	-	33.899	16.512	17.387
LOCAL 7. EQUIPMENT WAREHOUSE (17-19)	33.831	1.928	35.759	2.368	-	38.128	18.572	19.556
LOCAL 8. LOINS FREEZING (25)	168.520	9.606	178.126	11.796	-	189.922	92.509	97.413
LOCAL 9. 3. 603X400 REFORMER EQUIPMENT (23)	14.966	853	15.819	1.048	-	16.867	7.351	7.741
TOTAL LOCAL INVESTMENT EQUITY	1.199.308	68.011	1.266.617			1.349.114	653.786	688.440
TOTAL PROJECT INVESTMENT PLANT EQUIPMENT	4,419,420	143,441	4,564,405	1,521,805	310,839	6,479,546	2,654,218	3,735,942