

EA:SF/GHA/68
April 1968

UNITED NATIONS DEVELOPMENT PROGRAM (SPECIAL FUND)
Project in Ghana "Food Research and Development Unit"

GHANA'S
FOOD
INDUSTRIES
1968

An Economic Analysis

by

Eberhard Reusse

April 1968

INDEX

	Page
Introduction	1
1. Meat Industry	10
2. Fish "	28
3. Sugar "	47
4. Rice "	62
5. Oil "	76
6. Fruit & Vegetable Processing Industry	90
7. Wheat Milling & Bakery "	105
8. Milk Reconstitution "	111
9. Cocoa Conversion "	115
10. The "Interlocking Food Complex"	118
Appendix 1	120
Appendix 2	122
Appendix 3	124
Appendix 4	125
Appendix 5	127
Appendix 6	129
Appendix 7	132

FOOD RESEARCH INSTITUTE
LIBRARY

The text of each chapter is followed by a summary and
recommendations.

I n t r o d u c t i o n

The present economic analysis has been undertaken in order to bridge the apparent gap in information on the facts, hopes and problems of Ghana's food industries, and in addition to provide the Government of Ghana with economic advice on the many decisions which are due to be taken in this particular field.

Most of the information has been obtained firsthand on several visits to the industries concerned. This information was supplemented by that supplied by government departments. Food analysis and food consumption surveys carried out by the Food Research and Development Unit and Food Research Institute provided additional data.

It has not always been possible to extract hundred percent reliable figures. Most of the industries are comparatively recent establishments, many of which have not yet produced their first balance sheet. The general lack of qualified staff and the frequent transfer or other change of staff observed in some of the government industries posed another handicap in acquiring correct information. However, cross-checks against information obtained from other sources have reduced possible errors to a reasonably low margin.

One of the less easily assessable data was the production capacity of a plant. The operator's experience often deviated considerably from technical data obtained from statements apparently derived from supplier's specifications. In all those cases, where the deviation could not be recognized as of only temporary nature, a reasonable balance between the differing sources of information has been established in order to estimate the technical capacities of plant. The annual production capacity of a plant has either been determined according to seasonal limitations or, where those limitations were not obvious, on the basis of an assumed operation during 250 days at 16 working hours (2 shifts). Exceptions are the cocoa- and wheat-milling industries whose capacity determinations are based on 24 hours daily operation for at least 320 days. In general, the industries should be able to achieve 75 - 100 % utilization of their production capacities determined in this manner, provided good technical supervision and maintenance, raw material supplies, and a market for the product are secured.

How far many industries still are from achieving reasonable utilization targets, is shown in Table I.

TABLE I: Utilization of Capacities in Ghana's Food Industries
during 1966/67 Operation.

Cocoa Conversion (export)	82 %
Lime Processing (export)	60 %
Bakery and Confectionary	50 %
Pig (Carcass) Processing	50 %
Long-Range Fishing Fleet*	41 %
Oil Milling	38 %
Palm oil	55 %
Coconut "	45 %
Palm kernel "	40 %
Groundnut "	9 %
Milk Reconstitution	30 %
Fruit and Vegetable Canning & Bottling	17 %
Sugar Milling	9.5 %
Slaughter and Meat Canning Plants	6.5 %
Rice Milling	4.2 %
All Food Industries average	35 %

* not including the Russian-built side-trawlers

The low overall rate of utilization is particularly critical when investments are heavy, as e.g. in the sugar and longrange (refrigerated) fishing industry. The latter has by its specific capital-intensive structure been included as a marginal field in this analysis which is primarily concerned with processing industries.

Table II shows the investment in the industries arranged according to their potential size after assumed materialization of all projects still under construction (or on order).

TABLE II: Investment in Ghana's Food Industries
(initial values)

	Plants, operating in 1966/67	New capacities under construc- tion (or on order)	Total poten- tial invest- ment by 1970
	in million New Cedis		
Long-Range Fishing Fleet	22	22	44
Cocoa Conversion (& storage)	8	20	28
Sugar Milling	15	-	15
Fruit & Vegetable Processing	1.7	6	7.7
Oil Mill (& Utilization)	2	4	6
Fish Processing	-	5	5
Wheat Milling	-	5	5
Slaughter & Meat Processing	3.8	0.4	4.2
Rice Milling	0.6	1.5	2.1
Bakery & Confectionary	2	-	2
Milk Reconstitution	0.4	0.3	0.7
	<hr/>	<hr/>	<hr/>
	55.5	64.2	119.7

Regarding the large amounts invested and the fact that all but the two smallest (investment-wise) industries are wholly or dominantly government-owned, the question becomes obvious, whether these amounts of capital bring at least a minimum return in form of a modest rate of interest paid by the users. This is unfortunately not so. In no case has it been found that the capital entrusted to Government Corporations was liable to interest payments. In a country where capital for industrial investments is scarce, as in Ghana, the allocation of large amounts of capital "free of charge" will necessarily lead to wasteful usage. The slowness of some of the industries in the establishment of satisfactory levels of operation is only a consequence of this dangerous policy. This is further demonstrated in the case of the State sugar industry in Chapter 3.

The investment cost includes a high foreign exchange component, due to the fact that most of the machinery, equipment, building material etc. has to be imported. Therefore, the lower the utilization of an industry, the higher normally is the foreign exchange component in the cost-price of the product. This has to be kept in

mind when planning to substitute importation by local production. Only if reasonable utilization of production capacities can be achieved, may a net saving to the benefit of the trade balance accrue.

If, in addition to the foreign exchange component in investment cost, packing and even raw material have to be imported, the intended saving by import substitution may turn into a loss in foreign exchange regardless of all efforts of large-scale production. Table III indicates that in some cases the effectiveness of import substitution is problematic. The problems involved are analysed in the respective chapters related to each industry.

TABLE III: The Foreign Exchange Component in the Production
Cost of some Ghanaian Food Industries.

foreign exchange expense in production for 1 N¢
import substitution:

	under assumed full utilization of capacities	1966/67 operation (low utilization)
	N¢	N¢
Sugar Milling	0.60	3.00
Fruit & Vegetable canning & bottling	0.60	0.75
Milk Reconstitution	0.60	0.70
Long-Range Fishing	0.75	1.25
Corned Beef Canning	1.50	3.00
. . . for 1 N¢ export earning:		
Lime Processing	0.22	0.25
Cocoa Conversion	1.04*	1.05*

*Cost of cocoa (f.o.b. less shipping charges) is included in foreign exchange cost, since any cocoa processed could as well be exported unprocessed at current prices.

Before entering the specific problem field of each individual industry, it may be of interest to compare the industries with regard to their impact on the market for raw material supplies (as buyers) as well as for finished products (as sellers). Tables IV and V undertake this, grouping the industries according to size (tonnage) of output and requirement.

The figures in these two Tables are intended only to serve as a crude orientation. While already industrial capacity statements are not always fully reliable, as has been discussed, estimates of agricultural production and domestic consumption are believed to have often only guess value. The present estimates are mainly based on the last official estimates available, of 1963/64, commended on by Simaika*, and food consumption survey results.

Adjustments have been made, if found necessary, to reflect developments which have taken place or are expected to take place during the period 1965 - 70.

The generally high percentages of the national crop, claimed as requirement of the industries, show the ambitious aims under which the industries have been established. While a high percentage figure may normally indicate supply problems, this is not necessarily so in the case of concentrated plantation development in the area of the industry combined with rather low production and consumption of the particular crop outside this area (e.g. lime, sugar cane). On the other hand, to concentrate 20 % of the national mango crop, a crop which covers two-thirds of Ghana, and is in active demand for fresh-fruit consumption, may involve haulage distances of 100 - 300 miles which is not permissible in view of the high perishability of this fruit (besides transportation cost).

TABLE IV: Projected Theoretical Raw Material Requirements by Ghanas Food Industries, in 1969/70.

(full utilization of capacities and materialization of all projects presently under construction (or on order) assumed)

	<u>tons</u>	<u>in % of</u> <u>national crop estimates</u>
Sugar cane	360,000	100
Cocoa beans	100,000	25
Palm-nut (bunches)	75,000	50
Rice (paddy)	45,000	90
Sesame seeds	30,000	.. (new crop)
Tomato	28,000	120
Limes	25,000	120
Copra	16,000	100
Pineapple	12,000	35
Groundnuts	7,500	20
Mango	4,000	20

* Dr. Simaika: Availability and Accuracy of the Statistical Information necessary for the Indicative World Plan, a case study: Ghana. FAO, Rome 1967.

On the selling side (Table V) a similar interpretation is needed. The question here is: does the indicated market offer a free demand for the product(s) of the industry. While it is theoretically possible to sell the total potential output of the citrus industry in the domestic market, provided imports are restricted, the same may be very difficult for groundnut oil inspite of its low claim, since traditional processing trade proves a hard and often superior competitor in the market for this product.

Though industrial slaughter output at Bolgatanga and Tema would claim only 50 % of the beef market, it is unlikely that this share could be obtained, since besides hard competition from livestock-and-butcher-trade the distribution of chilled and frozen meat requires refrigerated storage facilities at wholesale and retail level, which are available only in a few urban places.

The very large excess capacities in the canning field may be activated in production for an export market. Problems concerned with this aspect will be discussed in the following chapters.

TABLE V: Project (theoretical) Output of Ghana's Food Industries in 1969/70

(full utilization of capacities and materilization of all projects presently under construction (or on order) assumed)

	<u>tons</u>	<u>in % of estim. domestic consumption</u>
Catch (frozen fish) from		
Long-range fishing fleet	150,000	100
Wheat flour	85,000	150
Sugar	30,000	55
Rice	24,000	28
Canned fish	19,000	200
Hardened fats	12-15,000	1000
Coconut oil	9,700	190
Palm oil	7,700	50
Beef (frozen, chilled, canned)	7,600	50
Canned Pineapple	7,000	4000
Canned tomato pures	4,200	240
Canned mango	3,600	5000
Groundnut oil	2,100	26
Palm-kernel oil	1,600	23
Citrus (canned & bottled)	500	100
Pork products	400 (800)	10 (20) of pork consump.

The present analysis does not deal with the largely known weaknesses connected with the rushed establishment of a great number of mainly government industries within a few recent years:

- a) the lack of competent management,
- b) " " " training, especially of on-the-job training,
- c) the tendency of over-staffing,
- d) " " " employment of poorly-qualified applicants under the influence of nepotism and tribalism,
- e) the danger of inactive attitudes, ranging from complacency through indifference and frustration, among managements in government enterprise.

Currency:

The currency used in the report is the New Cedi;

- a) original rate of exchange 2 N¢ = £1 (stg.),
- b) since devaluation 8/7/67 2.86N¢ = £1 (stg.),
- c) since £ stg. devaluation -/11/67 2.45 N¢ = £1 (stg.).

The sterling devaluation is not considered in the report. Present and future calculations are made on base b), reference to past expenditures (e.g. investments before July 1967) on base a).

Abbreviations:

C M B	Cocoa Marketing Board
CMC	" " Company
F M C	Food Marketing Corporation
F R D U	Food Research and Development Unit (joint project FAO/UN and Ghana Government)
F R I	Food Research Institute (Ghana Government Counterpart to FRDU)
G N T C	Ghana National Trading Corporation
N L C	National Liberation Council
S F C	State Fishing Corporation
S S P C	State Sugar Products Corporation
T D C	Tema Development Corporation

Abbreviations (continued):

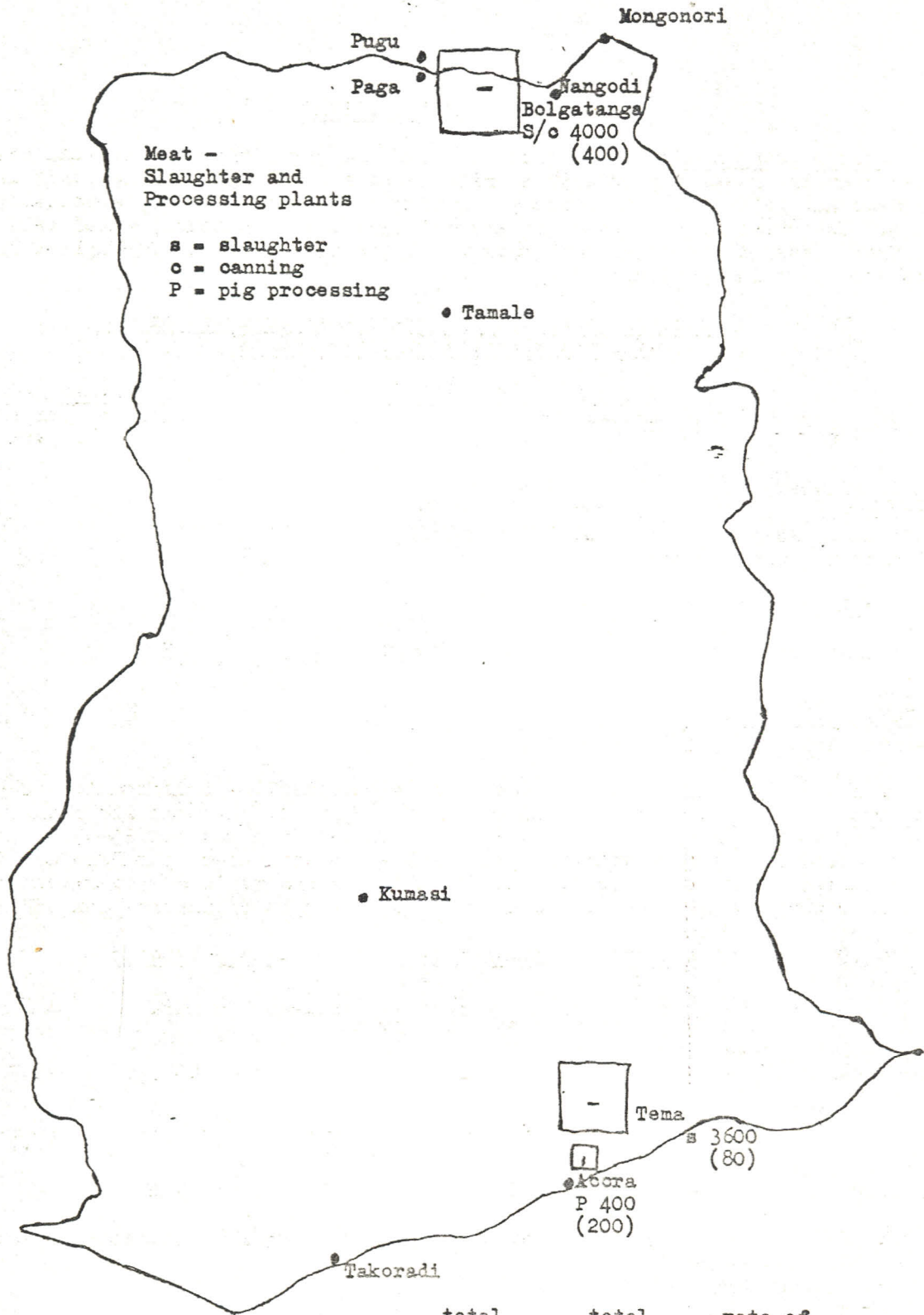
- T P I Tropical Products Institute (London)
U G F C United Ghana Farmers' Council (defunct)
M.F.V. Motor Fishing Vessel
U.H.T. Ultra High Temperature

Maps:

Maps, locating the food industries, are using the following symbols:

- | | | | |
|--------------------------|-------------------------------|--------------------------|-----------------------------|
| <input type="checkbox"/> | plant, in operating condition | <input type="checkbox"/> | private ownership |
| <input type="checkbox"/> | " , nearing completion | <input type="checkbox"/> | Government " |
| <input type="checkbox"/> | " , under construction | <input type="checkbox"/> | mixed priv./Govt. ownership |

Figures added to these symbols state (in tons output) annual processing capacity, based on normal technical performance during 250 operating days at 16 hrs. or a shorter number of days according to seasonal limitation (e.g. sugar, tomato canning); those in brackets state annual (average 1966/67) output in tons, achieved in actual operation.



total capacity	total output	rate of utilization
S/c 7600	480	6.5 %
P 400	200	50 %
8000	680	8.5 %

Remarks: It is planned to change the location of the Accra pig processing plant to Tema and at the same time double its present capacity.

1. MEAT INDUSTRY

Meat consumption in Ghana has declined. Imports, the main source, have been taxed heavily, resulting in a 50 % price increase. An equally important factor is the decrease in real consumer incomes during the period 1963-66, especially in urban areas. The establishment of a few special meat shops in Accra, which sell chilled and frozen meat in "continental" cuts mainly to an increased non-English European population, is insignificant.

Table 1 : Development of Livestock and Meat Importation and official slaughter figures 1961/67

	<u>1961/62</u> (annual)	<u>1966/67</u> (annual)	<u>decrease</u> absolute per head of population	
<u>Cattle (number)</u>				
imports	100,000	57,000	43 %	54 %
controlled slaughter (slaughter house records)	110,000	67,000	40 %	50 %
<u>Sheep & Goats (number)</u>				
imports	170,000	66,000	60 %	75 %
controlled slaughter	225,000	140,000	38 %	47 %
<u>Meat</u>				
imports, including canned (tons)	8,800	5,600	36 %	45 %

With the devaluation of the new cedi in July 1967, a modification of government meat import policy was implemented. Without regard to the economic implications, meat imports (including canned meat) were released from between 25-45 % taxation in order to offset the devaluation effect, while the equivalent tax load on livestock was retained. The effect is that the devaluation has replaced government taxation on meat imports, while adding another 43 % on the cost of importation of livestock.

Table 2 : Government taxation on beef and cattle imports

	<u>1960</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1965</u>	<u>1967</u> (Oct.)
	(in new pesewas per pound)					
<u>Beef (c.i.f. price)</u>						
frozen carcass	20	20	20	20	20	28.7
import duty	-	2.5	5	5	5	-
sales tax	-	-	-	-	2.8	-
	<u>20</u>	<u>22.5</u>	<u>25</u>	<u>25</u>	<u>27.8</u>	<u>28.7</u>
taxation in % of c.i.f. price	-	12.5 %	25 %	25 %	39 %	-
<u>Cattle (Zebu, carcass weight 300 lbs. value of non-carcass parts 15%) price at border in Upper Volta</u>						
	(in new cedis per head (Np/lb. carcass equivalent))					
export duty, Pugu*	58(16.4)	58(16.4)	58(16.4)	58(16.4)	58(16.4)	83.00(23.5)
import duty, Paga	-	-	-	2)	3(0.9)	8.6(2.5)
sales tax	-	-	-	2.6	6	6
income tax, Accra	-	-	-	7)	9.9)6.5	14.25)7.7
	<u>58(16.4)</u>	<u>58(16.4)</u>	<u>58(16.4)</u>	<u>67(19.0)</u>	<u>83.9(23.8)</u>	<u>118.85(33.7)</u>

Table 2 (cont'd.) :

combined gov't tax in % of price at border	-	-	-	15.5 %	45.5 %	43 %
Ghana gov't tax. in % of import price	-	-	-	15.5 %	37.5 %	30 %

* figure for 1967 according to traders' receipt (fr. 2000),
" " 1965 " " unofficial report.

This policy hit the livestock and butcher trade, but hardest the government meat factories. While these like the urban butcher trade depend on imported livestock as raw material, their sales are limited to a different market. This market consists of the meat shops, "cold stores" of department stores, hotels and institutional buyers, such as schools, universities etc., i.e. buyers with refrigeration facilities who are equally inclined to buy imported meat whenever a price incentive arises. Yet more directly under competition of imports is corned beef produced by the government meat factory at Bolgatanga.

The public markets, where the majority of the population buy and where an estimated 90% of meat for Ghanaian household consumption is sold, are up to now closed to chilled meat supplies from the factories. This is mainly a question of price, due to higher production and transport cost in the factories' price calculation. Besides, the retailing butcher and the market shopper prefer fresh slaughtered meat to chilled and more so to frozen meat, partly by taste preference and partly because of the higher perishability of meat, in the generally warm and humid climate, after release from cold storage.

The competition for the butcher trade is more of a marginal kind. It needs to be strong enough to pull the fresh meat customer away from his or her favourite shopping place, the public market. It arises on the one hand in form of low price imported cuts, often by-products of meat factories in developed countries, in various preserved forms i.e. frozen, dried, salted or canned; on the other hand the competition arises in kind of a growing demand among the educated consumers for more hygienic slaughter and retailing facilities. The neglect of these facilities by the local authorities has become too obvious. The chronic financial difficulties faced by these authorities during the past years have turned meat markets and slaughter houses from well-equipped "essential services" to run-down revenue earners.

The strongest position among imported meats is occupied by mutton and lamb. This meat is available on the world market within comparatively low price brackets, while the preference given to sheep and goat meat by Ghanaian consumers is reflected by a high price differential between sheep and goat meat and other kinds of meat sold in Ghana.

Table 3: Constellation of meat wholesale and retail prices
in Accra Oct./Nov. 1967
carcass, wholesale boneless, retail
(in new pesewas per pound)

<u>Beef</u>		
fresh	40 - 45	60 - 75
chilled	50 - 55	70 - 130
frozen	35 - 45	55 - 110

Table 3 (cont'd) :

Mutton & Lamb

fresh	50 - 60	75 - 85
frozen	30 - 45	55 - 100

Pork

fresh (from local breeds)	18 - 25	35 - 45
chilled (from imported breeds)	22 - 33	45 - 100

Chicken

	<u>wholesale</u>	<u>retail</u>
live birds (dressed weight)	45 - 55	55 - 75
dressed (from imported breeds)	55 - 65	75 - 100
frozen	40 - 55	60 - 100

Table 4 : Calculation of meat consumption in Ghana (according to import statistics 1965/67 and estimates of local production)

	<u>imported</u> <u>meat</u>	<u>from imported</u> <u>slaughterstock</u>	<u>from local</u> <u>slaughterstock</u> <u>and game</u>	<u>total</u>	<u>percent</u>
	tons	(tons carcass equivalent)		tons	%
Beef including smoked, dried and salted	600	8000	6000*	14,600	24.5
Mutton and lamb	1000	1000	2500*	4,500	7.5
Pork including bacon, ham and other processed pork	400	-	4000*	4,400	7.5
Poultry (dressed)	500	-	2500*	3,000	5
Canned meat products (mainly corned beef)	2500	100	-	2,600	4
Other meat including game, "bushmeat" (hamadilla, snail, etc.)	500	-	28000*	28,500	47.5
Edible slaughter offals	100	1300	1200	2,600	4
	<u>5,600</u>	<u>10,400</u>	<u>44,200</u>	<u>60,200</u>	<u>100.0</u>

* estimates taken from Dr. Kassem's Country Study (Ghana) on "Animal Husbandry, Production and Health", FAO, 1966.

Urban meat consumption in Ghana shows a different structure from that in rural areas. Most of the imported meats are consumed in towns, also most imported livestock is slaughtered for town consumption. Of local livestock approximately one-third probably serves urban consumption, the remaining two-thirds as well as eighty per cent of game and other "bushmeat" being consumed by the rural population. It can be concluded that urban meat consumption in Ghana centers on imported meat and meat from imported slaughterstock, while rural meat consumption centers on bush meat and local slaughterstock. This is confirmed, with regard to urban consumption, by a comparison of livestock imports with slaughter records of the presently 265 controlled slaughterhouses and -slabs, all in urban* places, (ref. Table 1). It is this urban consumption on which most industrial food processing undertakings in Ghana are focussed.

While the previous paragraphs described the situation until early 1968, a very recent important government decision has shifted the accents. The decision was taken two months after submission of an FRDU/FRI Memorandum on import policy for livestock and meat** and introduced a ban on beef importation. The full impact of the decision will only be realizable after a longer time period. The ban was the consequence of the partial treatment of livestock - and meat imports with regard to duty and other taxation since July 1967 (ref. Table 2); it was the only alternative to an unpopular re-imposition of duty on meat imports and/or a further revenue loss by cutting of duty on livestock imports.

The ban has widened the market for both traditional slaughter trade and meat factories. Initially, conventional buyers of imported meat will turn to the meat factories for substitution. Wholesale butcher trade, however, may with lower price offers and improved presentation succeed to take over a substantial share of this vacant demand. Prices are bound to increase, since only the low price meat imports prevented the livestock and butcher trade from transferring the nominal price increase of imported slaughterstock, after the devaluation, to the consumer. Indications of a 15% price rise for beef, mutton and lamb can already be observed in Accra markets.

All three fields of meat processing, i.e. slaughter and cutting, preservation, and product diversification, are represented in Ghana's three meat processing plants as well as in the traditional sphere of meat processing in the country. The three plants are the government slaughter plant at Tema, the government slaughter and canning plant at Bolgatanga, and the U.A.C. pig processing plant in Accra.

Only the last mentioned plant appears to be economically viable. Here, on average, 50 pig carcasses are processed each week into a variety of port products. The products or product groups in sequence according to turnover are :

- meat patties
- sausage rolls
- fresh sausage
- bacon
- ham
- delicatessen (i.e. sausage specialties)
- and pre-pack pork.

* "Urban" strata, counting towns of 5,000 and more inhabitants, comprised 27% of Ghana's population in the 1960 Census.

**"Urgent Memorandum (to Economic Committee, NLC) on government policy regarding the Importation of Livestock and Meat", Accra, Nov. 1967.

The assortment is obviously directed towards urban demand and derived from imported products for the conventional demand of the British expatriate population in Ghana. While expatriate patronage still appears to be the backbone of demand for those products, an equally important share is sold to Ghanaian consumers. With further improvements of quality and more expansive advertising and salesmanship the turnover of the present assortment could well be doubled, and in certain products, such as ham and bacon, more than quadrupled, before attaining full substitution of imports. The present rented premises do not allow much improvement nor expansion of processing operations. Therefore new siting of the plant is in planning, with optimal plant lay-out and doubling of present capacities.

Viability of the plant is secured, besides skilled management, by growing surplus production of pigs in the country, especially in eastern coastal areas. In these Ewe and Ga-Adangbe areas pig-raising and consumption of pork is traditionally developed. With the introduction of imported breeds, production in this area appears to have doubled. At present, about 150 pigs of imported (e.g. Yorkshire) breed are supplied weekly to Accra by the main raisers in the Ga-Adangbe areas. Considering the average carcass weight of 120 lbs, as compared with 45 lbs from local breeds, this supply constitutes already 500 tons annually, i.e. over 10 % of estimated total pig production in Ghana (ref. Table 4).

While there are still large unexploited feed resources for pig raising, consumption of pork is near the limit set by the prevailing consumption habits. Apart from Moslem influence, there are many non-religious traditional prejudices* against pork eating among all parts of Ghanaian population, strongest among those of the Akan tribes.

Against this background, the role of pig processing has gained an unequalled importance, because it may be the only quick means of widening the acceptance of pork by Ghanaian consumers. Only to a small extent can this potential demand be raised by the type of processing done by the present U.A.C. plant. New avenues for the commercial utilization of the growing surplus of pig meat have to be chosen. Research into traditional methods of meat processing in Ghana, such as drying and smoke-curing and their adaptability to industrial processing operation, would probably lead to pork products more readily accepted in Ghanaian markets. Here lies a promising field for the FRI officer for meat processing and product development.

Canning is another, though second-ranking approach. The high foreign exchange expense on packaging material and machinery must be considered. The planned U.A.C. investment envisages sausage canning, as already practised by the same concern in Nigeria. Considering the long-term dependence on beef and cattle importation as compared to the low-price surplus supply from local pig production, the development of corned pork labelled as "Corned Meat", might be worth an effort. If only 20% of the popular demand for corned beef could be diverted to such a product, a 15 - 20% increase of present pig production would be absorbed. Re-imposition of the former (before devaluation) taxation on corned beef importation and economic pricing of Ghana-made corned beef would be a pre-condition. While then corned beef would sell at approximately 65 Np retail, "Corned Meat" at lower packaging cost (round cans) and meat input of 24 Np per 12 oz. could be sold at 48 Np retail.

* Some of those "prejudices" are well founded on experience with diseases carried from pig to man, e.g. trichinosis. Improvement of hygiene and veterinary control over the whole pig industry will take a long way to rule out those valid suspicions.

An example of untapped feed resources for pig production is the Nzima copra zone. Fresh copra cake from rural oil production, fed to pigs in the Volta Region, is completely wasted in the Nzima area where pig raising and consumption of pig meat appear to be widely unknown. The wasted cake can be estimated at 500 tons per annum. Some 1200 Yorkshire pigs could basically be fed on this valuable feed which would probably be available at 20 Np per cwt. including collection cost. It should not be difficult to raise such pigs at a production cost of 18 Np and less per pound carcass.

The envisaged new U.A.C. plant is considered to expand its production program into the field of poultry and beef products. While primary concentration on pig processing would be most desirable by reasons already discussed, any effort to open new markets for the country's growing poultry production can only be welcomed.

Poultry is after pigs the next meat stock which may soon develop surplus production. The new government hatchery at Winneba with a final annual capacity of up to 10 million chicks, may exert a tremendous impact on poultry production, provided the distribution of day-old chicks all over the country can be conducted according to plan and will find ready acceptance by the rural population. Besides the development of a variety of local poultry products, partly in substitution of imported products, the sale of dressed birds at lower prices than at present could considerably raise consumption of local poultry in urban areas. At prevailing low prices for maize, the sale of dressed chicken at 55 - 60 Np per pound retail should be possible. It appears that a few larger raisers within maximum distance for non-refrigerated transportation of dressed birds to Accra are controlling the price.

To let more competition enter, especially from small- and medium-scale raisers who represent two-thirds of supplies, a dressing and packing plant at Accra could have a substantial impact. The plant could reduce processing costs by concentration of dressing and packing operation, attract supply of live birds from a variety of sources and thereby gain in bargaining power, develop standardized quality grades and guarantee uninterrupted refrigeration until delivery of the chilled chicken at meat shop, supermarket or catering enterprise in Accra.

In addition to these existing outlets, the public markets could be supplied with selling facilities for dressed poultry. This step would not only increase sales considerably, but also exert some pressure on trade margins of established retail outlets, since market traders are used to trade at a low-cost and profit-margin. Consignments for market traders should be killed on the early morning of delivery and not chilled. Like other meat sold in the markets, they are to be sold out by noon of the same day.

A dressing and packing plant complying with above outlined policies should be able to achieve a turnover of 6 tons weekly or approximately 4,500 chicken (at average weight of 3 lbs.) for Accra customers only. A refrigerated van may be employed for the supply of other towns and institutional customers in south Ghana, if prices and sales volume justify the extended sales operation. Total turnover could then be well above 6,000 birds weekly or N¢ 8,100 at an assumed average sales price of N¢ 1.35 per chicken.

The two government meat factories at Tema and Bolgatanga are concerned with the slaughter of livestock, predominantly cattle, and the processing of beef and by-products. Both plants are in the second year of operation, but still producing at less than 20% (Bolgatanga) and 5% (Tema) of capacity. In spite of management aid by the

supplier countries (West Germany and Yugoslavia) both operations consume heavy direct or indirect subsidies. Their problems are of basic nature and it is at present still doubtful whether they can be solved without ignoring sound economic and social principles.

Tema. The plant, in operation since late 1966, is importing livestock and selling meat and carcass to supermarkets, hotels and institutions. Only small quantities, however, were until recently ordered by these buyers, who paid less for imported meat or for carcass meat supplied by wholesale butchers in Accra, and who receive offers as well from the government meat factory at Bolgatanga through its Accra sales office. With the lately introduced restriction of beef imports and the Tema management's determined effort to obtain a market share at prices far below cost, orders have increased but found the factory unprepared with regard to organized supply of slaughterstock. Even if maximum attraction of the conventional buyers of chilled and frozen meat could be achieved, the slaughter demand would scarcely exceed 10 heads cattle and similar numbers of sheep, goats and pigs per day.

To increase sales beyond this level, a break-through into the traditional slaughter meat market would be required. Only at prices below 40 Np/lb., delivered at Accra markets, this may be achievable. Such price calculation would admittedly leave both expense- and overhead-costs of the slaughter plant uncovered and would require a monthly subsidy of N¢ 5,000-10,000. The T.D.C. (Tema Development Corporation), which is running the plant as one of its enterprises, is determined to use part of its large income from housing estate rents for these subsidies. The question however arises, if the TDC management is not acting against the interest of both communities, Accra and Tema, and of the country's economy as a whole, when using public funds in order to under-cut cost prices of economically viable enterprises.

Apart from those direct subsidies, indirect ones in form of import privileges, implying revenue loss for Government, have to be included in a review of subsidies paid to both factories, Tema and Bolgatanga. One privilege, the exemption from sales tax, which for the livestock trader amounts to N¢ 14.25* per head cattle and is paid together with duty on importation into Ghana, is only enjoyed by the Bolgatanga plant due to its category as "meat processor". A further tax load for the livestock trader is the payment of N¢ 7 income tax flat rate per head of cattle, to be paid before application for foreign exchange transfer can be made. This obligation does not exist for both factories. Another very important privilege is the supply of purchasing funds in foreign exchange. This enables the factories to establish purchasing accounts in supplier countries, while the livestock trader does not receive foreign exchange until approximately three months after collecting of stocks in the supplier country and must employ special agents for the transaction of a series of formalities. This difficulty in foreign exchange supply is reflected in a surcharge of more than fr. 2000 or N¢ 9 in import price calculations of the traditional livestock trade. The three privileges result in an artificial trade advantage for the government plants of N¢ 30 (Bolgatanga) and N¢ 15.75 (Tema) per head cattle, of which amounts N¢ 21 and N¢ 7 respectively are a clear revenue loss to Government. This fact has to be remembered in course of any comparative cost analysis of traditional against factory trading and processing operations.**

* Very recently reduced to N¢ 13.30.

**Full cost account of traditional operations in the importation, distribution, slaughter- and retail trade is given in Appendix 1, further details on administrative procedures connected with livestock importation by the traditional trade are given in App. 2 to FRDU "Memorandum", quoted on page 13.

As another less expensive move to raise the factory's employment, it has been suggested to close the obsolete Accra slaughterhouse and divert all slaughter through the Tema plant. However, this cannot be recommended, since such change would introduce higher slaughter- and transport-margins and thereby increase the meat price in Accra markets or call for high subsidies.

The plant cannot compete with the butcher trade. The investment of approximately 1 million New Cedis would even at 3 shift operation present a bill of N¢ 3 per head cattle to cover the cost of depreciation and interest on invested capital only. This is already N¢ 1.30 more than wholesale butchers have to pay for the use of slaughter facilities in Accra inclusive of kraal fees and transport fees kraal - slaughter house - meat market. The labour expense for the butcher and his assistants amounts to approximately N¢ 3/head raising total expense for the butcher to N¢ 4.70. At Tema, operational expenses could be estimated at approximately N¢ 6/head. These would have to be added to the N¢ 3 investment cost, plus N¢ 1.50 cost of refrigerated transport of the slaughtered animal to Accra (22 miles), bringing the total cost of slaughter at Tema meat factory for the Accra market to at least N¢ 10.50/head cattle. In addition to more than doubling the butcher's slaughter expense, slaughter at Tema would necessitate frequent if not daily travelling for the Accra butcher who would want to control movement of his cattle as well as timely shipment of his slaughter products, especially the intestinal ones which can only be sold profitably if slaughter-fresh. Since all butchers would want delivery early in the morning, chilling of part of the consignments would be unavoidable, introducing the above mentioned problem of lower acceptability of chilled meat in the markets. The greatest problem, however, is the absence of sufficient slaughter demand in the Accra-Tema area to utilize more than one shift operational capacity even if all slaughter were done by the factory. Present daily slaughter in the area amounts, on average to 35 heads cattle, 60 sheep and goats and 30 pigs, of which numbers approximately 85% are slaughtered in Accra for Accra consumption. It appears that at the time of planning 1961/62 a consumption of double these amounts of slaughterstock by 1967/68 was envisaged for the area. Such optimism was supported by approximately 50% higher Accra slaughter figures at that time, the plan for rapid expansion of the new township Tema, the general accelerated population increase observed in urban Ghana at a growth rate of 7.5%, and the reliance on further increases of consumer income. The result demonstrates the importance of realistic planning, which should include reservations and precautions rather than rest on optimistic speculations. Based on the quoted slaughter figures as the plant's maximum potential employment for the near future, the investment costs (depreciation and interest) rise to N¢ 9 and the operational costs to approximately N¢ 10 per head of cattle slaughtered. Adding N¢ 1.50 transport cost for delivery at Accra, the expense for the Accra wholesale butcher would be above N¢ 20 i.e. more than four times his present expense. Even if total investment costs were written off at government expense, the operational, including delivery-, costs would remain 150% above the present expense incurred for the wholesale-butcher in connection with slaughter in Accra.

It also has to be kept in mind that a high share of factory costs and directly or indirectly in foreign exchange i.e. the greater part of the investment, repair and maintenance costs, fuel and power supply etc. Regarding the limited slaughter potential of the area, the foreign exchange component in slaughter cost (including investment cost) per head cattle at Tema would, even with maximum patronage, amount to approximately £3. 10. --.

Apart from the high cost of plant operation, also the factory's purchasing costs have been much higher than those of the Accra wholesale butcher. Inexperienced purchasing and transport organization resulted in overpayment of agents and 7 - 15% losses in transit by deaths, disease and emergency slaughter. The factory-owned fleet of cattle lorries has increased normal transport cost by travelling one way empty-loaded. Experience may in course of time yield better results. However, there remains the danger of less visible though serious losses wherever large-scale purchasing for a government or private concern is made from a market as intransparent as that for livestock.

Bolgatanga : The factory was planned for the production of corned beef. However, it appears that this plan was ill-conceived. Corned beef production is an economic proposition under two alternative situations :

- a) where substantial surplus of low-cost slaughterstock needs to be turned into a product marketable over long distance, e.g. to overseas countries. (e.g. the situation in most South American countries.)
- b) where strong and generally applied consumer preference for specific cuts of the carcass meat and low appreciation of others create large amounts of scrap meat as low-price raw material for corned beef manufacture. (e.g. North West European countries.)

In both cases, the plant output has to be large enough to make the production of meat extract as an important by-product of corned beef production technologically feasible. Corned beef produced under these conditions is a cheap and popular convenience food, successfully introduced in consumer markets all over the world wherever it offers a price advantage compared to fresh meat. Neither situation a) nor b) prevail in Ghana, who imports the greater part of her slaughter-stock and whose population has developed little preferential differentiation in the consumption of carcass meat; nor does the scale of production at Bolgatanga permit the investment of an extraction plant. A cost price calculation of corned beef produced at Bolgatanga therefore results in a retail price of approximately 85 Np. per 12 oz. can, i.e. 60% above the price for fresh beef in Ghana's urban retail markets. It can be assumed that practically no sales could be made at such price. Squeezing down this price by waiving duty on raw material, writing off the investment, charging only direct production cost and narrowing wholesale and retail margin by control price ordinance, could afford a minimum retail price of 65 Np. This price would still be 25% above the retail price of beef. Should cattle importation for the butcher trade be equally freed of duty and salestax obligations, this price difference would widen again to 45%. Any retail price fixation below 65 Np. means government subsidy in actual expense with every can of corned beef produced; i.e. the present government controlled retail price for "Volta" corned beef of 45 Np. involves an immediate subsidy of 20 Np. per can.

Regarding the effect of substituting corned beef imports by national corned beef production, the unfortunate result is that the foreign exchange component in production cost of one can of "Volta" corned beef amounts to approximately 48 Np. i.e. 33% above the average c.i.f. price of standard quality corned beef from Europe and South America, and 50% above that of the more comparable Israeli, Yugoslav or Chinese brands.

Table 5 : "Volta" Corned Beef and Imported Brands,
Cost-Price Calculation 1967 (after devaluation)

	<u>"Volta"</u>	<u>imported</u>	<u>(Argentine, Brazil)</u>
	(Np. per 12 oz. tin)		
raw meat input (value on the hoof)	*38 (32)**		
package	12 (6)	aver. }	
transport	2	c.i.f. }	36
dir. process. cost	10 (8)	Tema }	
min. wholesale price in Accra	<u>62</u> (48)		40
over-head cost	10 (7)		
	<u>72</u> (55)		
government controlled retail price	45		50

* 28 Np/lb. carcass on the hoof at factory gate
 10 " compensation for bone weight (26 %)
 38 " less 25 % weight loss by evaporation
 = 38 Np. per 12 ounces.

** Figures in brackets are projected for break-even scale of total slaughter operation according to schedule of Appendix 2, when C.B. production (remained at present size) would absorb only one-seventh of total meat production with the consequence of concentration on low value meat for canning. They further speculate on the use of round cans produced by the can making plant of the new tomato cannery at Bolgatanga, as well as on reduced direct and overhead costs by improved skills and cost depression with larger slaughter (not canning) output.

In view of this situation it can hardly be recommended to continue the production of corned beef. If the Government does not wish to completely extinguish "Volta" corned beef from Ghanaian markets, then the alternatives are to either re-impose duty and sales tax on imported corned beef and raise the retail control price for both local and imported products to 65 Np., or allocate an affordable amount of subsidy and limit production to such funds; e.g., at prevailing control price the annual production of 500,000 cans (approximate 1967 output), which covers approximately 10 % of consumption, would absorb Np 100,000 subsidy.

The factory management has for the meantime decided to keep the production of corned beef at the present low level of approximately 10,000 cans per week, equivalent to 1 day's (10 hrs.) production i.e. operation of the canning line at 15% of capacity. This absorbs about 60% of the 1967 monthly slaughter average of 300 - 350 heads, based on the experience that 1 carcass of the factory-average weight of 280 lbs. yields 200 cans (12 oz.) of corned beef. In practice, of course, corned beef is mainly produced from forequarter meat and hindquarter scrap, while hindquarter top cuts and whole hindquarters are shipped to meat stores at Accra, Takoradi and Kumasi in refrigerated meat vans. This quantity of chilled beef, equivalent to 30 carcasses per week, was the share the factory could acquire in the market for chilled and frozen beef in 1967. The quantity could be doubled soon after the ban on meat importation was imposed. The bulk of this quantity is still sold in Accra, though Kumasi is gaining importance in the factory's sales. Meat shops, department stores and insti-

tutions are still the main customers. Increased sales efforts and the lately introduced competitive price structure based on cost calculation under assumed reasonable utilization of capacities* may well raise the monthly slaughter throughput in 1968 to 500 heads.

However, in spite of the increased demand from conventional buyers of chilled and frozen meat resulting from the change in government import policy, the factory needs to enter the fresh meat market in order to utilize its slaughter and transport facilities to a profitable extent which would be reached at a slaughter rate of at least 1,200 heads per month.

Is such a break-through into the field of the traditional meat trade possible? Regarding the already mentioned adverse attitude of the butcher trade towards chilled meat and the high production cost (compared to municipal slaughter) at Bolgatanga, the answer can hardly be positive. However, in view of the importance of the fresh meat market, the factory's sales policy has to make every effort to find entry to this market.

Unlike the Tema plant, the Bolgatanga plant is confronted with a large demand for slaughter meat in the Ashanti region, the region with highest beef consumption in Ghana, concentrating in Kumasi where 80% of the region's controlled slaughter takes place. With an average daily slaughter rate of 55 heads cattle and 70 sheep and goats, Kumasi is the leading meat market in Ghana, besides its geographically favoured position as the country's central livestock market. The Bolgatanga-Kumasi road is the main cattle transport road, offering the same transport distance for meat on the hoof as well as chilled in carcass form. Kumasi offers itself as the essential outlet for the factory's meat production.

However, one of the planning errors in establishing the Bolgatanga factory was the speculation that carcass transport was more economical. It has, instead, turned out to be more costly than live transport, by the following reasons:

- 1) The investment in a refrigerated van is nearly twice as high as in a cattle lorry of equal horse power and carrying capacity. Also insurance, maintenance and running expense are substantially higher.
- 2) The payload, already reduced by the heavier insulated body, refrigeration-equipment and-machinery, can not be utilized at more than 70% due to the specific needs of chilled meat transportation (free hanging).
- 3) Edible non-carcass parts, which in Ghana form one-sixth of the cattle value, lose 25 - 50% of their slaughterfresh market value by the need of long distance transportation in chilled and, as necessary with most of these products, frozen condition.**
- 4) There is normally no adequate return freight.

A cost calculation for chilled meat transport Bolgatanga-Kumasi (Accra), under assumption of empty return trips*** results in 45 (40) Np./ton-mile or 7 1/2 (10) Np./lb. carcass, including the charge for value loss of transported non-carcass

* shown in Appendix 2.

** Bulk-sale fresh at Accra slaughterhouse N¢ 20 - 28;
returns for frozen delivery (from Bolgatanga) N¢ 12 - 18.

*** Some return freight has meanwhile been attracted, mainly building material, beer (at very low rate) and frozen fish (seasonal). While at present these freight incomes reduce meat transport costs by approximately 20%, it is doubtful if this relation can be retained with increasing meat shipments to the South.

parts (ref. 3, above). The equivalent cost figure for livestock transport from Paga (border station 20 miles north of Bolgatanga) to Kumasi, based on actual trade charges for transport- and other services involved in this transaction and including a risk allowance of 2% for deaths* and emergency slaughter in transit and 1% weight loss,** is 28.5 Np./ton-mile or 5 Np./lb. carcass (ref. Appendix 3).

This comparative disadvantage in transportation cost and the high overhead costs of the Bolgatanga plant make it even under prevalence of the above mentioned subsidies (privileges) impossible for the factory to compete with fresh meat wholesale prices. The price difference may vary between 10-25% depending on further government policy in the taxation of livestock trade. The lowest offer of chilled carcass to Kumasi butchers could at present be made at 45 Np./lb. (ref. Appendix 2), while the present wholesale price for fresh slaughtered carcass, at Kumasi, of 36 Np. is expected to rise as a belated devaluation effect to between 39 - 42 Np./lb. (ref. Appendix 1). Not considered in the factory meat price calculation is the eventual need for cold storage at Kumasi, without which daily supply to market butchers, a necessity, might not be reliably secured. Further has to be considered that with equal treatment of livestock trade with regard to taxation and foreign exchange supply (ref. page 17) fresh-meat wholesale prices would decrease by at least 5 Np. per pound.

It is hard to find quality characteristics of the factory's carcass meat which are interesting enough for the butcher and consumer, who both share a preference for fresh meat, to overcome the mentioned price difference.

One consideration in the decision to establish the Bolgatanga plant had been the long-range government efforts to stimulate and support the development of commercially operated local livestock herds. To establish a guaranteed market for local slaughterstock and to develop the factory's holding ground into a large-scale cattle ranch were among the aims of the project. Unfortunately, these aims were crossed by the aim of bringing the employment benefit of the project to an area with unemployment problems by reason of overpopulation. A compromise between these aims seems hardly possible. In a country with vast underpopulated areas with equally good natural conditions it is a wasteful effort to boost livestock development in an area where most of the terrain is under intensive cultivation and the remaining part threatened by river blindness. As it stands, the factory's holding ground and cattle ranch at Nangodi, 20 miles east of Bolgatanga, is an expensive appendix to the enterprise. As a holding ground it increases transport cost, since half of the cattle are imported through Paga and travel an extra 40 miles to pass through Nangodi.*** A holding ground should be close to the factory to avoid long drives on the hoof before slaughter, respectively avoid the undesirable stress the wasteful loading and unloading exerts on the cattle. That sufficient uncultivated land for this purpose had apparently not been available in closer vicinity, confirms the unfavourable location of the project.

* This low percentage is confirmed by a series of interviews with livestock traders and lorry drivers at northern border stations. An increase, however, is experienced during the dry season, since the lake formation has developed a transport bottleneck at the Yeji ferry. Installation of a second ferry at Yeji and/or improvement of the Kintampo road is a much needed government investment.

** This percentage is deliberately assessed. According to traders' interviews there is no noticeable weight loss. Carcass weights at Accra showed the same average as carcass of the same grade at Bolgatanga meat factory.

***The management is now trying to avoid these costs by gearing cattle imports through Paga to weekly slaughter needs and transferring 2 - 3 days consignments on the hoof from Paga quarantine station direct to the slaughter plant (20 miles).

The hopes of the present factory management to utilize the ranch for the up-grading of cattle purchased in the lean season may not yield the profit needed to cover the expense of such exercise. Purchases during the past twelve months show very little price and weight variation. The leanest condition of arrivals was recorded in May with 5% below annual average live-weight and 8% below December, the month with the highest monthly average of 631 lbs.

The predestined area for extensive cattle rearing appears to be the Northern Region, extended into southern parts of the Upper Region e.g. Mamprusi. The optimal center for a meat industry based on local and supplemented by imported livestock would be Tamale. However, in view of the discussed advantages of slaughter at place of consumption, the incentive would rest on intensification of extension work and establishment of livestock markets. The question of slaughter in the livestock producing area may be reconsidered as soon as production has become large enough to feed a plant of economical scale, e.g. at the rate of 500 heads cattle per week. While the weight loss during the terminal section enroute (present livestock transport Paga/Manori - Kumasi) is negligible, the weight loss over a similar distance, but starting at ranch grazing weight, may be a factor to consider.*

One generation might pass, before local livestock production in the Northern Region will yield quantities such as mentioned above for shipment to urban southern Ghana. By that time, wholesale and retail outlets for chilled meat will probably command sufficient turnover to absorb the output of one or two plants of the Tema/Bolgatanga size.**

A comparative assessment of priorities leads to the conclusion that for the amounts so far invested in the two government projects the existing 265 controlled slaughter houses and - slabs, where still 95% of slaughter for urban consumption takes place, could have been supplied with, on average, N¢ 15,000 each; an amount probably sufficient to raise the security, hygiene and efficiency of their operation to acceptable standards and even to relocate slaughter houses in a few most needed cases such as Accra. Further, operational losses incurred plus subsidies consumed by the two factories during only one year at present low output can be estimated at approximately N¢ 400,000, depreciation of only short-life equipment and machinery included***, an amount with which 40 meat markets in Ghana's larger towns could be overhauled and improved.

It is hard to understand why the capital city of Ghana was unable to even supply its primitive slaughter house in the center of town with running water, while the central government could spend huge amounts on immature projects of little priority.

* However, recent investigations in Portugal in connection with German Development Aid projects, were unable to identify any loss of carcass weight by medium distance rail transport of cattle.

** Though the present analysis deals with cattle as the main and up to date almost exclusive slaughter object of the two plants, sheep, goats and pigs may also be slaughtered but will (with the possible exception of pigs at Tema) not play any significant role due to the case of domestic slaughter of these animals.

*** That the Bolgatanga plant, apart from causing a revenue loss on cattle import of approximately N¢ 80,000, did probably not experience high operational losses in 1967, can be attributed to the complete absence of salaries for high-paid technical and managerial staff which is still provided by German Technical Assistance, and to large numbers of livestock in trades respectively foreign purchasing funds at hand, at time of devaluation.

Much as the that-time central government is to blame for this wrong allocation of funds, the municipal governments cannot be excused from exploiting public processing and marketing facilities as revenue earners. Substantial parts of fees levied on the users of these facilities are not re-invested in the facilities, but absorbed as general revenue, while they should be reserved as funds for replacement and improvement expenses. In the case of the Accra slaughter house, approximately 50% (of a total fee of e.g. ₵ 1.70 per head of cattle, ref. page 17), in case of Accra's public markets, an even higher share of the fees is being diverted for general revenue purposes, while these amounts, accumulated over the past 10 - 15 years, could have built up sufficient funds to improve, re-organize and even relocate such facilities.

Summary and Recommendations

1. Rising meat prices due to high duty and other taxation on meat- and livestock imports, levied between 1962 - 65, have seriously affected meat consumption in Ghana, especially in urban areas which depend for their meat supplies mainly on imported slaughter stock.
2. These tax levies were waived for meat, in order to balance the devaluation effect, but retained for livestock imports, which partial treatment consequently led to a rush for meat import licences and necessitated drastic import restrictions. However, while in the interest of the Government meat factories (presently predominantly engaged in cattle slaughter) beef importation was practically banned, the importation of mutton and lamb, pork products and canned meat e.g. corned beef has suffered little restriction and imports of these products are believed to have increased sharply.
3. The Government meat factories enjoy tax privileges amounting to N¢ 7 (Tema) and N¢ 20 (Bolgatanga) per head of slaughtered cattle, and further privileges in foreign exchange supply for cattle purchases. Nevertheless, they are facing great problems in competition with wholesale-butcher trade:
 - a) high overhead costs,
 - b) high transport costs,
 - c) limited market (espec. Tema),
 - d) consumer preference for fresh-slaughtered meat,
 - e) losses in the disposal of by-products (espec. Bolgatanga),
 - f) dependence on refrigerated storage facilities for wholesale distribution.

In view of the difficulty experienced by the two factories to obtain sufficient orders, and the fact that both compete in the same market, it appears that one factory alone would have a better chance of survival.

The Bolgatanga management has shown much initiative in its attempts to compensate for the above mentioned competitive disadvantages by progressive sales and business policies, while the policy of the Tema management to subsidize unrestrictedly a cut-throat competition by public revenues, is destructive to trade. Location and disequilibrium of plant capacity and slaughter demand in the area are structural disadvantages of the Tema operation, which cannot be overcome even by highly subsidized price offers.

4. The production of corned beef in Ghana is uneconomic and leads to foreign exchange losses.
5. Livestock- and butcher trade are efficient but badly neglected with regard to public market and slaughter facilities, condition of which facilities is deteriorating while they are exploited as revenue earners. Duty- and other

taxation policy on trade with imported livestock appear discriminative, foreign exchange transfer procedure could be much facilitated. It should be considered that livestock import trade as compared with meat import trade

- a) creates more employment,
 - b) costs less foreign exchange
 - c) secures wider distribution (meat trade depending on refrigerated transport and storage facilities),
 - d) is serving consumers' preference for fresh meat,
 - e) intensifies regional trade relations (more than 90% of meat imports during the last years came from overseas countries).
6. Different from beef consumption, in which Ghana depends heavily on importation, the demand for pork and chicken is entirely met by domestic supplies. While these supplies can readily be expanded, especially by pig raising on by-products from oil seed- and grain-milling industries and (in future) fish processing plants, demand has limitations:
- a) for poultry as a matter of price which could for Accra probably be reduced by establishment of a well managed small-scale killing and dressing plant;
 - b) for pork due to inherent consumer suspicion concerning the hygiene and feed sources of local pig raising.

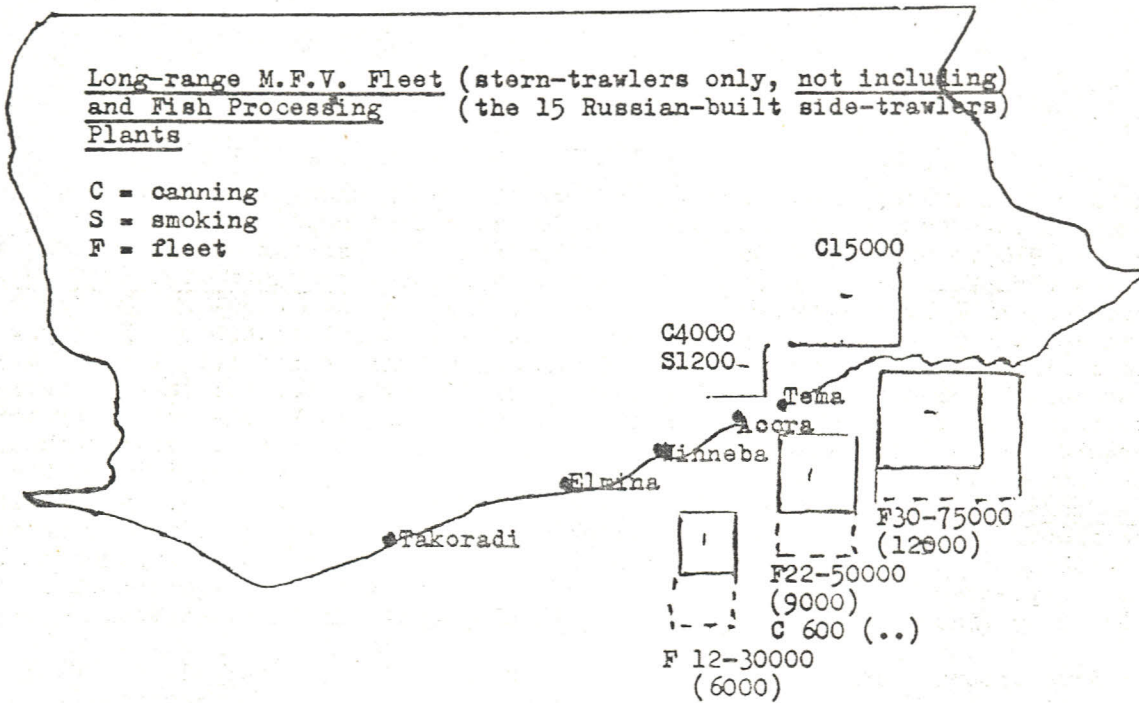
The plentiful supplies of pig feed (e.g. in the Nzima area) make part-substitution of corned beef by "Corned Meat" from pork an economic proposition.

It is therefore recommended, to:

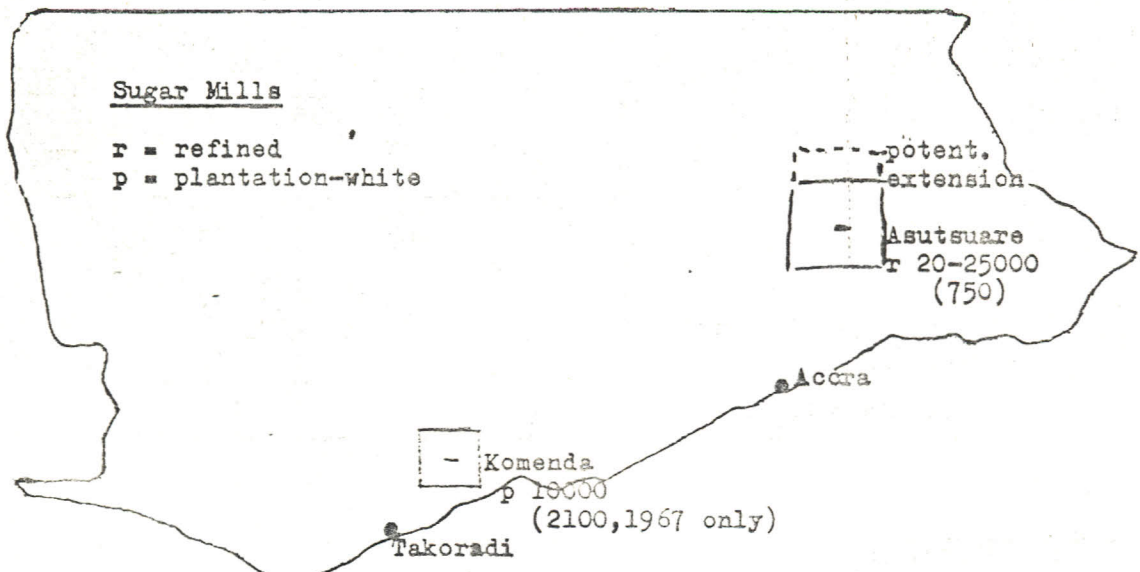
1. Restore fair competition in the livestock and meat market in the interest of sound economic development by:
 - a) re-imposition of duty on meat importation (especially mutton and lamb, pork and pork products and canned meat),
 - b) waiving of sales tax on livestock importation,
 - c) improving of transfer procedure for the traditional livestock import trade,
 - d) weight - grading of cattle at border-quarantine stations, in order to facilitate subsequent marketing in Ghana.

(more detailed substantiation of recommendations a) - d) is contained in FRDU/FRI submission to the Economic Committee (NLC): "Urgent Memorandum, subject Government Policy regarding the Importation of Livestock and Meat")

- e) protecting slaughter and butcher trade against competition from Government enterprise at prices unrelated to production cost and subsidized by public revenues,
 - f) urging and assisting Municipal and Local Councils to improve public slaughter - as well as meat and livestock marketing facilities.
2. Discontinue corned beef production or, if to continue by other than economic reasons, limit it to a max. yearly output of 500,000 cans.
3. Turn the Tema plant into a poultry and pig processing and general cold storage plant, with cattle slaughter and beef processing as a sideline for special customers. This type of versatile operation would appear more appropriate in the hands of private enterprise which is already experienced in this field and ready to expand (ref. page 13).
4. Continue slaughter operation at Bolgatanga with the following motivation:
- a) development benefit for the area;
 - b) training for Ghanaians in business management and industrial processing operation;
 - c) challenge for butcher trade and Municipal (and Local) Councils to improve on hygiene of slaughter and market facilities and presentation of meat;
 - d) direct source of information on livestock and meat trade;
- but under the condition that:
- a) the West-German (Technical Aid) management team stays on for at least another three years;
 - b) direct subsidies and privileges are gradually reduced to a minimum;
 - c) the factory ceases to expand into the establishment of refrigerated wholesale and retail facilities. (It is, however, recommended to strengthen the responsibilities of the veterinary services in the control over wholesaling and retailing of meat, especially of chilled and frozen origin.)
5. Support every initiative which can lead to the improvement or diversification of and thereby to increased demand for pig and poultry products; give specific attention to the largely unexploited feed resources (discussed e.g. in Chapter 5 "Oil Industry" of the present report) for pig raising and the potentiality of introducing Ghana-made canned pork products on the canned-meat market in Ghana (e.g. "Corned Meat" for Corned Beef).



	<u>total capacity</u>	<u>total output</u>	<u>rate of utilization</u>
1966/67 ann. aver.	F 65000	27000	41%
1967 under construction (F on order)	F 90000		
	C 19600 (the processing vessel of 600 tons)		
	S 1200 (started to produce 1967)		



	<u>total capacity</u>	<u>total output</u>	<u>rate of utilization</u>
1966/67 ann. aver.	r 20000	750	3.75%
	p 10000	2100	21%
	<u>30000</u>	<u>2850</u>	<u>9.5%</u>

2. FISH INDUSTRY

Ghana's fish industry is characterized by the rapid change from import dependence to overcapitalized excess capacities. In order to offset a supply gap which was expected by 1970 to exceed 150,000 tons, an investment of approximately £22 million (sterl.) has been sunk into the establishment of a local long-range fishing fleet, last deliveries of which will be taken about 1969/70. Approximately 60% of the fleet is delivered and taken into operation by private and government concerns. However, owing to various misfortunes and the scarcity of managerial skills for this type of operations, ashore as well as on sea, the annual output of the fleet so far put into operation is far shorter of expectations, not surpassing 35,000 tons. While theoretically this output could be 2-3 times as high, it is more than doubtful if a domestic market for such quantity of frozen fish landings would exist. The original estimate of 250,000 tons fish consumption by 1970,* two-thirds of which was to be supplied by Ghanaian deep sea fleet, was based on the expectation that an upward trend of Real consumer incomes would accompany the known trend of population increase, that further a wide consumer acceptance for frozen fish would exist, and that only insignificant increases in the catch by traditional and small motor fishing craft could be expected.

The development, meanwhile, seems to rule out all three assumptions. Real incomes stagnated. Frozen fish as such found ready acceptance only during temporary and seasonal shortage of fresh fish, and inland only after conversion into a second grade smoked product. Last not least, a steady expansion of inshore motor-fishing craft, an at least temporary revival of the man-power-drained canoe fishery and the development of a substantial Volta Lake fishery appear likely to keep the supply gap (supposed to be filled by long-range vessel landings) from expanding to more than 40-60,000 tons.

Table 6 : Fish Supplies for Ghana 1963-67

Source: Fisheries Department; External Trade Statistics; writer's estimates for river-lake-and-lagoon-fisheries and all 1967 figures:

	(in 1000 tons)						
	1961	1962	1963	1964	1965	1966	1967
Imports, cured and canned	20	20	14	11	14	12	10
" , frozen fish**	26	20	33	20	23	25	14
Total Imports	46	40	47	31	37	37	24
Long-range Fleet (frozen fish)	—	—	9	15	33	22	33
Short-range M.F.V.s	3	4	4	8	7	17	20
Marine Canoes	28	33	36	43	17	25	28
Lagoon-,River-,Lake Fisheries	12	12	12	12	14	16	19
Total Domestic:	43	49	61	78	71	80	100
Total Consumption:	89	89	108	109	108	117	124

* "Seven Year Development Plan", Office of the Planning Commission, Ghana, 1964.

** These imports are only partly shown in the "External Trade Statistics" pending an agreement on the formal question of terminology. They are fully reflected in the statistics of the Fisheries Department under "landings from foreign vessels"; they are imports since they are paid for in foreign exchange.

To draw-up an estimate for 1970 supplies, three factors need consideration:

- 1) Investments in fishing harbours are under way and serious measures are being taken to increase the output of the two Ghanaian boatyards to at least 25 boats per annum, of which it is recommended that most should be in the 60' class.* This would mean an annual increase of the catch capacity of the inshore M.F.V. fleet by 6 - 8,000 tons. A further substantial increase of this fleet's catch is likely to occur, if the present trials of commercial light-fishing prove successful. It is the considered opinion of Dr. Zei, project manager of the UNDP/Ghana Government Fishery Research Unit, that light fishing can be profitably employed to secure abundant supplies of herring throughout the greater part of the presently experienced off-season. On the other hand, a great number of the operating foreign-built boats are ageing and a reasonable allowance has to be made for the gradual laying-off of those boats. While replacement has become more difficult with increased purchasing prices after devaluation, many of those boats have now less difficulty in importing spare parts. The latter improvement might bring more boats back to use than are falling out in the near future. An estimate of 36,000 tons fish supplies from inshore M.F.V. fleet by 1970 may appear a little high, however it may be considered that catch recordings especially by this category are believed to be understated.**
- 2) The stabilizing effects of the new Government's economic policies have re-allocated manpower to agriculture and fisheries, benefitting mainly labour intensive lines of production. The marine cance fishery, with and without outboard motor, can therefore be expected to increase its output. The same is likely to happen with lagoon- and river fisheries.
- 3) As a new supply factor, the Volta Lake fishery will exert some impact on Ghanaian fish markets, especially on all those east of the Tamale-Kumasi-Accra road. Already, lake-fish, especially hot smoked cat fish and salt-dried tilapia, is a common feature in all these markets and lake-tilapia is distributed as far as Takoradi. Annual fish harvest is difficult to estimate, since a stable fauna has yet to develop as well as a fishing population with adequate fishing techniques. However, after elaborate discussions on the subject with national, bilateral and international authorities in the field, the expert feels that an estimate of 20,000 tons fish harvest from the Volta Lake by 1972/73 is probably not aiming too high. Theoretically, this figure can be much higher as well as it can be lower. Particularly during the first decade, the development towards a balanced fish fauna may be a very instable one. The 1967 lake production has been included in the supply estimates of Table 7 with 6,000 tons. For 1970, 12,000 tons may be figured as a very vague guess, raising the total estimated supply from lagoon-, river- and lake fisheries to 25,000 tons. These estimates, as well as those for lagoon- and river catch, stand yet without authentic support and serve only as provisional assumptions in the econometric model of a combined supply projection.

* personal communication. National Investment Bank (D.S.I.), Accra.

** personal communication, Fisheries Department, Accra.

Allowing for a further 5% annual increase of fish consumption, the supply structure by 1970 may be drafted as follows:

Short range (predominantly inshore) M.F.V. fleet	36,000 tons
Marine canoe fishery	30,000 "
Lagoon-, river-, and lake fishery	25,000 "
Cured and canned imports	9,000 "
Supply gap (frozen fish landings)	50,000 "
	150,000 tons

For two reasons, frozen fish landings are not entered according to projected supply capacities but as a balance between projected consumption and fresh-fish supplies. Firstly, because frozen fish has an easy market only during periods or at places when or where fresh or fresh-cured fish is in short supply. Secondly, because frozen fish supply is most adaptable to seasonal variations of the fresh fish supply-gap due to the continuous operation of long-range fishing and the relatively long storage possibility for frozen fish landings.

Focussing these frozen fish landings from foreign and Ghanaian long-range vessels, it becomes obvious that the fresh fish supply-gap has not widened considerably.

Table 7 : Frozen Fish Landings (Fresh Fish Supply-Gap)

	(in 1000 tons)							
	1961	1962	1963	1964	1965	1966	1967	1970
							(esti- mate)	(projec- tion)
Ghanaian Fleet:								
a) Corporation	-	-	0.5	3	15	14	14	50
b) Companies	-	-	8.5	12	18	8	19	
Foreign Fleet:	<u>26</u>	<u>20</u>	<u>33</u>	<u>20</u>	<u>23</u>	<u>25</u>	<u>14</u>	<u>-</u>
Total:	26	20	42	35	56	47	47	50

A fresh fish supply-gap will always exist due to the strong seasonal fluctuation of inshore marine catch. It is, however, questionable if the investment in a Ghanaian long-range fleet for this supplementary supply was well advised.

Table 8 : Seasonal Variation of the Fresh Fish Supply-gap in 1966

	(in 1000 tons)				
	Canoe- and short-range M.F.V. catch	Lagoon-, river- and Lake-catch (estimated)	Imports, cured and canned (es- tim.distrib.)	Supply-gap (demand for frozen fish)	Consumption (estim. Dis- trib.)
Jan.	2.2	1.0	1.0	3.8	8.0
Feb.	3.5	1.0	1.0	3.0	8.5
March	2.3	1.0	1.0	4.7	9.0
Apr.	2.0	0.5	1.2	5.3	9.0
May	1.3	0.5	1.2	6.0	9.0
June	2.3	0.5	1.1	5.3	9.2
July	2.6	1.5	1.0	4.2	9.3
Aug.	7.0	2.0	0.5	2.0	11.5
Sept.	8.4	2.0	0.5	1.6	12.5
Oct.	5.6	2.5	0.5	2.4	11.0
Nov.	2.3	2.0	1.0	4.2	9.5
Dec.	<u>2.5</u>	<u>1.5</u>	<u>2.0</u>	<u>4.5</u>	<u>10.5</u>
	42.0	16.0	12.0	47.0	117.0

Though Table 8 includes guesswork which needs substantiation by further research, the seasonal pattern of the "supply gap" as shown in the Table resembles the oscillation of demand for frozen fish as experienced by the State Fishing Corporation and private deep-sea fishing companies. The demand variation by up to 300% necessitates the accumulation and liquidation of heavy stocks over periods of several months. Up to now landings from foreign vessels have contributed to satisfy the peak demand during April - June. However, the growing Ghanaian long-range fleet is now almost able to cover the demand all year round. The expanding short-range M.F.V. fleet, on the other hand, shows its greatest impact during the herring season July - Sept./Oct., when saturation of the fresh-fish market is reflected in high unsold stocks of frozen fish (e.g. 12,000 tons stored at Tema in cold stores and on vessels at kray by beginning of November 1967). The new potential of the Volta Lake fishery will reduce the supply gap during November - Febr./March, not the least by carrying-over of dry-salted tilapia from Sept./October catches. The demand for frozen fish will concentrate more than previously on the second quarter of the year, during which period possibly half or even more of annual sales may take place.

The ambition to supply for such a highly seasonal demand by the operation of a Ghanaian long-range fleet implies several problems, namely:

- a) high investment in cold storage facilities;
- b) uneven utilization of those facilities;
- c) quality loss and deterioration of stock by over-long storage.
- d) accentuation of seasonal over-supply by dumping-sales of frozen fish in order to acquire storage space for arriving vessels;
- e) accumulation of 2 Np. average storage cost per pound (average 6 weeks storage), i.e. 30% of landed price for frozen fish imports.

The indicated problems show that a long-range fleet for the supply of the Ghanaian market with the aim to abolish fish importation cannot be an economical proposition. To fill the fresh fish supply-gap, for Ghana there are three alternative economic solutions, the feasibility of each depending on the competitiveness of the Ghanaian fleet-operation cost.

- 1) To abstain from running a long-range fleet with its high investment and high foreign exchange component in operation cost and supplement fresh fish catch by well-timed imports. This will be feasible, when a Ghanaian fleet would operate at a foreign exchange expense equal to or higher than the c.i.f. price for imported frozen fish. This situation is at present prevailing in Ghana.

The landed cost per ton fish from Ghanaian vessels during 1963-67 ranged from £70 - £100. The only domestic cost factors are crew salaries in the low ranks, labour cost of locally-provided repair and maintenance jobs and local storage and delivery costs (including duty and tax) of imported material. They form at most 30% of operational cost, leaving £50 - £70 per ton as costs in foreign exchange. In comparison, c.i.f. prices paid for frozen fish imports into Ghana during 1963-67 were ranging from £36 - £62. The difference of £8 - £14 per ton was a foreign

exchange loss to Ghana, amounting to approximately £1.2 million over the 5 year period with total frozen fish landings by Ghanaian vessels of about 115,000 tons. Considering, that during the same period most productive investment potentials such as intensification of local boat building, extension of old and establishment of new fishing harbours, adequate fish marketing and processing facilities etc. were neglected, and that vessels had to lie idle due to lack of foreign exchange for the payment of foreign crews and spare parts, the haphazard expansion of the Ghanaian long-range fleet out of governmental funds cannot but be regretted.

- 2) To operate a Ghanaian long-range fleet of moderate capacity, with landings in the range of the months with lower demand, thereby cutting out 50% of frozen fish imports, the remaining imports taking care of the seasonal fluctuations. Storage expense can thereby be kept at a minimum. Such a fleet would have annual capacity of 25,000 tons. This proposal would be feasible, when the foreign exchange component in operating cost is below the c.i.f. import price for frozen fish, and when unemployed manpower is available for crew vacancies. A few well managed vessels are now on the borderline of this category. The greater part of the Ghanaian long-range fleet, however, is still generating foreign exchange deficits.

The Ghanaian fleet has already outgrown the chance to operate under principle 2.

However, it may not be impossible to dispose of excess capacities in order to reduce the fleet in line with principle 2. In order to reduce operating costs to the demanded level, first of all annual output per vessel must be increased. A reasonable short-term goal is an annual landing of six times the carrying capacity including carrier vessels. The 15 Ghanaian long-range vessels (not including the 15 Russian side-trawlers, still more or less idle) operating throughout 1967 with an average carrying capacity of 550 tons per vessel, should under this goal achieve an annual catch of 45,000 tons. The expected actual 1967 landings of only 32,000 tons demonstrate how far the fleet still is from being profitable (in terms of foreign exchange). There will be at least 8 new vessels, five of which have 700 tons capacity, operating from the end of 1967, bringing the 1968 potential output to 75,000 tons. Another 10 vessels with 500 tons average capacity are ordered, two of which are already awaiting delivery, the rest to be completed by 1970. With those vessels added to the Ghanaian fleet, 1970 long-range operation would have to produce, from the point of feasibility, more than 100,000 tons of frozen fish i.e. more than twice the need of the Ghanaian market. In view of those pre-committed investments, it appears that Ghana is confronted with solution 3.

- 3) To operate a long-range fleet of monthly landings in the range of the months of peak demand for frozen fish (April to June). Such a fleet could satisfy domestic peak demand without costly accumulation of stocks, but would have to sell the fluctuating surplus during the first, third and fourth annual quarter in the export market. The capacity of such a fleet for Ghana would be 90 - 100,000 tons, half of which catch would have to be exported. This solution is only feasible, if the foreign exchange cost component of the fleet operation plus part of the domestic cost component can be recovered by the export price. The uncovered part of the domestic cost component, in case of exportation, may be recoverable by sur-tax on sales in the protected domestic market. Also to be considered are

the available manpower resources and the eventual priority of investments in other fields of the fishing industry, especially those which increase the productivity of existing economic activities, such as investments in fishing harbours, boat and dock yards, fish marketing and processing facilities.

With a total investment in deep-sea vessels of £22 million by 1970, Ghana has spent £14 million more than was needed for the medium way of solution 2) and the country is, in course of the realization of this investment, fast advancing into situation 3). Apart from questioning the priority given to this investment into a highly capital-intensive industry such as deep-sea fishing with freezing and cold storage-facilities on board and ashore, it appears doubtful if the fleet can operate for export without heavy subsidies. It has been stated previously that the present operation for the domestic market already absorbed more foreign exchange per ton output than the landed c.i.f. price for imports. It is probable that export returns per ton will be substantially lower than c.i.f. Ghana import prices. Ghana is known as one of the best fish import markets in the region, where up till now comparatively high prices could be obtained. It may be difficult to obtain an average landing price of above £40/ton in African harbours including the important fish exchange market on the Canary Islands. At the presently 100% higher production cost of the Ghanaian fleet, such exportation would mean carrying away foreign exchange.

The introduction of a compensatory price policy on domestic markets during the peak season for frozen fish demand (April - June), under strict government protection against external competition, will become a necessity. This, however, will only be successful, if the necessary price agreements among the fleet owners are loyally kept. The inflexible, year-round uniformly fixed government control price on fish has recently been abolished, making way for more constructive price policies. Further, the former duty of up to 5 Np/pound on frozen fish landings, regardless if from Ghanaian or foreign vessels, has been abolished. This measure compensated for increased operation costs after devaluation. Foreign landings have been banned; the danger of disguised importation, however, must not be overlooked in view of the large difference between import prices and Ghanaian landing cost and the introduction of carrier vessels.

Before the end of 1968, competition for the domestic market will begin to show all symptoms of structural oversupply. Reluctant to venture into the export market with much lower returns. Ghanaian deep-sea vessel operators will probably choose to expand their domestic sales at prices far below cost, as long as the returns are above those from exportation. Financially, this would be possible by omitting depreciation and interest charges for government loans (corporation) and equity capital (private companies), thus reducing wholesale cost prices by approximately 20 %. If in addition maintenance and repairs are neglected, a 30 % price reduction may be possible for a period well over one year. Such a sell-out policy would not only damage the Ghanaian long-range fleet, but also seriously retard the growth of the inshore fleet as well as discourage further manpower allocations to the traditional fisheries. A development of this kind must by all means be prevented, keeping in mind that the comparatively most valuable contribution to Ghana's economy in the present period of development is made by the traditional fisheries which produce at the lowest foreign exchange input. In Table 9 the potential output of Ghana's expanding long-range fleet is given for various levels of operational efficiency. Efficiency is measured by its most effective factor, the number of fishing trips per year.*

* It can be assumed that the vessels rarely return without full load. Off-loading to a carrier is counted equivalent to a trip. Carriers are, however, counted as vessels, i.e. fishing vessels served by a carrier have to compensate by increased catch for this service.

Table 9 : Potential output of Ghanaian long-range fleet, 1967/70 at various levels of operational efficiency

	Number of vessels	I (4 trips) Output in '000 tons	II (6 trips) Output in '000 tons	III (8-9 trips) Output in '000 tons	I surplus for export	II surplus for export	III surplus for export
1967	15	32	48	65	-	-	20%
1968/69	23	52	78	100	-	35%	50%
1969/70	33	75	110	155	33%	55%	67%

Based on an estimated annual demand for frozen fish of 50,000 tons (ref. page 3), the Table demonstrates a need for exportation as early as 1968. Only if the operational efficiency of the fleet remains at its present very low standard could the fleet's 1968 output probably be absorbed by the domestic market. A policy of evading confrontation with the highly competitive export market by deliberate restriction of productivity, as presently practised by the State Fishing Corporation, would surrender Ghanaian long-range fishing operations to authorized inefficiency, a burden on the Ghanaian tax payer.* However, a decisive step towards intensified operation is to be expected with realization of the "Aker Agreement". The corporation's 7 Norwegian-built vessels, now put under Norwegian fleet-management by this agreement, are supposed to raise their output by 50 - 100%, if the ambitious aims of the agreement can be materialized. While guaranteeing a minimum output of 2,400 tons per vessel (5 trips), the aim declared at a press conference is to turn out a total annual catch of 30,000 tons, i.e. 4,300 tons (8-9 trips) per vessel. Considering that the Norwegian-built vessels represent less than one-third of Ghana's 1968 deep-sea fishing capacity, and that the other two-thirds of the fleet, under Corporation and private ownership, will not want to stay behind, the dividing line between import substitution and over-supply and exportation has to be anticipated in the course of 1968.

The Aker Agreement in its full content has not been made public. Apparently, it does not include any commitments for the marketing of the 7 vessels' catch. If this impression is correct, then the agreement should be reconsidered in view of the fact that a more off-loading of catch at Tema for disposal by the S.F.C. sales department would not serve any useful purpose in a situation of rapid change from sellers' to buyers' market. As stated already, the S.F.C. has great difficulty in selling its present catch. Chronic over-stocking is experienced. Moreover, the fish from the Norwegian-built and manned vessels has gained a poor reputation due to bad packing, underweight and less popular assortment. In spite of the fact that private fishing companies still imported during the first half of 1967, the corporation's sales further decreased to about 10,000 tons (estimated) for 1967. Since the Corporation is still supporting a country-wide refrigerated distribution network, which once (in 1965) handled 36,000 tons, the losses in storage and distribution are adding severely to those of the fleet.**

* Even more destructive is the temptation to keep Ghanaian vessels in port, while obtaining sufficient profits from importation to pay the running expenses on such idling vessels. In spite of the declared ban on fish importation, licences have been issued, while considerable stocks of frozen fish from Ghanaian vessels were in stock at Tema.

** For further information on basic problems of the S.F.C. (distribution section), reference is made to the expert's paper "Marketing Operations of the Ghana State Fishing Corporation", in the Food Research Institute Technical Report, December 1966.

Lack of co-ordination in marketing and fleet-operation has been an important factor in the overall failure of this government enterprise. The Aker management should not be entirely freed of marketing responsibilities ashore. Furthermore, the Aker management should be made fully responsible for the export marketing of a substantial share of the catch, e.g. 33% in 1968, 50% in 1969, 66% in 1970. No Ghana landings should be permitted during the months July - October, when landings from inshore vessels will be sufficient to provide the market.

Table 10 demonstrates the expected impact of the combination of cost decrease and export increase by extended and intensified operation of Ghana's long-range fleet on the country's foreign exchange budget and on the profitability of the participating enterprises for the period 1968/70. Calculations in the Table are based on cost accounts of State and private fishing enterprise during the period 1965-67. The figures try to show the average situation. They include the effect of devaluation which has raised the foreign exchange component in production cost to approximately 75%. Full allowances for depreciation and interest on investment are included. A decrease of storage charges with rising production is assumed, since less time will be needed to accumulate stocks for the peak selling months in the market. Wholesale prices at Ghana port are indicated at a continuously high level under the assumption that the compensatory price policy, either by agreement or compulsory contribution to an export-support fund can be implemented. The c.i.f. import price quotes the average landed price of catch from Russian vessels; it also reflects an average of prices deduced from External Trade statistics. Export prices are quoted in accordance with price expectations by private fishing enterprise for export of currently fished species to ports in the Gulf of Guinea; an increase is expected, when in course of time and experience assortment, grading and packing can be improved to conform with market requirements. Estimates of total long-range fleet production, at various levels of efficiency, are taken from Table 9.

In view of the fact that most figures in Table 10 are presenting averages deduced from a considerable range of data experienced by the individual enterprises, the Table can only serve as a model to be adjusted for situations as they arise and in accordance with the individual cost structure, performance and marketing experience of the participating enterprises.

Table 10 : The Impact of Expansion and Intensification of Ghanaian Long-Range Fishing Operations in terms of Commercial and National Profitability

efficiency level (number of trips per year)	I (4 trips)		II (6 trips)		III (8-9 trips)	
	1968/69	1969/70	1968/69	1969/70	1968/69	1969/70
	deep sea vessels (number)	23	33	23	33	23
total catch ('000 tons)	52	75	78	110	100	155
surplus for export (%)	-	33%	35%	55%	50%	67%
production cost:	N¢ per ton		N¢ per ton		N¢ per ton	
a) direct or indirect in foreign exchange	£60 = 172		£50 = 143		£37 = 106	
b) from local sources	52 224		42 185		32 138	

Table 10 (cont'd) The Impact of Expansion and Intensification of Ghanaian Long-Range Fishing Operations in terms of Commercial and National Profitability

	I (4 trips)		II (6 trips)		III (8-9 trips)	
	1968/69	1969/70	1968/69	1969/70	1968/69	1969/70
cold storage cost quay-, handling- and sales- charges	44 <u>22</u> 290	28 <u>22</u> 274	28 <u>22</u> 232	15 <u>22</u> 219	15 <u>22</u> 175	15 <u>22</u> 175
∅ wholesale returns at port (herring season excluded)	260		260		260	
∅ c.i.f. export price	£40= 114		£40= 114		£40= 114	
∅ c.i.f. import price	£48= 138		£48= 138		£48= 138	
business loss/gain:						
a) domestic market	-30 -14		+28 +41		+85 +85	
b) export "	-110		-71		-24	
c) overall "	-30 -46		-6 -20		+30 +12	
foreign exchange loss/gain:	<u>£stg. per ton</u>		<u>£stg. per ton</u>		<u>£stg. per ton</u>	
a) in replacement of imports	-12		-2		+11	
b) in production for export	-20		-10		+ 3	
c) overall	-12	-15	-5	-6.4	+7	+5.6

The following conclusions may be drawn from the model of Table 10:

- 1) At present low efficiency (level I) high overall business losses as well as high losses in foreign exchange are unavoidable. The only way of temporary survival is by omission of depreciation and interest charges on the investment, which would mean wearing-out the vessels without building-up funds for replacement.
- 2) An increase in efficiency by 50% (level II) would result in good profits on Ghana landings. These profits are, however, absorbed by higher total losses on the much increased volume of exports which necessarily rises with rising fleet productivity.

Foreign exchange losses on exports would still be considerable. Those on replacement of imports would be only small. With gradual reduction of the number of expatriate fleet staff the overall loss in business terms as well as in foreign exchange could probably be balanced in the course of a few years.

- 3) With 100% increased efficiency (level III, Aker target) high profits on Ghana landings, combined with moderate losses on the rapidly growing share of exports, would result in substantial overall profits. Also the foreign exchange calculation would now show gains, at least on import substitution.
- 4) The stability of a remunerative wholesale price level for Ghana landings is indispensable for the survival and prosperity of the fleet.
- 5) An increase of total long-range fleet output over and above 100,000 tons is neither in the interest of the participating enterprises nor in the interest of the foreign exchange budget. The output of 100,000 tons, i.e. 50,000 for export and 50,000 for domestic consumption (ref. page 32, solution 3) can be achieved with the present fleet of 23 vessels provided efficiency is raised to level III, a target which must be fulfilled in the long run if the large investments in this fleet are to turn into an asset for Ghana's economy.

To strive for higher efficiency with a larger fleet than necessary would increase the share of expatriate staff and thereby foreign exchange cost per ton produced, besides the risk of landing more fish than can be marketed gainfully. Under this perspective it should be considered whether all or the greater part of the 10 vessels still on order could be prevented from joining the Ghanaian fleet. The vessels are British and Japanese-built. In case of choice preference might be given to the 5 Japanese vessels, since already a fleet of 7 Japanese vessels is being operated by Ghanaian fishing companies. Only 1 British vessel has yet been put into operation by Ghana (S.F.C.), but has not reached full performance due to technical difficulties. A British agreement to dispose of the whole Ghana order of 6 vessels (including the one already delivered) otherwise, retaining a reasonable amount out of prepayments and installments as indemnity, would be in the best interest of Ghana's economy.

In none of the calculations of this paper has the fleet of 15 Russian-built side-trawlers been included. This fleet, 10 S.F.C.- and 5 private-owned, has been out of operation since the Russian fleet staff left for political reasons in March 1966. The 10 S.F.C. vessels are still idling and have been offered for sale. The private-owned ones have been put back to sea, manned with German and Norwegian personnel. All 15 vessels, each with 130 tons capacity, could at medium efficiency (level II) contribute 12,000 tons to annual frozen fish landings, if they were to return to normal fishing operations. However, the private fleet owner, in anticipation of a saturated domestic market, has decided to adapt the equipment of his side-trawlers to tuna fishing for export to U.S.A. Since he is the only potential Ghanaian buyer for the 10 state-owned side-trawlers, these will probably share the same diversion to tuna fishing, if they are not sold abroad. Specialized in such a way and producing for a comparatively secure export market, the side-trawler fleet would create no marketing problem and therefore has not been included in any of the foregoing calculations. Should, however, the tuna project fail and the 15 vessels return to production for the domestic market, this would aggravate the situation of growing over-supply and make the proposed cancellation of outstanding orders for British and Japanese vessels a vital necessity.

One of the motives in the establishment of a Ghanaian long-range fishing fleet was the endeavour to extend fresh (i.e. frozen as substitute for fresh) fish distribution over all interior areas of Ghana. Not sufficient consideration was given to

the fact that, apart from the coastal population, the Ghanaian consumer has little or no interest in the purchasing of fresh or frozen fish, but is used to buy and consume fish almost exclusively in cured forms such as fermented, dried, salted, fried and most of all smoked. Even on the coast more fish is consumed in cured than in fresh form.

Two reasons may be responsible for this situation:

- 1) trade and households generally do not possess cold storage facilities and therefore prefer to deal with fish in less perishable form.
- 2) fish is mainly consumed as ingredient of "soups", in which function cured fish serves better due to its stronger and more diversified flavour.

The preservation effect differs widely among the various curing methods. While dried-salted fish is being kept from 3-9 months, the common type hot-smoked fish keeps in its best form not longer than 4 - 7 days after which it has to be re-smoked in intervals up to a maximum shelf-life of between 2 - 3 weeks. While the popular hot-smoking process (3-5 hours, 25 - 40% moisture reduction) takes care very well of the day-to-day fluctuations in fresh-fish landings, the Fantis are reported to practice a traditional method of cold smoking which lasts over a number of weeks (moisture reduction up to 75%) in order to preserve herring for sale several months after the main season.

In view of these methods and the popularity of cured fish, a balanced fish supply to Ghanaian households should be possible in spite of the seasonal and day-to-day variations of fresh fish landings. A problem, however, arises with the growing concentration of landings at the only two harbours for motor fishing vessels, Tema and Takoradi. The share of Tema landings among total fresh-fish landings on the Ghanaian coast is supposed to have grown from 15 - 35% between 1961 - 67. This concentration of landings is not matched by an equal concentration of traditional skills in the various methods of fish preservation. Since furthermore marketing facilities are absent or not functioning at this important landing point, seasonal gluts with their discouraging effect on the fishing industry are experienced in a more accentuated form than necessary.

It is evident that the employment of larger production units in the form of motor vessels and their concentration at only two (or in the long run 3 - 5) harbours calls for adequate processing and marketing capacities. Those capacities are not to replace, but to supplement and/or fortify existing traditional functions. Smoke-curing on a commercial scale should be encouraged. Once a private investor or Government has demonstrated the profitability of a small- or medium-scale smoke-curing plant of 0.3 - 2 tons output (of smoked product) per day, the financially well-equipped fish trading women may quickly realize the advantage and form partnerships such as co-operatives to invest and operate similar plants. The productivity of one smoke-curing woman trader who at present processes not more than, on average, 50 - 100 lbs. fish per day, may by such co-operative investment rise more than 5-fold. Needless to say, it is advisable to let these well-experienced women do all the technologically important operational jobs as well as the commercial control of the overall trading operation of such plant, and not try to employ men who by tradition are strangers in these lines. 5 commercial smoke-curing plants of 1 ton daily output each would already be able to absorb 10-15% of fresh herring landings at Tema during the peak

months July-Sept./October. This and better organized quay-side wholesale marketing of fresh-fish landings might prevent the market from collapses frequently experienced in the past, with herring prices, e.g. during the 1967 season, of 1 Np. and less per pound. For herring- and other fresh-fish landings the introduction of an auction at Tema fishing harbour may be a worthwhile project to consider. Space is available right adjacent to the quay-side where already at present the unorganized sales take place. An auction system would bring the advantage of :

- 1) shortening sales transactions to a fraction of the presently needed time;
- 2) co-ordinating and rationalizing handling and transport operations;
- 3) centralizing the control over distribution and return of containers (fish boxes) as agent for the owners;
- 4) providing authentic price and supply-information on the various species of fresh fish landed at Tema.

The sale of all fresh-fish landings at Tema fishing harbour through the auction would have to be obligatory. This would enable the generation of a counterbalance fund, fed by a small percentage levy on auction sales. The fund would be used to subsidize fish prices whenever the auction price fell below a minimum level of e.g. 2.5 Np. per pound herring. By prohibiting sales outside the auction area, the quay-side would be released from its present disorganized congestion. Canoe landings from the neighbouring canoe harbour could be permitted to enter the auction area if fishermen were prepared to join their catch for bulking, grading and packing according to auction rules. During the herring season auctions should take place twice daily. The average daily landing of herring only at Tema fishing harbour in August 1967 was 70 tons or 1500 boxes, while an estimated additional 10 tons daily arrived at Tema canoe harbour. During the off-season, when frozen fish is much in demand, deep-sea vessel owners might use the auction to sell a share of their new arrivals right away at a 1 - 2 Np. reduced price per pound instead putting it into cold storage.

If no other vessel arrives at the same time, 10 - 15% of a stern-trawler's catch may thereby avoid cold storage and related transport and handling charges.

Auctioning of fish or other produce would be a novelty in Ghanaian marketing. This means that the risk of failure by obstructive trade reaction and/or inexperienced management is high. It is therefore suggested not to introduce the system before two Ghanaians, one of the Fisheries Department and one of private enterprise, have been trained in auctioning fish at a place abroad where such system is well introduced. Thereafter these experts, if convinced that the system would be beneficial to Ghanaian fish marketing, should test it at a less important landing place than Tema. After this has proved successful, the introduction of an auction at Tema can be ventured. A capital-strong wholesale trade exists, with well developed agency relations which take care for long distance distribution.*

* The majority of present sales to women traders at Tema are in consignments of 5 - 30 cartons i.e. 300 - 2,000 lbs., all purchased cash; many women have accounts running with their supplier at above N¢ 200 to their credit, securing priority supplies at time of scarce landings.

Also the above recommended commercial smoke-curing plants would, outside the herring season, offer their capacities to increase the immediate off-take of frozen-fish landings. One or two larger plants, especially equipped for the quick-thawing and smoke-curing of frozen fish, but also adaptable for herring, would be much needed asset for the long-range fishing industry and most likely a fairly profitable one. A smoke-curing section of 1,200 tons annual output capacity is incorporated in the "Tema Fish Complex", completion of which project is in suspense. The smoke-curing plant would absorb approximately 2½% of total (fresh and frozen) fish landings at Tema. This will be of comparatively little impact, considering that the greater part of fresh and 75% of frozen fish landings are smoke-cured at whole-sale or retail level before getting to the consumer.

The present inability of traditional methods to cope with the volume of fish landings, especially of frozen fish, arriving (or released from cold storage) at Tema has led to the system of carting frozen fish by all kinds of inadequate means of transportation to coastal and inland towns up to 100 and more miles away. After arrival at destination in a condition of more or less advanced deterioration, the fish is processed on the spot into a smoked product of inferior quality. The State Fishing Corporation has expanded this system up to several hundred miles inland by use of insulated (and a few refrigerated) vans and cold storage facilities at place of destination. However, due to various technical and organizational shortcomings, the result with regard to further processing and quality of end-product is similar. While the Corporation has not succeeded in getting the inland consumer used to buying frozen fish as such, further technical improvements in the cold chain would raise distribution costs to a level which would render the price of frozen fish uncompetitive.

The smoking of frozen fish soon after landing and near to the harbor would appear to be the best way of producing a good quality smoked product, while at the same time cutting down cold storage and transport costs.* Table 11 shows processing margins in the smoke-curing trade. Unfortunately, the statistical records do not differentiate in fresh and frozen fish; this reduces the value of the price records, since frozen fish prices are influenced by subsidized operation of frozen fish distribution through the State Fishing Corporation.**

* It may, however, be considered to establish a second smoke-curing center at Kumasi, if the large resource of saw dust from the Kumasi timber industry proves a suitable fuel. For further discussion of the advantages and reservations regarding smoke-curing of frozen fish before distribution, see the paper "Marketing Operations of the S.F.C." (reference: foot note on page 28.

** *ibid.*

Table 11 : Annual Average price for Fresh and Cured Fish, 1966

	or <u>fresh</u> <u>frozen</u>	<u>smoked***</u>	<u>dried</u>
	(new pesewas per pound)		
<u>*Kumasi, wholesale:</u>			
Mackerel	15	32	-
Sea Bream	19	38	-
Tilapia	16	-	30
<u>**Accra, retail:</u>			
all species (average)	24	40****	42
Source: *Fisheries Department (monthly records)		** Central Bureau of Statistics (monthly records)	

***Weight loss by moisture reduction during the common "hot smoking" process 30 - 40%.

****Depressed average by the comparatively low prices of smoked herring, an indication that the bulk of herring smoking is based on low-price supplies during seasonal gluts.

Two canneries are under construction for government, involving a planned investment of approximately 5 million new cedis. The final account of investment costs will be considerably higher due to the frequently suspended construction works on the projects which were started four years ago. The present indefinite suspension of both projects is due partly to disturbed relations with the suppliers, partly to a lack of confidence in the economic viability of the undertakings.

One of the two projects is the already mentioned "Tema Fish Complex". This Complex is designed to incorporate a variety of fish processing activities, including fish meal production and the above mentioned smoke-curing section, around canning as the main function. The moderate capacity of the plant, 4000 tons canned fish per annum, the convenient location adjacent to the fishing harbour, and the diversification of processing lines could, if properly adjusted to local demands, make this plant ideally suited for the Ghanaian situation. Unfortunately very little is known about equipment and operating principles of the plant, after contacts with the Russian counterpart organization for supply of equipment and specialists have been suspended since the change of Government in February 1966.

The other project is a 15,000 tons (canned output) fish cannery, incorporated in the so-called "Interlocking Food Complex". As in most other sections of this Complex (wheat mill, oil mill, feed mill, margarine plant, fish meal plant, tin manufacture), production capacity of the cannery is over-sized. Annual importation of canned fish during recent years in the range of 10 - 12,000 tons cured and canned fish (ref. Table 6) consists to approximately 80% of canned fish. In view of the low prospects for rising consumer incomes over the next 3 - 5 years and the fast increasing domestic supply potentials for fresh, cured and frozen fish, consumption of canned fish is likely to fall further (ref. the experts consumption estimate of 9,000 tons cured and canned fish by 1970). Since it will most likely not be possible to substitute canned fish importation completely by Ghana-made products, the potential demand for canned fish produced by the two canneries at Tema may be estimated at 6,000 tons. This is only one-third of the two plants' combined capacity of 18,000 tons. The main demand is for oil sardines. Other canned fish products commonly consumed in Ghana are pilchards, mackerel and, to a small extent, salmon and tuna. While canning of tuna for the domestic market cannot be an economic proposition in view of the low demand (and would need to be a highly specialized large-scale operation if aimed for export production) sardines and other products of the

herring family would be feasible objects for a young canning industry in Ghana. Since export opportunities at cost-covering prices will be non-existent in view of the comparatively high landed price and capital cost of the Ghanaian canning industry, capacities should not exceed domestic demand which for the feasible products may be calculated at 6,000 tons for imported or 5,000 tons for Ghana-made products. Of the 6 - 7,000 tons raw fish required for an annual production of this size approximately 5,000 tons would be herring. This quantity would represent about 25% of average Ghanaian herring landings and approximately 50% of average herring landings at Tema. Considering the very strong demand for fresh herring in its traditional forms of preservation, a greater off-take for canning would hardly be practicable.

It appears, therefore that from the demand- as well as from the supply- aspect Ghanaian canning operations during the next three to five years ought to be limited to a total output capacity of 5000 tons. This range would be nearly covered by the Tema Fish Complex (4,000 tons) and the existing canning capacity of 600 tons which is installed in a private-owned long-range fishing- and processing-vessel, which needs mentioning here. This vessel has already produced a good stock of canned fish, mainly mackerel, which will soon make its entry to the Ghanaian market.

Landed prices for canning may be derived from Table 12 which shows the impact of the herring season on the general price level of fish landings. Though the Table indicates prices paid at other parts of the Ghanaian coast can generally be assumed to be at a similar level.

Table 12 : Average Range of Landed Price for Herring and other Species at Tema, 1966/67.

	<u>Herring</u>	<u>Other Fresh Fish</u>	<u>Frozen Fish ex cold store</u>
	(New pesewas per pound)		
1966 :			
Jan. - June)	8 - 11	9 - 14	12
Nov./Dec.)			
July - Oct.	5 - 7	8 - 9	11
1967 :			
Jan. - June)	7 - 10	8 - 13	11.5
Nov./Dec.)			9.0*
July - Oct.	3 - 5	6 - 8	10.0

Source: Fishery Department (weekly records) and long-range fishing enterprise (personal communication).

* Accumulated stocks and slow sales made further price reductions necessary to avoid great losses on over-stored fish.

The average landed price for sardine canning may be estimated at 7 Np. per pound. If storage facilities for raw fish, e.g. brine tanks for frozen sardines, are available, large consignments can be bought during seasonal gluts and thereby the average landing

price paid by the cannery reduced. The following "price-lows" were for instance recorded during July - September 1967, each lasting up to one week:

July	2.7 Np./lb.
August	2.0 "
September	1.5 "

Keeping for the present calculation to an annual average of 7 Np./lb. and allowing for 25% offal, the fish input for the popular 5 oz. tin sardines would cost 3 Np. The commonly sold brands are imported into Ghana at an average c.i.f. price of 10 Np. and sold retail at government control price of 14 Np. An ex-factory price of 12 Np. for the Ghanaian product would permit 9 Np. for costs of salt (consumed mainly in pre-canning preservation processes), oil and spices, packing material (mainly tins), labour, overheads (capital cost, administration etc.) and marketing (sales organization, advertising etc.). A tentative breakdown of permissible operational costs for production and marketing of oil sardines at Tema would be (per 5 oz. tin):

herring	3 Np.
salt, oil and spices	2 "
packing material	3 "
labour	2 "
overheads	1.5"
marketing	0.5"
	<hr/>
ex-factory price	12.0" per 5 oz. tin
retail	" 15.0"

Fish-meal and - oil production goes along with canning and smoke-curing operations which supply offal as raw material. At Tema, this source of raw material would hardly account for more than 10 tons daily. Another 10 tons may arise out of fresh and frozen fish consignments which due to advanced decomposition have lost most or all of their market value. Occasionally, during seasonal gluts and over-loaded cold storage capacities at Tema, good fish might be turned into fish meal. Fish species, which are not in demand in Ghana but often caught mixed with the desired species, will serve fish meal production during the off-season when the short-range motor vessels normally return with free payload. For the deep-sea fleet this will hardly be feasible, since their refrigerated storage capacity is normally fully utilized by fish of good market value. For the substantial quantities of unwanted fish, normally thrown back to the sea, a fish meal plant on board can be a feasible investment, if its installation does not reduce the vessel's fishing capacity. The above mentioned private-owned processing vessel is equipped with such a plant. An important contribution in European countries, the down-grading of under-size fish to fish meal production, is not possible in Ghana where small-size fish is much appreciated by consumers.

Considering the resources discussed above, a fish meal plant ashore could probably count on daily raw material supplies of 10-40 tons. An output capacity of 6 tons fish meal daily or 2000 tons per annum would be a realistic investment. The marketing of such quantity in Ghana should not create any problems. If the information on fish meal production within the Tema Fish Complex 30 tons daily, can be understood as raw material requirement, then the capacity of this plant would be in line with above-made calculations.

Summary and Recommendations

1. Fish landings by local Ghanaian fleet have increased faster than population growth, due to the establishment of a long-range fleet, the rapid expansion of the inshore M.F.V. fleet and the development of the Volta lake fishery. As a consequence, the share of imports in Ghanaian fish consumption could be reduced from 50% in 1964 to 20% in 1967.
2. Part of the long-range fleet is still not delivered yet. Actively operating during 1966/67 was only approximately half of the total stern-trawler fleet (incl. vessels on contract). Most of the Russian-built side-trawlers are still idling at Tema, since the change of Ghana Government caused the leaving of the Russian crew members.
3. Productivity of the Ghanaian long-range fleet is still very low, which fact, combined with a high foreign exchange component in fleet costs, so far has resulted in net foreign exchange losses on the substitution of imported fish.
4. The present long-range fleet at a fair level of efficiency (a level which is being approached by some vessels of private fishing companies) would be in the position to supply sufficient frozen fish to bridge the gap in the supply of fresh fish. However, since this gap is subject to wide seasonal fluctuation, accumulation of frozen fish stocks over long-time periods (with its effects on storage costs and fish quality) are necessary and unavoidable, unless the principle of self-sufficiency is exchanged against a policy of minimum stocks by a combination of export and import activity.
5. Since price expectations for exported fish such as presently landed by Ghanaian fleet are comparatively low, it appears that it would have been better had the fleet remained at the level of 1964 when its catches were in the range of the months of lower demand for frozen fish, supplementing imported fish during months of peak demand and thereby saving on storage cost and improving on quality.
6. Since export will for a number of years not be possible without involving high financial losses, long-range vessel owners will tend to flood the local market, possibly without calculating depreciation and interest on invested capital, with destructive effect on the inshore-fishery.
7. Against this background, the Aker agreement, while leading to increased frozen fish supplies, can only be beneficial, if also marketing services, especially export-orientated ones are provided under the agreement.
8. Since imported fish, besides enjoying preferential demand (better graded and packed) in Ghanaian markets, is landed at prices approximately 35% below average present production cost by Ghanaian fleet, there exists a temptation for Ghanaian fleet owners to deliberately retard operations in order to make room for the transaction of imports at high profit margins which well cover the idling expense of the fleet. The temptation is especially present, when no capital cost (interest) enters the cost calculation, as in the case of vessels provided by Government to its corporation.

9. The little appreciation frozen fish enjoyed in Consumer markets, has been further reduced by frequent sales of over-stored fish in the above described situation. Neither has the idea of selling frozen fish through retail stores owned by the fishing concern been successful, though the attempt was supported by subsidized government control prices.
10. Efforts in the interest of increased and wider fish consumption and distribution have to take into account the consumer preference for fresh and (inland almost exclusively) cured, mainly smoked, fish. Also here, the use of overstored frozen fish in the preparation of an inferior cured product can do damage to consumer attitude towards fish.
11. In order to accelerate wholesale transactions during the peak of the herring season, an auction may be a useful innovation, though this may have to be synchronized with the establishment of canning and commercial smoke-curing operations.
12. The increasing capacities in Ghana's herring fishery, in conjunction with intensive research and trials of new methods for the harvest of herring over an extended season, including the greater part of the year, have made the operation of a small sardine cannery for the supply of the domestic market an economic proposition. The Russian-built "Tema Fish Complex" with its combination of smoke-curing, canning and fish-meal production appears to present the right dimension for this undertaking.

Under the assumption that Government is fully aware of the situation outlined above, in particular with regard to the critical development of the long-range fleet and the inherent preferences in domestic fish consumption, it is therefore recommended to :

1. Prevent the presently operating long-range fleet from growing further by immediate negotiations with suppliers of those vessels still on order, to cancel these orders against unavoidable payments of indemnity. One British vessel, which has already been received as the first of a series of six on order, but has not yet been put on to full operational schedule, should, if possible, be returned to the suppliers, since it would otherwise remain the only British vessel within the Ghanaian fleet with the disadvantage of keeping special stocks of spares and employing extra skills for repairs and maintenance of this one vessel only.
2. Make a decisive effort to dispose of the 10 S.F.C. side-trawlers. Do not hesitate to dispose of a few stern trawlers as well, should the opportunity arise.
3. Encourage and support private fishing companies to provide motor fishing vessels with equipment for shrimp and tuna fishing.
4. If possible, introduce into the Aker Agreement the commitment to market abroad all catch brought by the Norwegian vessels during the months July - October.
5. Encourage trial exports by private fishing companies and assist in co-ordinating sales and storage policies of the participating enterprises with the aim of preventing overstocking and price collapse by a joint export policy supported by a comparatively stable price level in the domestic market.

6. Levy a duty of 2.5 Np./lb. on fish importation of any grade or kind in order to discourage fleet owners from substituting productivity of their own vessels by profitable trade in imported fish. Instead of a duty rate, this amount can be charged as a legal contribution to a Government-administered fund for the support and progress of the fish industry (e.g. for the support of initial export operations, conversion of fleet equipment for export-orientated production, installation of harbour and processing facilities etc.).
7. Abandon the attempt of direct government intervention in fish whole-sale and retail trade (S.F.C.).
8. Carry-out with the aid of the FRDU/FRI a study on the food-analytical quality criteria and consumer appreciation of fish retail supplies derived from frozen-fish landings, in whole and processed (smoked, salted, fermented) forms. Implement regular quality controls, if the results of the study prove those necessary in the interest of a wider fish consumption.
9. Sponsor the establishment of industrial smoke-curing plants. Offer financial assistance to traditional processors who are willing to invest in small- or medium scale modern smoke-curing equipment.
10. Carry-out a comprehensive technical evaluation of the uncompleted "Tema Fish Complex" and, if such evaluation does not reveal major inadequacies, proceed with the installation of the complex, under the condition that the suppliers provide technical and commercial management for the initial years of operation.
11. Provide training abroad (if possible, in a tropical country) in fish auctioning for two Ghanaians, recruited one each by Government and private enterprise.

3. SUGAR INDUSTRY

After the Fishing Industry, the Sugar Industry is the largest investment in Ghana's Food industries in recent years. About 24 million new cedis (approximately half of which in foreign exchange) have been invested, over the past four years, in the two Government plantation and milling projects at Komenda and Asutsuare.* With their daily crushing capacity of 1,000 tons (Komenda) and 2,000 tons (Asutsuare) and the assumption of four months crushing season, a combined annual output of 30,000 tons sugar and approximately 500,000 gallons alcohol (from the molasses distillery included in the Asutsuare project) may be expected as soon as a sufficient cane supply can be secured. A further 250,000 gallons alcohol will probably be produced by rural distilleries from plantation- and farmers' cane crushed for juice and from molasses at Komenda. Unlike the 96% pure alcohol produced by the factory distillery at Asutsuare, the rural product is the 35 - 40% alcoholic local drink 'akpeteshi', i.e. the above mentioned 250,000 gallons alcohol will enter the market in the form of about 650,000 gallons of akpeteshi.

The potential impact of the young sugar industry on the Ghanaian alcohol/akpeteshi market is an important factor in future sugar demand in Ghana. An estimated 66% of granulated sugar, i.e. 33% of total sugar imported into Ghana (half of which is in form of cube sugar) is processed into akpeteshi by the numerous village distilleries all over Ghana.**

Table 13 shows the development of Ghanaian sugar importation during the last 15 years and a tentative breakdown of users. Since no rural sugar production is known to exist in Ghana and the above mentioned projects are just starting with negligible initial output, imported quantities represent national consumption.

Table 13: Sugar Imports into Ghana 1950/66 and tentative Breakdown of Uses. (in 1000 tons)

	<u>total</u>	<u>cubed</u>	<u>granul.</u>	(estimated distribution of granul.imports:)		
				Household. and catering	Bakery, Confect., Beverage	<u>Akpeteshi distillery</u>
1950	13		
1957	35			
1962	60	20	40	1.5	7.5	31
1966	58	30	28	2.0	8	18

The figures show the different impact of the introduction of 2½Np./lb. import duty and 10% sales tax (introduced between 1961/65) on the demand for cubed and granulated sugar. Consumption of cubed sugar, the main form of sugar used in households and catering, further increased in spite of nearly stagnating household incomes. Imports of granulated sugar, 90% of it industrially used, dropped by 30%. This is to a small extent the result of a 40% decrease in wheat flour consumption during this period, bakery being a substantial consumer of granulated sugar. The main cause, however, can only be a remarkable decrease of sugar usage in akpeteshi distillery.

* Including the cost of water supply, contributions of other government agencies such as State Farms, Irrigation Division of the Ministry of Agriculture, the defunct U.G.F.C., and preliminary project expenses during the period of establishment.

** This estimate is still low compared with opinions expressed by trading firms and distillers. However, though there is extremely little usage of granulated sugar in Ghanaian households, its industrial use other than distillery tends to be underestimated.

This decrease may primarily be explained by an obviously existing price elasticity of this particular demand. The wholesale price increase by approximately 50%, following the above mentioned introduction of duty and sales tax, has placed the common indigenous raw material for akpeteshi distillery, e.g. palm-sap, cane juice, fruit, or manioc, at a comparative cost advantage. The devaluation of the New Cedi brought a 43% increase in c.i.f. prices, which effect was compensated by a duty decrease from 2½ to 1 Np. and abolition of the sales tax. While thereby wholesale prices for granulated sugar will remain practically unchanged, prices for the above mentioned indigenous raw materials have decreased during the last twelve months as part of the general fall in the prices of domestic agricultural produce. In this situation the demand for granulated sugar for akpeteshi distillery cannot be expected to rise. Instead, a further decrease in the use of sugar for akpeteshi distillery will be unavoidable with the above indicated impact of molasses and cane juice distillery arising from the newly established sugar industry. If all alcohol distilled at Asutsuare at full-scale production can be absorbed as planned by the State Distillery Corporation in its campaign to substitute akpeteshi consumption by a safer, attractively bottled alcoholic drink at moderate consumer price, this, together with the village distillery of molasses and cane juice around the sugar factories (estimated above at 650,000 gallons akpeteshi at full operation) may eventually take over 2 million gallons of the present akpeteshi market.* The loss in turnover suffered by the existing rural distilleries will result in a decreasing demand for distillery sugar. Applying the production formula, described by DSI of National Investment Bank, i.e. 1 cwt. sugar yielding 12 gallons akpeteshi of 36% alcoholic strength, the demand for distillery sugar may fall by as much as 8,000 tons.

Furthermore the sugar price will have to rise by approximately 50% in order to cover the high cost of local sugar production, as will be discussed later. This will have a depressive effect on the demand for both cubed and granulated sugar. A tentative projection of sugar consumption by 1971/72 would probably show little increase in the consumption of cubed sugar and a further significant decrease in that of granulated sugar.

Table 14 compares this projected domestic demand with existing national production capacities. The demand projection is made under assumption of the above mentioned price rise.

Table 14 : Provisional Demand Estimate and National Production Capacities for Cubed and Granulated Sugar in Ghana 1971/72 (1000 tons)

	Domest. Demand	Production Capacity		Import gap
		Asutsuare	Komenda	
cubed sugar	36	20*		16
granulated sugar	20	(5)**	10	10 (5)
Total	56	20(25)	10	26(21)

* The Asutsuare factory is at present not equipped with cube making machinery. Installation of such machinery, as recommended later, is anticipated in this Table.

** The figures in brackets state the potential extended capacity provided for in the design of the Asutsuare plant.

* No estimate of total akpeteshi consumption is available. However, a minimum of 8 mill. gallons must be assumed, considering the quantities of granulated sugar imports over the past years.

A study of Table 14 permits two conclusions :

- 1) The investment of cube making machinery at Asutsuare is a necessity. Production of cube sugar should start by 1970 latest, otherwise marketing problems will arise for the increasing output of granulated sugar.
- 2) By 1971/72 existing capacities will be able to handle all but 26,000 tons of estimated requirements, of which at least 5,000 tons is already provided for at Asutsuare. There may be room for one more large-scale sugar investment in the range of 15 - 20,000 tons annual output, the greater part of which required in form of cubed sugar.

With regard to conclusion 1, no cube making plant had been included in the Asutsuare investment. In planning the investment of such plant, consideration may be given to a 15,000 tons cube sugar plant owned by Messrs. Drevici as part of the colossal amount of not yet unpacked or partly installed machinery and equipment bought by this company for investment programmes under the former Ghana Government. The plant was destined to be incorporated in the mammoth cocoa storage and processing complex at Tema. Apart from the unclear future of this complex, there is no economic justification for the installation of a cube-making plant at Tema, i.e. 50 miles away from the sugar factory. Installation of the plant at Asutsuare, however, may be an alternative proposition.

With regard to conclusion 2, a Japanese rice and sugar cane irrigation project was taking shape adjacent (to the south) of the Asutsuare project, at Aveme. The project, which was to be supported by its own sugar mill, has been abandoned since early 1966. Another area of approximately 8000 acres, for which complete soil- and topographic surveys with special regard to irrigated sugar cultivation have been prepared, is situated along the eastern banks of the river Volta, opposite the Asutsuare project. Interested private investors may investigate these location first, without the need of time-taking and costly surveys. It is further possible that farmers become interested to produce brown sugar by means of low-price Indian-made "Mini-Mills", with the incentive of the above mentioned sugar price increase and the example of the large mills. One such mill is presently being invested by a cane farmers' co-operative at Anyirawase, 54 miles from Asutsuare. If the brown sugar produced by those mills can be priced much lower than cube sugar (e.g. cube 15/brown 8 Np. per pound), it could probably attract a good share of household and catering demand in nearby rural and urban areas.

The existance of milling capacity alone, of course, does not solve the problem of sugar production. Cane supply in adequate quantities and at reasonable cost has to be secured almost simultaneously with completion of milling aggregates in order to avoid accumulating losses from under-utilization of factory investment, which might not be recoverable during the lifetime of the plant. So far, the Government sugar industry has failed seriously with regard to both cost and quantity of cane supplies. Table 15 shows the tremendous gap between investment and the establishment of reasonable returns from operation.

Table 15 : Establishment and Operation of the State Sugar Industry, 1963 - 67

	<u>Asutsuare</u>	<u>Komenda</u>
Commencement of project	1963	1963
Completion of mill	1965	1966
1st milling campaign	1966	1967
Cane requirement for full-scale campaign	240,000 tons	120,000 tons
" " per crushing day (24 hrs.)	2,000 "	1,000 "
Cane supplies 1st crushing campaign	17,500 "	32,000 "
Average daily supply during 1st crushing campg.	292 "	479 "
" supplies per crushing day*	650 "	830 "
Cane supply 2nd crushing campaign	16,500 "	(1968)
Average daily supply during campaign	275 "	"
" supply per crushing day	1,000 "	"

* i.e. only those days during which actual crushing was done.

Table 15 shows the operation of the State Industry in isolation, i.e. to the extent that the State Plantations supplied cane, but excluding the share of farmers' cane supplies. The original planning of the projects did not provide any supply quota for their individual farmers or those co-operatively organized. The declared aim was to run mills and plantations as 100% integrated State Industries. The need for additional supplies from cane farmers was, however, realized, when it became obvious that the State plantations' development remained far behind schedule. An extension service was organized and credit to cane farmers' Co-operatives provided by the Agricultural Development Bank. Though started late, the farmers quickly established their supply share which, especially in the case of Asutsuare, is fast increasing.

Table 16 : Farmers' Contribution to Cane Supplies for the Government Mills.

	<u>Asutsuare</u>				<u>Komenda</u>		
	(estimated)				(estimated)		
	1966	1967	1968	1969	1967	1968	1969
	(in '000 tons)				(in '000 tons)		
State Plantation Supplies	17.5	16.5	32	50	32	40	50
Farmers'	7	10	21	43	5.5	7.5	10
Total supplies	<u>24.5</u>	<u>26.5</u>	<u>53</u>	<u>93</u>	<u>37.5</u>	<u>47.5</u>	<u>60</u>
Average " per crushing day (ref. Table 15)	0.9	1.6			1.0		
Farmers' share in total and average supplies	29 %	38 %	40 %	45 %	15 %	16 %	17 %

Farmers' contribution raised the average supply per crushing day to 980 tons (Komenda) and 1,600 tons (Asutsuare, 2nd campaign), i.e. to 98% (Komenda) and 80% (Asutsuare) of requirement for uninterrupted 24 hrs. crushing operation.

Nevertheless, the milling result was very poor as shown in Table 17.

Table 17 : Sugar Recovery out of Milling Operations 1966/67

	Asutsuare		Komenda
	1966	1967	1967
total tons cane crushed	24,500	26,500	38,000
" " sugar produced	650	900	2,100
sugar yield from cane	2.7%	3.4%	5.5%
recovery of sugar content in cane (average rendement in cane 10%)	27%	34%	55%

The reasons for this very low sugar recovery are:

- 1) Wrong timing of cane harvest. While the ideal harvesting time is the dry season from mid-November to mid-March, cane was harvested in
 March/April (Asutsuare, 1st campaign) 1966,
 May/June (" , 2nd ") 1967
 and July/August (Komenda , 1st ") 1967.

The disadvantages are: generally reduced sugar content during the wet and humid season; further rapid reduction of sugar content when cane has to be cut, loaded or stored wet; irregularities in cane supply due to haulage problems in rain-muddied fields.

- 2) Chronic short supply of cane (only at Asutsuare), causing very frequent interruption of milling operation with the result of deterioration of juice in process and high amounts of sugar left in molasses.*
- 3) Losses by lack of experience in operating the new mills and initial difficulties in adapting machinery, equipment and technological formulae to local conditions.

While the last mentioned reason is to some extent experienced by any new processing operation, the chronic shortage of supplies during the short number of crushing days in the first and second campaign at Asutsuare and especially the wrong timing of the campaigns cannot easily be excused. A major reason for these mainly organizational failures has been the lack of active support by the controlling ministerial government departments. The campaigns, for instance, had been planned by the management of the industries to take place during the first quarter of the year. However, in 1966 as well as in 1967 it took months until the necessary funds to run the campaigns were granted.

Since state enterprise is not charged with interest for the use of operational and investment funds provided by Government, a lack of drive to utilize invested capacities is the natural result. However, the use of capital costs money, e.g. lost interest which could be gained by alternative uses such as depositing it in domestic or foreign banks. The effect of slow materialization of the projects in terms of capital costs is demonstrated, in the case of Asutsuare, by Table 18.

* Though the sugar in molasses can be turned into alcohol, the net profit of the distilling process is much below the value of the sugar lost.

Table 18 : Project Development and Capital Costs at Asutsuare

	<u>Capital Outlay</u>	***** <u>Interest</u> 5%	***** <u>Depreciation</u> 5%
	(in 1000 new cedis)		
Invested* during 1963-1967 approx.	15,000	1,780	
Operational loss** 1966/67 "	2,800	140	
Accumulated interest charges	<u>1,920</u>		
Capital outlay, incl. accumul. interest charges, per 1/1/68	19,720		
Annual interest- and depreciation charges 1968 - 1982***		493 + 750	
			= 1,243
in % of estim. sales 1968 (N¢ 0.7 mill.)			177%
in % of estim. sales at full-scale op.			=
a) at present sales prices (N¢3.6 mill.)****			35%
b) at 50% increased sales prices for sugar (N¢ 5 mill.)			25%

* All building, machinery and equipment plus 3 million N¢ out of "expend. over income" (1.5 debit to factory, - 1.5 to land-establishment)

** The remaining part of "expend. over income", excl. approximately N¢ 500,000 "depreciation".

*** average annual interest charged at half rate, due to compensatory finance effect of depreciation.

**** 20,000 tons sugar at N¢ 140 plus 500,000 gall. alcohol at N¢ 1.60

***** Calculated interest, at preferential rate; though at present not charged, it represents the min. capital cost of the project.

***** Assuming an average life time of total project investment of 25 years from commencement of installations and plantation establishment (1963) or 20 years from 1968.

Further operational losses due to under-utilization of capacities and further expenditure on land establishment, together probably exceeding 5 million N¢ over the coming 4 years, will have to be financed by provision of additional government funds. Amortization of total losses during the period of under-utilized capacities, 1966-71, estimated at about N¢ 12 mill., will have to be provided out of profits in later years, when full utilization of capacities is achieved.

It has to be realized, however, that, at present sales prices, even at full capacity operation, only 65% of sales income (ref. Table 18) will be available to cover all running expenses of the project, i.e. mainly local and expatriate labour, fuel, spare parts, insurances, and purchases of farmers' cane. According to estimates by the Principal Agriculturist, State Sugar Products Corporation, these running expenses at full operation will amount to approximately 90% of sales income,* i.e. annual losses at the hight of 25% of sales income or approximately N¢ 900,000 will be unavoidable.

These losses need to be balanced by a proportionate i.e. 25% increase of sales prices. Amortization of losses accumulated during the initial period of operation 1966-71, however, will only be possible if sales prices are increased by 50%,

* "Plan of Extension of Plantations and Financial Estimates covering the period 1967-71, Asutsuare Branch", extract given as Appendix 4.

thereby providing an additional N ¢ 900,000 per year or N ¢ 14.5 million over the remaining 16-year period 1972-88 (out of the 20 years depreciation period 1968-88). Government may decide to wholly or partly write off the losses occurring during the six-year period 1966-71. Such act should not necessarily reduce the proposed margin of price increase, under the following considerations:

- a) The rate of interest, applied in the calculation of Table 18 is low;
- b) The depreciation rate applied in the same calculation is likewise low, considering the substantial share of fast wearing equipment, especially in the agricultural and transport sector of the investment, and the late start of the depreciation period, five years after commencement of installations.
- c) The human and soil resources as well as climate influences in the area have not been experienced to the extent as to guarantee sufficient and regular supplies of cane in the long run.
- d) The calculated price of N ¢ 1.60/gall. obtained for alcohol distilled by the factory needs to be reduced if export becomes necessary.

The calculation of interest charges on invested government funds, which so far have been provided free to the industries, is open to dispute. It has to be realized, however, that Government cannot afford a non-commercial attitude in dealing with state industries, since these have grown to such number that their open or disguised subsidy can disrupt government finance and distort the country's economic development. Though it is regrettable that the slow pace of establishment and other miscalculations, which will be discussed, have raised the cost of sugar produced by the State Industries, the recovery of these costs via consumer prices appears to be a reasonable solution. There can be no social bias against this method, since sugar is not an essential commodity in Ghanaian diets; maize, plantain and cassava being equally economical sources of calory supply besides having valuable mineral and vitamin contents in which sugar is completely lacking. The low nutritional significance of sugar consumption in Ghana, but its growing importance as a habitual and prestige food, is demonstrated by a comparison of sugar imports over the last 25 years, which shows quantities a mere 5% of present figures during the early 1940es. Because of its low nutritious value, sugar is used by most countries as a revenue earner in form of high duty tariffs, sales tax and/or exercise on domestic production.*

A gradual increase of the sugar price in Ghana will be possible without political implications by a close following of world market prices, which are likely to rise but not to fall after the low of the last three years. Once the world market price (inclusive c.i.f. and clearing charges and the prevailing duty rate of 1 Np per pound) has reached the cost price level of domestic sugar production, this level may be stabilized as the minimum price level for imported sugar. The margin accruing with falling import prices may be retained by a Government agency with sole importation right (GNPC acted already as such in 1964/65) and remitted as government revenue.

The question of a price increase for the industry is not urgent, since output is still very low and the gain by an increase of sales prices would be insignificant compared with overall losses faced during this initial period. By 1970, however, and at least by 1971/72 prices ought to be at a level of 50% above the present one,

* E.g. sugar retail prices in Japan were reported to be about four times as high as the world price (FAO Commodity Review 1962). Among other countries with similar or higher sugar prices were Italy, Liberia, Togo and Equatorial Africa (FAO Commodity Bulletin, Series No. 32, 1961).

if the industry is to pay its own way. There is all hope that this level will be reached in the harmonic way proposed above, since the world market has frequently experienced price rises as high and higher than the swing needed for the proposed domestic price policy; e.g. the average c.i.f. price for granulated refined sugar during 1963 was three times the price in 1966 and the present price; a similar price-high occurred around 1957. Forward prices, quoted December 1967 at London stock exchange for supplies in December 1968 show a 20% increase over 1967 prices.

Table 19 : Past and Prospective Sugar Price Development in Ghana 1963/71
Model (ref. paragraphs above)

	1963 (annual average) N¢	1966 N¢	1967 Aug./Sept. N¢	1968/69 +25% N¢	1970/71 +50% N¢
per ton c.i.f.:	£100=200.00	33.10=67.00	35=100.00		
duty:	56.00	56.00	22.40	variable margin of revenue for Government	
sales tax:	-	6.00	-		
handling & clearg. and import margin:	20.00	20.00	20.00	20.00	20.00
ex Tema harbor:	276.00	149.00	142.40	175.00	210.00
ex Ghana Sugar Mills:			140.00	175.00	210.00
= per cwt:	13.80	7.45	7.00	8.75	10.50
= " pound:	0.126	0.067	0.063	0.078	0.094

Revenues out of sugar imports will be attractive, probably averaging N¢ 30 - N¢ 50 per ton, a contribution of over N¢ 1 million per year until the import gap, remaining after full-scale production of the State industry, is filled by private sugar establishments. As these revenues from imports will decrease, they may be substituted by excise on private and state sugar production. The excise should be introduced gradually in order to enable the industries to absorb the levy by rising productivity, not by increased sales prices.

The solution of the profitability problem of the state sugar industry by the above outlined protectionistic government policy must not obscure the fact that the industry, by the wasteful way of its establishment, has nearly jeopardized and certainly put far ahead the chance to become a real benefit to Ghana's economy. The industry has been set up more capital-intensive than necessary, further aggravating investment cost by the slow development of plantations. Capital is expensive in a developing country and most capital goods have to be directly or indirectly imported. This applies not only to the investment of a mill, but as well to the investment of irrigated plantations. It can be assumed that three quarters of the factory investment and one-third of the agricultural investment at Asutsuare, both including accumulating interest charges, have to be valued in terms of foreign exchange. Since over 60% of the investment is connected with factory establishment, including transport equipment, the foreign exchange component in total investment cost is approximately 55%. Of operational expense, half of factory cost and one quarter of agricultural cost can be estimated as directly or indirectly involving foreign exchange. Since in operational expense the agricultural wing of the project is the heavier one (approximately 75%), total operational expense (at full-scale operation) will contain a foreign exchange component of 31%. Investment cost (depreciation and interest on invested capital) at full-scale operation being approximately 28% of total production

cost, the overall foreign exchange component in the cost of sugar production by the state industry can be estimated at 37.5%. Applied to a minimum cost price per ton Ghana sugar (refined) of N¢ 210, an amount of N¢ 79 can consequently be assumed to be the foreign exchange outlay in production cost per ton.

It can be concluded that, if world market prices would remain low as at present (ref. Table 19), the substitution of sugar imports by domestic production could yield no significant foreign exchange saving. However, the present world sugar price is abnormally low and does not cover production cost in any of the exporting countries. It is a reasonable assumption that the c.i.f. price for sugar imports (granulated, refined) into Ghana over a period of 5 - 10 years is more likely to average N¢ 130 or above. In relation to such an assumed average c.i.f. price, substitution by local supplies can yield a foreign exchange saving of approximately 40% of the import price. This comparatively low saving in foreign exchange may be disappointing, since the establishment of a sugar industry is often regarded as a particularly effective effort in import substitution policy.

All the above calculations have been based on the Asutsuare case, since more account records are already available on this project, which has completed its second crushing campaign. However, the financial conclusions so far derived in this report can well be extended to the Komenda project, since in spite of the more encouraging start (ref. Table 17) there is little prospect of yielding better financial results at Komenda than at Asutsuare. A balance of advantages and disadvantages of the Komenda project, compared with the Asutsuare one, is given below:

Table 20 : Characteristics of the Komenda Project, in Comparison to Asutsuare

<u>Advantages (at Komenda)</u>	<u>Disadvantages (at Komenda)</u>
faster plantation development	nematode attack
higher productivity of labour	lower share of farmers' cane supplies
much lower labour-transport and- housing cost	extremely high cost of water supply (for factory and plantation use)
lesser threat of endemic human diseases	danger of corrosion for factory installations (located close to the shore in reach of surf dust)

The unfavourable economic result of the large investment into the state sugar industry, though protectionist government import policy may assure nominal profits in the long run, must not be accepted; on the contrary, means to improve this result have to be found and implemented.

The most obvious means of structural improvement of the two projects is a decisive policy to accelerate the development of farmers' cane supplies. While farmers are supplying at the factory price of N¢ 6 per ton, the operational expenses alone for cane supply from the factory-owned plantations is N¢ 12 per ton. This estimate is the result of cost-analysis and -planning up to the year 1971, produced for the Asutsuare sugar plantations (ref. foot note on page 52). Capital cost added, total cost per one ton plantation cane has to be figured at above N¢ 15, i.e. two and a half times the price paid to farmers. This high production cost on the government plantation prevails, though less than one-third of the acreage will be irrigated.

Investment- and operational cost per ton cane will be higher on irrigated land, since the yield increase by irrigation has not been able to compensate for the irrigation expense. Mechanization playing a much greater role on the plantation than on the farms, the foreign exchange involvement per ton cane in plantation production may be considered five times that on farms. Some secrets of this remarkable difference in productivity are revealed by the Principal Agriculturist, Sugar Products Corporation*:

- "(1) The farmers' plantations are allocated normally on the best soils in the area.
- (2) Some of the field works, especially planting and gap-filling are done more carefully than by wages labour staff.
- (3) The rainfall data and rainfall distribution in the present farmers' plantation site is more favorable.
- (4) Harvesting of sugar cane is done much better, i.e. cutting just at the bottom of stalk. Moreover the farmers are not leaving any canes in the fields uncollected and covered by trash as our labourers do, despite all efforts of our field supervisory staff against this; sometimes even 8-10% of canes are left on the fields."

Every means to accelerate the extension of sugar cultivation by farmers should be implemented. The Sugar Products Corporation has finally realized the benefit of the farmers' contribution. The expert's advice to raise the price paid to farmers and to charge farmers for cane transport in order to prevent cane cultivation from dispersion over too far distances, has been implemented in principle, but not yet with enough consequence. The price for farmers' cane was raised from Np 5 at farm to Np 6 at factory, the 20% increase being much reduced by the introduction of 4 Np./mile cane transport charge. In order to assure a significant incentive, the farm price should be raised to Np 7.-, while a realistic transport charge cannot be set below 6 Np./ton/mile, if the aim to keep sugar cultivation concentrated and attract contract transport ** shall materialize. At an average transport distance of 8 - 10 miles, this arrangement will leave a net return of Np 6.50, at average, for the farmer. The cane purchasing cost at factory will be between 7 - 7.50 new cedis (as long as the corporation's transport, at much higher cost than 6 Np. is used). This cost price is still only half that of plantation cane.

In order to keep the quality of supplies under control, it will soon become necessary to establish polarization tests at weighing point for all cane deliveries and differentiate the price according to suchrose content.*** This innovation must not lead to a lower average payment per ton, but rather to an increase in the average payments by an effective premium on quality.

While a large share of the cane price goes to the Agricultural Development Bank as amortization of loans, the remaining part should be paid to the farmer without undue delay.

* "Indispensable Explanations", supplement to "plan of Extension..." (ref. foot note on page 52).

** The Corporation's intention to offer a large number of tractors and trailers at Asutsuare to farmers and contractors for cane haulage and other farm transport needs, can be commended.

*** If this method, though ideal in its control effect, proves too elaborate, sample tests drawn from the fields before harvest, may be chosen as substitute. However, the latter method does not provide a control over sucrose losses during the time between cutting and delivery.

The extension services, provided by the corporation, are very important and should by no means be neglected, but strengthened and expanded.

Credit facilities should be extended to individual farmers as freely as to co-operatives, and this should be made widely known. The haphazard formation of co-operatives with the aim of easier access to government credit often leads into difficulties such as lack of members' support, disunity, corruption etc. Some of the production co-operatives in the Asutsuare area have entered into these difficulties. These cases have to be kept under close control and, if feasible, the land has to be broken down into individual plots before eventually the whole undertaking comes to a collapse.

Farmers in the Komenda area had up to now only very limited loans by the Mechanization and Transport Department of the Ministry of Agriculture. The Agricultural Development Bank should establish the same fruitful relations as with farmers in the Asutsuare area as soon as possible, in order to achieve similar increase in cane supplies (ref. Table 16).

Feeder road construction by the corporation can aid farmers in the opening of new sugar lands, such as presently along the new Asutsuare - Shai Hills Road.

The irrigation question has to be reconsidered. Originally, the total acreage of both plantations was planned to be irrigated. While response to irrigation on trial plots had shown reasonable results, on a larger plantation scale, no significant yield increase has been noticed. Responsible are:

- 1) generally low top soil fertility due to heavy levelling for surface irrigation;
- 2) only occasional rainfall deficiency;
- 3) low efficiency of operating staff;

Contrary to expectations, the yield of large tracts of "irrigated" land has been considerably lower than that of rainfall land, since the frequent interruptions of irrigation on account of inefficient operation severely retarded growth of the plant which has under early irrigation developed a shallow root system and is therefore more susceptible to drought.*

Table 21 : Farmers' and Plantation Yields, Asutsuare Project 1966/67

	<u>1st campaign</u>	<u>2nd campaign</u>	<u>average</u>
	(tons cane per acre)		
S.S.P.C. plantation (most acreage irrigated)	26	15	20.5
Farmers' lands (rainfall only)	29	31	30

In view of the high cost of establishment, maintenance and operation of irrigation, it appears advisable to reduce the originally planned irrigated acreage to the extent presently established and concentrate for the time being on the faster and less costly establishment of rainfall cultivation.

* Personal communication, Principal Research Officer, State Sugar Products Corporation.

A great reduction in milling cost per ton would result from an increase of cane supplies at Asutsuare beyond the present target of 240,000 tons, to 300,000 tons. According to the manufacturer's specifications, the milling capacity can be expanded from 2,000 tons to 2,500 tons per 24 hrs. milling day with relatively little additional investment in machinery and equipment. This target, which because of the uncertainty of its achievement has not been included in the calculations to Tables 18 and 19, would call for a 60% increase of projected farmers' supplies.

Table 22 : Desirable Development of Cane Supplies for Expanded Milling Capacity at Asutsuare

	acreage	cane yield		milling season days	mill capacity		sugar yield total '000 tons
		per acre tons '000	total tons		daily ('000 tons)	total	
<u>1971/72</u>							
Plantation	6000	20	120				
Farm Land	5000	24	120				
Total	11000		240	120	2	240	20
<u>1976/77</u>							
Plantation	6000	20	120				
Farm Land	8000	22.5	180				
Total	14000		300	120	2.5	300	25

Last but not least, stable management is an indispensable condition for survival and progress of the two projects. On both projects, the first manager has been removed either during or shortly after the first campaign. With these men, all the managerial experience accumulated during the years of establishment of the factory and plantation as well as during the preparation and operation of the first campaign has been lost.

In the case of Asutsuare, the follow-up management has yielded much lower results and has again been removed. Since months, the project is without a general manager. In the case of Komenda, the first manager was removed in spite of a remarkable success in the organization of the first campaign. The management has been taken over by the consulting agents for the project.

It should be considered, that it is not only experience in the sugar industry, but also experience with climate, soil, labour and public institutions in the particular area of work, that is needed for successful management.

That Ghana's sugar industry can provide surprises, also for the representatives of world-known sugar concerns, is shown by a comparison of a consultants' prediction of the yields of Asutsuare's second campaign with the factual result. The comparison demonstrates the difficulty for any newcomer in estimating the many specific factors which oppress productivity in Ghana's young state industries.

Table 23 : Asutsuare, Sugar Campaign 1967: Divergence of Factual Result from Consultants' Prediction (produced during campaign)

	predicted	achieved
acreage harvested	1,800	1,500
yield per acre, tons	23.3	17.6
total yield, "	42,000	26,500
sugar yield, per cent of cane	9.5%	3.4%
sugar yield, tons	4,000	900

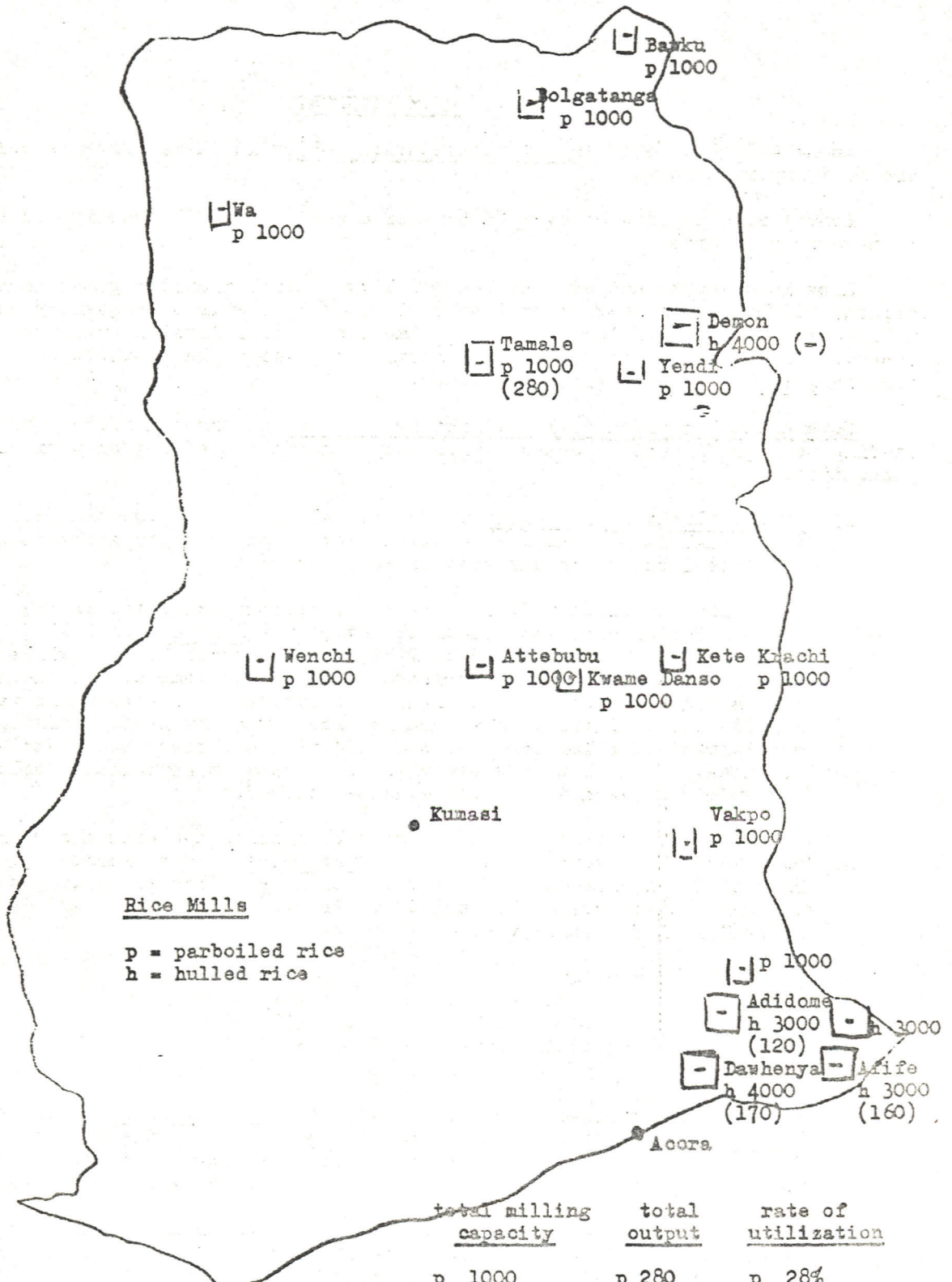
Summary and Recommendations

1. The slow pace of establishment, especially of cane supplies, has raised investment costs (depreciation and interest on invested capital) in the State Sugar Industry to a relatively high level.
2. Cane production cost on State plantations is high due to low yields and low productivity of both labour and mechanized equipment.
3. Private farmers' cane, on the other hand, is delivered in increasing quantities at a price less than half the plantation cost price per ton.
4. Irrigation efforts so far yielded disappointing results. Average yields on rainfall lands (private farm land) were higher than on irrigated (plantation) land.
5. Wrong timing of harvesting operation has disastrous effect on sugar yield in Asutsuares' first and second campaign.
6. Instability of management and lack of active government support have greatly contributed to the bad results, especially at Asutsuare.
7. Results at Komenda have been more encouraging, mainly due to better availability of suitable labour force and strong initial management.
8. The present sugar price does not cover the full cost of the projects, even at assumed full-scale operation. A 50 % price increase will be necessary to carry the projects through the 1970ies without government subsidy, while in addition enabling them to balance the greater part of accumulated initial losses.
9. Sugar consumption in Ghanaian households is in form of cubed sugar. Granulated sugar is mainly consumed by Akpeteshi breweries whose demand will much decrease with rising sugar price and in competition with low cost alcohol from molasses distillery. It will therefore not be possible to sell much more granulated sugar than what will be produced at Komenda, while the Asutsuare mill will have to concentrate on cubed sugar production.
10. The sugar supply gap by 1971/72, at assumed full-scale operation of the existing two mills, may be estimated at only 20,000 tons, mainly cubed sugar. Besides the possibility of the establishment of a third sugar project for cube sugar production, "Mini Mills" operated by individual farmers or co-operatives may become a factor in Ghanas' sugar industry.

It is therefore recommended to:

1. Expand the cane supply basis with regard to cultivation on private farms as well as on State plantations as fast as possible, aiming at 6,000 acres' under State and 5,000 acres under farmers' cultivation by 1971 and a further increase of farmers' plantation to 8,000 acres by 1974.

22. Confine irrigation to the presently irrigated area and nurseries and bring its operation to high standards while extending the acreage under rainfall cultivation, with eventual application of temporary (marginal) cover-head irrigation.
23. Continue and expand credit support to cane farmers, individual as well as co-operatively organized, and strengthen extension services as the link between farmers and mill.
24. Raise the price for farmers' cane to N^o 7, delivered at factory, but induce farmers to contract for private transport; charge at minimum 6 Np. per ton/mile, if factory provides transport; sell transport equipment unsuitable for plantation use at low price to farmers and transport contractors in the area.
25. Establish a suitable system of quality control over cane supplies, and provide incentive to improve standards by introduction of a bonus system, besides down-grading of severely deficient cane.
26. Plan crushing campaigns well in advance and secure the necessary funds without delay, during the initial five years of operation the projects cannot run self-supporting.
27. Raise the sugar price by 50%, gradually, if possible using price movements in the world market, in the course of 1968-70; prevent price competition from imports by flexible duty rates or government import monopoly.
28. Equip the Asutsuare mill with cube-making machinery, for 75% of its planned output, by 1970 latest.
29. Confine any new sugar project to predominantly cubed sugar production.
30. Supply both projects as quickly as possible with able, self-responsible, long-term management.



	<u>total milling capacity</u>	<u>total output</u>	<u>rate of utilization</u>
1966/67 ann. aver.	p 1000 h 14000 <u>15000</u>	p 280 h 350 <u>630</u>	p 28% h 2.5% 4.2%
1967 nearing completion	p 10000 h 3000		(started operation end 1967)

Remarks : machinery and equipment for three more parboiled-rice mills, location of which is still pending, are in storage.

4. RICE INDUSTRY

Among all objects of import substitution policy in Ghana, rice is certainly the most important one.

Annual rice imports of over N¢ 6 million during 1966/67 constituted 16% of Ghana's food imports.

Rice in quantity and of excellent quality is traditionally grown in almost all regions of Ghana. Production cost on small holdings, with subsequent parboiling and milling at farm- and village level, is almost bare of a foreign exchange cost component. The question, how to bring domestic supplies to an equilibrium with consumption, is therefore a great challenge.

Government has tried to boost rice agriculture in three different ways, all leading to high financial losses without any significant effect on national rice production:

- 1) by establishing rice mills with purchasing funds to buy and process individual farms' and co-operatives' crops and thereby serve as guaranteed outlet in the area of establishment.

This was first and with great persistence attempted in the Western Region with the establishment of the Esiama Rice Mill. The mill operated from 1926 to 1952, at continuing losses, while purchases soon started to decrease from year to year with a short revival at very high purchasing prices during the second world war. Finally the mill tried to secure its employment by merely hulling consignments for farmers at a low miller's fee, covering direct expenses. Even then it was unable to attract an appreciable volume of employment, and it was consequently closed.*

The same development appears to be experienced with a more recently invested government mill at Kwame Danso, Brong Ahafo Region. This mill also has reduced its commercial operation to hulling jobs for farmers, co-operatives and State Farms. Total employment during 1966/67 milling season was:

for farmers		4 bags paddy	
" rice dealers	181	" "	
" cocoa Marketing Board	191	" "	
" State Farms	<u>355</u>	" "	
	731	" = approx. 50 tons	

The latest investment of the kind are 15 rice mills, fully equipped with parboiling facilities, which were purchased by the defunct United Ghana's Farmers Council in one of those ill-conceived attempts by the then-time government to solve Ghana's problems by a series of establishments in a field where one of its kind had not been able to prove its viability. Of the fifteen mills which arrived from West Germany early 1964, three are still unpacked, one is dismantled to supplement missing or broken part and spares for the remaining eleven, which have been wholly or partly installed in more or less completed premises. Only one mill,

* The more detailed history of the mill is described by C.N. Coombes: "The Esiama Rice Mill", Dept. of Agric., Accra 1952.

installed at Tamale, Northern Region, has been operating yet, from October 1966 to May 1967. Since then it has been standing idle. Total investment in the 15 mill projects, accumulated between 1963 and 1968, can be estimated at approximately N¢ 1.5 million, total output (only Tamale) at N¢ 30,000.

The Government milling ventures which so far have had a chance to operate, i.e. the old Nzima Mill at Esiama and the recent establishments at Kwame Danso and Tamale, have not shown ability to compete with the traditional rice processing trade at farm- and village level in respect to either milling-costs or economy. The great care applied by the village processor at low opportunity cost and the high utilization of the small universally used village mills, which, ingeniously operated by one man and adjusted from case to case, mill rice as well as maize, millet, guinea corn, konkonte, groundnut, copra and palm kernel, will for many years to come put any industrial competitor at a competitive disadvantage. At the same time, the lack of farmers' response to the establishment of outlets for their paddy at guaranteed price proves the comparative efficiency of the traditional marketing structure.

- 2) by initiating and financing co-operative mechanized rice farming; in fact, most of the above mentioned 15 mills have been located at places where such new co-operative ventures had been launched. None of these production co-operatives, established by official persuasion, has survived. Only in a few cases some acreage of co-operative owned rice fields, developed at high mechanization cost, could be kept under cultivation after breaking down the co-operative land into individually owned plots. Among the factors responsible for the failures were:

wrong selection of areas and sites;
destruction of top soil by heavy bulldozing;
over-reliance on mechanization, accompanied by chronic breakdowns of machinery,*
unwillingness to sacrifice and lack of loyalty among members who regarded the heavy mechanization investment by government-owned machinery as a gift rather than as a loan.

The ruins of the rice farming co-operatives are underlined by debts of approximately N¢ 150,000, which may have to be written off by the crediting government agencies.

- 3) by establishing State Farms; these failed to a similar extent as the co-operatives and by mainly the same factors. However, most are still continuing operations, heavily subsidized. So far, rice sales by these farms could only provide funds for the payment of labour and salaries, while cost of fuel, spare parts and depreciation of machinery, together amounting to approximately two-thirds of total production cost, remain uncovered.** Partly responsible for this very poor result is the low extraction rate achieved by the State Farms' rice mills. None of these mills could produce a higher percentage than 35% of standard quality rice from the paddy milled, compared with over 65% generally achieved by village processors.

* By lack of servicing facilities, insufficiently educated operators, carelessness, or low suitability for Ghanaian conditions.

** Consequently, mechanized rice agriculture on these farms probably cost more foreign exchange than an equivalent quantity of imported rice.

Table 24 : Rice Yield and Processing Economy on Selected State Farms, 1965/67

location	acreage planted	paddy yield net*		rice yield :				
		total '000 lbs.	per acre planted (lbs.)	standard %	1/4 grain %	split & bran %	total %	per acre (lbs.)
Dawhenia	68	22	323	30	16	27	72	233
Afife	2800	1000	357	32	24	14	68	243
Adidome	1420	540	380	33	17	15	65	247
average (total)	4288	1562	364	32	21	15	68	247

* Net yield, i.e. after seed allocation; not including paddy loss in fields which were not harvested due to weed infestation and floods. Gross yield per acre harvested may be assumed to be about 750 lbs.

Table 25 : Yield and Processing Economy in the Traditional Rice Industry (parboiling and milling at farm- and village level)

place of sample observation	paddy variety	paddy yield net per acre planted (lbs.)	standard %	rice yield :			total %	per acre (lbs.)
				1/4 grain %	split & bran (estim.) %	total %		
Ejura	long grain white		63.2	3.1	10	76.3		
Bolgatanga	" " "		66.3	2.3	10	78.6		
"	oval grain, red		65.5	2.0	10	77.5		
average		800	65.3	2.5	10	77.8	661	

for comparison :

govt. parboil. and milling plant at Tamale	42	6.5	23	71.5
govt. mill at Kwame Danso	40-50%			

In order to demonstrate further the importance of a careful and experienced processing operation for the economy of the rice industry, the results of Table 24 and 25 are shown in their sales values by Table 26.

Table 26 : The Impact of Processing Economy on the Value Yield in Rice Agriculture

Milled produce	market value at source per 100 lbs. N¢	Value Yield					
		per acre planted State Farms N¢	per 100 lbs. paddy. State Farms proces. N¢	per 100 lbs. paddy. village Tamale mill N¢	per 100 lbs. paddy. State Farms proces. N¢	per 100 lbs. paddy. village Tamale mill N¢	per 100 lbs. paddy. State Farms proces. N¢
Rice: Standard	7.50	8.70	39.10	25.20	2.42	4.90	3.15
1/4 grain split & bran	6.00	4.50	1.20	3.10	1.26	-.15	-.39
	2.50	1.35	1.20	3.70	-.37	-.15	-.46
	2.00						
	1.50						
		14.55	41.50	32.00	4.05	5.20	4.00

Performance of the State Farm Mills can not clearly be judged by comparison because of the generally low quality of paddy supplied by the farms due to weed infestation, bird damage and floods, as well as belated or wet harvest. Also contributing to the bad results are lack of spares, maintenance and know-how for the operation of East German and Japanese equipment which was formerly handled by Russian engineers.

The Tamale mill processes mainly farmers' paddy, which ought to be comparable to that traditionally processed. It should therefore be possible to raise milling economy at Tamale to an output of at least 60% standard and 1/4 grain, i.e. by 25%, with well trained staff and good management. However, it might not be possible to reach the efficiency of traditional processors (67% standard and 1/4 grain). To compete with traditional processors in the rice market, the mill will either have to purchase paddy at a lower price or to operate at lower cost than the traditional processor.

It is possible for the mill to purchase paddy at an approximately 10% lower average season price than the village processor, if government funds for transaction of total purchases during and shortly after harvest are provided. Supplies of those farmers, who are willing to sell quick at the seasonally reduced price, could be attracted. However, strict control is required to avoid purchasing stocks underweight, with high moisture, and/or with high portions of "foreign matter" (green and blind seeds, weed, stones etc.), otherwise the price advantage, which will anyhow be reduced by storage cost, might be completely offset.

While the employment of purchasing funds may bring about a competitive advantage of up to N¢ 0.50 per bag of paddy, this advantage appears to be small compared with the competitive disadvantage faced by the mill with respect to processing cost. A breakdown of experienced and estimated future cost of milling operation at Tamale is given in Table 27. The experienced cost calculation is based on the seven months improvised milling operation in 1965/66. The mill was not fully staffed. The team of labourers employed for the season was deployed when the milling of the available paddy stocks had been completed. The technical supervision, administrative and marketing services were rendered by the local branch of the defunct U.G.F.C. A calculated cost figure is entered for these services under "administration". The long-term cost structure is calculated on the assumption of an average utilization of two-thirds of the mill's capacity, i.e. 10,000 bags paddy. The cost structure is divided into "expense" costs, which are reflected in actual expense during the season of operation, and "calculated" costs, which are either borne by Government (e.g. interest on capital outlay for investment and working capital) or materialize in actual expense only after a period of two and more years (depreciation).

Table 27 : Cost of Rice Milling Operation at the Government's Parboiling and Milling Plant, Tamale

	experienced during 1st milling season 1966/67, through- put 4,600 bags paddy	per bag	estimated for fully established operation, 10,000 bags paddy	per bag
	N¢	N¢	N¢	N¢
labour & techn. staff	8,000		10,000	
fuel			3,000	
admin. & marketing	1,500		3,000	
repairs and mainten.	neglig.		1,200	
other expenses (incl. transp.)	"		1,000	
"expense" cost	9,500	2.07	18,200	1.82
depreciation (6% on N¢120,000)	7,200		7,200	
interest (7 1/2% on N¢150,000)	5,600		5,600	
"calculated" cost	12,800	2.78	12,800	1.28
total cost	22,300	4.85	31,000	3.10

In comparison, the average village processor's trade margin of about N ϕ 1.50 per bag paddy is built up as follows:

Table 28 : Cost Calculation in the Traditional Rice Processing Trade

fire wood	N ϕ 0.15
carrier charges	" 0.15
millers' charge	" 0.70
labour at opportunity cost (i.e. average trade profit of woman processor and helping family member)	" 0.50
per bag of 180 lbs. paddy	<u>Nϕ 1.50</u>

A description of the traditional parboiling process is given in Appendix 5.

A comparison of processing costs between the government mill and the traditional industry reveals a striking cost advantage for the traditional industry, based mainly on the absence of capital costs. It is obvious that by omission of interest- and depreciation-charges the mill's cost calculation could be approximated towards that of the traditional industry. This tactic, of writing off the investment at government expense and granting working capital free of interest charge, is practised often with government enterprise, but is almost always an entirely wrong solution to the problem. It means subsidized competition with private enterprise by a government investment which has admittedly been mislocated. It leads to a relative decrease of private activity in the respective field of trade and/or industry, makes a viable traditional industry appear odd and out-dated, creates the desire for government employment and contempt for self-employment (in the traditional sphere) in young people and - in the end, after machinery and equipment have been run down and no funds for re-investment have been earned - leaves a vacuum. This needs to be said in this categorical form, because thirteen mills such as the one installed at Tamale are presently awaiting government decision on location (3), completion of installation (5) and commencement of operation (5).

The recommendable decision is: to run the Tamale mill with the best managerial and technical staff available (a rice parboiling and milling expert under OPEX/UN assignment would be rightly employed here), under the condition that within 2 - 3 years a milling and trading economy near to that of the traditional processing trade is achieved. This would require:

- a) experienced purchasing and storage policy: fixing of realistic purchase prices and adequate transport charges to avoid that only produce from less accessible areas is being offered; gradual but determined introduction of quality grades (control of moisture, blind grain and "foreign matter") and education of farmers to understand their need; drying of high moisture consignments before storage; control of stocks and fumigation when necessary;
- b) experted technical supervision: parboiling, drying of the wet paddy and milling the parboiled grain, all three are arts to be handled with great care in order to achieve the best possible extraction rate and a clean rice, free of undesirable odour;
- c) imaginative sales policy: utilizing the nutrition argument in favor of parboiled rice, e.g. finding a vernacular expression for its virtues and print on the bags; expressing in a similar way that the rice (unlike local rice in general) is guaranteed free of "foreign matter" especially of stones which are much disliked;

- d) high productivity of technical and clerical staff: careful screening of job applicants; avoidance of empty functions; intensive training on-the-job; control and rewarding of efficiency;
- e) co-ordination by able and authoritative management: the proposed UN/OPEX expert should, if possible, be from one of the traditional parboiled-rice producing countries; in co-operation with his Ghanaian counterpart, he should be authorized with the highest possible degree of self-responsibility; funds should be supplied as requested and without delay.

"Calculated" costs per bag can be lowered as soon as with increasing paddy supplies the investment of a second parboiling plant (i.e. soaking vats, steaming drums and drying yard) becomes feasible, since the milling section could double its output by milling over day the supplies from drying floor I and over night those from drying floor II. A cost price difference of at least N¢ 1 per 100 lbs. rice (due partly to still lower extraction rate, partly to still higher processing cost) in favour of the traditional processing trade would most likely still exist even under very able management. However, it may be possible to establish a preference market which is prepared to pay this price difference, if the quality of the mill's rice is superior (e.g. free of "foreign matter", especially of stones). Up to now products from the Tamale mill as well as from State Farm mills proved rather inferior in competition with those of the traditional trade.

Regarding the economic disadvantages in competition with the traditional processing trade and the ambitious efforts to balance these by extraordinary performance, it should not be ventured to take any of the remaining 13 mills into operation, until the Tamale mill has proved ability to operate without loss*.

This caution need not be applied, when a mill is needed to serve large-scale rice plantations. Such plantations are bound to experience some marketing difficulties with their paddy crop, since the traditional processing trade in the particular area is normally unable to expand its capacities in proportion to the sudden impact of the plantation crop. Without a mill and storage facilities the large-scale planter might have to dispose of his crop at prices much below wholesale market prices. In spite of the higher operational cost, compared with the traditional processing trade, the benefit in marketing through the independence obtained by running his mill, may make the investment feasible. A precondition, of course, is the economic viability of the plantation investment and reliable indication that a crop of approximately 1000 tons paddy can be achieved, by one plantation alone or in co-operation with other plantations in the area. Unfortunately, besides State Farms which are already over-equipped with milling capacities, there is at present no plantation venture of noteworthy paddy yields in the country. Even the rice growing State Farms in the coastal plains between Tema and Aflao do not produce a combined yield of the required volume, their combined average annual harvest during the last years being around 700 tons only, compared with their combined milling capacity of more than 10,000 tons.

While neither collective, mechanized cultivation nor the provision of industrial processing facilities with guaranteed purchasing prices for farmers' paddy can yet claim any positive result, the question of how to increase domestic rice production has probably been approached with success, though indirectly, by import policy.

* This recommendation sounds less restricting, when considering that, according to a recent report by the Ministry of Agriculture, only 3 mills out of the 14, namely Tamale, Attebubu and Adidome can count on noteworthy supplies of paddy, the rest still dependent on planned developments in rice cultivation.

Unfortunately, no reliable data on the volume of rice production in Ghana seems to exist. Neither do the amounts recorded by consumption surveys appear realistic. However, observations in local markets all over Ghana show the ubiquitous availability of local rice in various kinds and create the impression that in all but places near the main harbours local rice, as compared to imported, is the primary source of consumer supply. Since this has apparently not always been so, it can be assumed to be partly the result of sharp price rises for imported rice by drastic taxation of imports during the period 1962 - 65. A relaxation in the taxation of rice (and other food imports) in 1966/67 was partly countered by remarkable increased c.i.f. prices. The challenge of an overall 60% increase in wholesale prices for imported rice, which was immediately reflected in rising prices for local rice, obviously stimulated rice production in all growing regions of Ghana.

Table 29 : Annual Quantity and Value of Rice Imports 1960 --67

	<u>rice im- ports in '000tstg.</u>	<u>in % of food imports</u>	<u>average c.i.f. price per ton tstg.</u>	<u>rice im- ports in '000 tons</u>	<u>in lbs. per head of popul. lbs.</u>	<u>wholesale price average (Accra, 100 lbs.) import.rice local rice</u>	
						<u>N¢</u>	<u>N¢</u>
1960/62	2,600	11%	52	50	14	6.50	7.00
1963/65	1,800	10%	56	32	8	11.50(10.00)*	11.50
1966/67	3,150	16%	70	45	10	10.50(10.30)*	11.00

* prices in brackets are government control prices which during the period of restricted imports were practically never observed.

The similarity of prices for local and imported rice in Accra does not reflect the average price relation in the country. Due to transportation cost, Accra, near the principal harbor, enjoys the lowest prices of imported rice, while prices in Accra markets for local rice, most of which is grown in the northern regions of Ghana, are relatively highest.

That the price increase had the assumed beneficial effect on production and not only on trade margins, can be seen from the following break-down of trade calculation.

Table 30 : Break-down of Trade Calculation on Sale of Local Rice in Accra, 1966/67.

aver. wholesale price, Accra 100 lbs N¢ 11.00 = per 240 lbs. bag	N¢ 26.40
" supply distance 480 miles a Np. 5/ton/mile =	" 2.40
2 bags of each 180 lbs. paddy yield 1 bag 240 lbs. rice	" 24.00
	* per bag paddy " 12.00
aver. processor's margin (parboiling and milling)	1.50
	10.50
aver. price received by farmers	" 9.00
cumulative trade margin (minim. 3 traders involved)	" 1.50
in % of wholesale price, Accra	11.5%

Local rice production was estimated by 1963 at 33,000 tons paddy i.e. 20-22,000 tons milled rice.* This estimate appears to reflect the production volume during the early years of the 1960 decade, a similar amount (32,000 tons) being shown in an earlier estimate around 1960.** It can only be assumed on basis of a general trend of rising consumer demand for rice in the fast-growing urban population centers,*** that with the incentive of rising prices the decrease of rice imports by 18,000 tons during 1963/65 has partly been compensated by rising local production. Price elasticity of consumer demand has been less effective, since a rapid increase in institutional consumption (colleges, hospitals, canteens, workers' brigade, marine crews, army and police) took place throughout the decade.**** The assumption of substantial increases in domestic rice supplies appears to be confirmed by frequent complaints from rice-growing areas about slowly moving stocks, after in 1966/67 rice imports increased under the impact of food aid agreements.***** More drastically shown is the market saturation by the difficulties experienced by G.N.T.C. in selling large quantities of short grain rice, imported under aid agreement. Stocks, endangered by infestation, are still hanging over from July imports, in spite of a 20% price reduction. Under the impact of low consumer appreciation, the slow sales of these consignments have partly blocked further imports and reduced monthly sales of imported rice by about 50%. Since an almost equivalent shift to consumption of local rice must be assumed, but no rise in prices for local rice has been observed, it can be concluded that domestic production is large enough to compensate for such wide demand fluctuations.***** In Table 31 quantitative estimates of the above outlined development are ventured.

* "Crop Areas, Yield and Production," published by Division of Econ. Statist., Ministry of Agric. 1963/64; the estimate was included in FAO Production Accounts.

** "Food Balances for 30 Countries in Africa and West Asia 1959-61", publ. by U.S. Dept. of Agric.

*** Rice is with kenkey leading in the important "prepared food" sales which occupy 10-20% of food consumption in large towns. A recent inquiry into consumer preferences proved a high preference for rice among young people. Institutional consumption, which is heavily based on rice for reason of convenience, increased more than proportionate to population growth.

**** During 1967, rice supplies to the army alone, by the main importer G.N.T.C., amounted to approximately 3,200 tons i.e. 7% of imports.

***** "PL 480" imports (included in the figures of Table 29) added about 10,000 tons to trade imports in each of the years 1966/67.

***** It must be admitted, that the lack of information on stock in trade and on farms renders the whole analysis hypothetical to a good extent. If increased supplies are partly the result of rising stocks, then the assumptions of rising consumption as well as production may become questionable. However, there are indications that confirm the expert's analysis; e.g. a survey of 30 rice-growing farmers in 5 villages around Tamale and Yendi, carried out under the expert's supervision in September 1967, i.e. 1 - 2 months before beginning of the new harvest, recorded depleted stocks at all but one large farmer who had 50 bags left of 400; most farmers planned to expand rice cultivation in 1968; most reported increasing acreage under rice during 1964 - 67. The increased demand has more likely been compensated by a rich harvest Oct.-Dec. 1967 than by a hang-over of stocks.

Table 31 : Estimates of Annual Rice Consumption and Domestic Production
1960 - 67.

	<u>rice consumption per</u> <u>head of population</u>			<u>domestic rice</u> <u>production, estim.</u>	
	<u>total</u> <u>(estim.)</u>	<u>import</u>	<u>local</u> <u>(estim.)</u>	<u>milled rice</u> <u>(standard)</u> <u>& 1/4 grain)</u> <u>in '000 tons</u>	<u>paddy</u>
	lbs.	lbs.	lbs.		
1960/62	20(18)*	14(12)	6 =	22 =	33
1963/65	15(12)	8(6)	7(6) =	28 =	42
1966/67	18(14)	10(7)	8(7) =	34 =	51**

* figures in brackets indicate estimated consumption in households and private catering, i.e. total consumption minus estimated share of institutional consumption (ref. discussion in previous paragraph).

** including approximately 1,200 tons from State Farms which accordingly contribute 2.5 % of estimated total paddy production.

If the estimates, contained in Table 31, are realistic, the conclusion would be that a price rise in imported rice calls for an increase in consumption and production of local rice; the conclusion can be extended on basis of the above mentioned G.N.T.C. experience, i.e. that a similar effect is achieved by importation of low quality rice.

A new agricultural census, consumption surveys and the further development of rice importation will have to prove the value of the estimates contained in and conclusion derived from Table 31. If both are right, the period 1968/70 should bring a further decrease in consumption of imported in favour of local rice, i.e. rice imports should either remain at the present level of 45,000 tons or fall.

The devaluation of the New Cedi, though accompanied by further relaxation of import levies, has strengthened the competitive position of domestic rice.

Table 32 demonstrates the competitive advantage of local rice in Ghanaian markets by end 1967 (5 months after Devaluation).

Table 32 : Competitive Situation in the Domestic Rice Market by End 1967
(after Devaluation)

	<u>wholesale price in N¢</u>			<u>competitive advantage</u> <u>of local rice</u>	
	<u>local rice</u> <u>bag = per</u> <u>240 lbs. 100 lbs.</u>	<u>imported</u> <u>(long grain)</u> <u>100 lbs.</u>		<u>N¢ 100 lbs.</u>	<u>%</u>
Accra	24	10.00	11.30	1.30	11%
Kumasi	22	9.20	11.80	2.60	22%
Tamale	19	7.90	12.50	4.60	37%

The substantially lower price for local rice compared with the 1966/67 average (ref. Table 29) is only partly explained as a seasonal low during harvest time (Nov./Dec.), but is also a result of rising domestic supplies meeting increased rice imports.

The present price relation will undoubtedly shift more consumption from imported to local rice. While in coastal areas the majority of consumers, used to spending 1 Np. more per pound on imported rice, may still keep to imported rice consumption, this can hardly be expected from most consumers further inland. However, increased rice consumption being a typical feature of urbanization and the densest urban development in Ghana taking place in the coastal zone, the question how to win these urban coastal consumers for local rice as such has to be answered in order to reduce imports to a minimum.

A consumer opinion survey, carried out by the Food Research & Development Unit in Accra in January 1968, revealed that in spite of a lower price and generally conceded higher nutritious value local rice is less liked because of its impurities (mostly in form of stones which can damage teeth in chewing). The survey gives an indication that sales of local rice in Accra markets could substantially rise, if the rice could be supplied free of stones. It would therefore be of great benefit for Ghana's rice industry as well as the national trade balance, if simple methods of avoiding infiltration of paddy and rice with stones and/or sorting out stones from rice could be discovered and implemented at farm-, processing- and/or market level.* Furthermore, and especially as long as local rice sold still contains stones, efficient devices of sorting these out at kitchen level would immediately serve to widen consumption of local rice especially in institutions which are obviously the most conservative buyers of imported rice.** Considerations of purchasing economy and the nutrition argument in favour of parboiled rice would be additional factors to bring about a shift of institutional consumption from imported to local rice.

Once the causes of the impurities and the means to eliminate these have been discovered, the main support in the implementation of a higher quality standard of local rice has to be sought from trade. Market traders must become stricter with regard to quality of supplies. Once a source of parboiled rice "free of stones and dirt" is established, this competitive advantage must be exploited by effective advertisement. The Nutrition Division of the Ministry of Health may be interested to assist in such campaign, especially by supplying market traders who reliably restrict their trade to "clean parboiled rice, free of stones" with revocable certificates and placards. The expert has contacted G.N.T.C., as main importer and supplier of most institutional consumers. Though this important trading company dealt up till now exclusively with imported rice, a ready interest to investigate possibilities of establishing purchasing activities through its sales depot at Tamale was met, in view of the attractive price difference and shrinking turnover in imported rice, particularly observed at this depot. If processing trade in the Northern Region could be advised and educated to produce reliably clean supplies,*** G.N.T.C. may be able to direct large quantities of these supplies to institutional buyers.

* This could be a most rewarding assignment for the Food Research Institute's Agric. Engineering and Processing Section.

** Tray-winnowing, a usual practise to clean grain etc. before utilizing it for consumption, proves not capable of eliminating the small transparent stones which resemble rice split and are the main infestation.

*** The C.M.B., as successor of the U.G.F.C., constituting the link to agricultural marketing co-operatives, has readily agreed to support such operation, eventually by supplying credit for the expansion of village-hulling facilities.

The Food Research & Development Unit should co-ordinate a Rice Trade Development Program with main contributions by Food Research Institute (processing economics and engineering, consumption and marketing surveys, taste panels), Nutrition Division (propaganda, strongly linked with market trade and institutional consumers), G.N.T.C. as the greatest potentiality of direct substitution of trade in imported rice by trade in domestic rice, C.M.B. and Extension Services of the Ministry of Agriculture as educators and promoters of rural processing trade. While this program aims at improvement of rice processing at farm and village level, the area which provides 95% of local rice supplies, it may be recalled that production of clean rice is one of the main challenges for the government rice mills and means for them to achieve higher prices.

Once a reliable supply of clean local rice is guaranteed, Government may consider to restrict importation to short grain rice only, in order to assist consumers to overcome the conventional preference for imported rice.

Though a great part of the calculations, suggestions and conclusions regarding the replacement of imports by domestic rice in the past and present years is still lacking substantiation, the expert is convinced that the policy of high-priced imports has been an effective inducement to higher output in the domestic rice industry. To yield a much greater effect during the coming years, this policy has to be accompanied by an improvement of the quality of local rice, which can be achieved by greater cleanliness and elimination of stones in rural processing operations (inclusive threshing and drying after harvest).

Summary and Recommendations

1. Favoured by high prices of imported rice, the share of locally grown rice in consumption is rising. In spite of a reduced total rice consumption, consumption of local rice has increased in absolute terms.
2. The price increase in the rice market has stimulated domestic production. With further increased prices for imported rice, as an effect of the devaluation, there is indication that more than two-thirds of consumer demand could be turned to local rice, if the main quality argument raised by consumers, the infestation of local rice with small stones, could be eliminated.
3. Practically all commercial rice processing is done by small village mills, after the paddy has been parboiled in the trader's compound. This combination proves still more efficient in both milling results and cost of operation than any industrial-scale milling operation so far undertaken by Government.
4. In view of eleven new Government parboil- and milling plants installed all over Ghana without due regard to potential paddy supplies, the technical and economic efficiency of these plants needs to be thoroughly tested.
5. Direct and indirect Government investments in large-scale rice agriculture by State Farms and Government-sponsored production co-operatives have failed. Besides very low yields per acre, the milling results achieved by State Farms are extremely poor.
6. The traditional marketing and processing system is working efficiently at moderate trade margins. A minor disturbance occurred when by end of 1967 large amounts of slowly moving stocks of P480 short grain imports were thrown on the market at 20-30% reduced prices.
7. Great consumers of imported rice are institutions such as army, colleges, hospitals, canteens etc. Procurement of reliable supplies of local parboiled rice, free of stones, to these buyers along with some influence Government could take on their purchasing policy could open large demand resources for local rice.

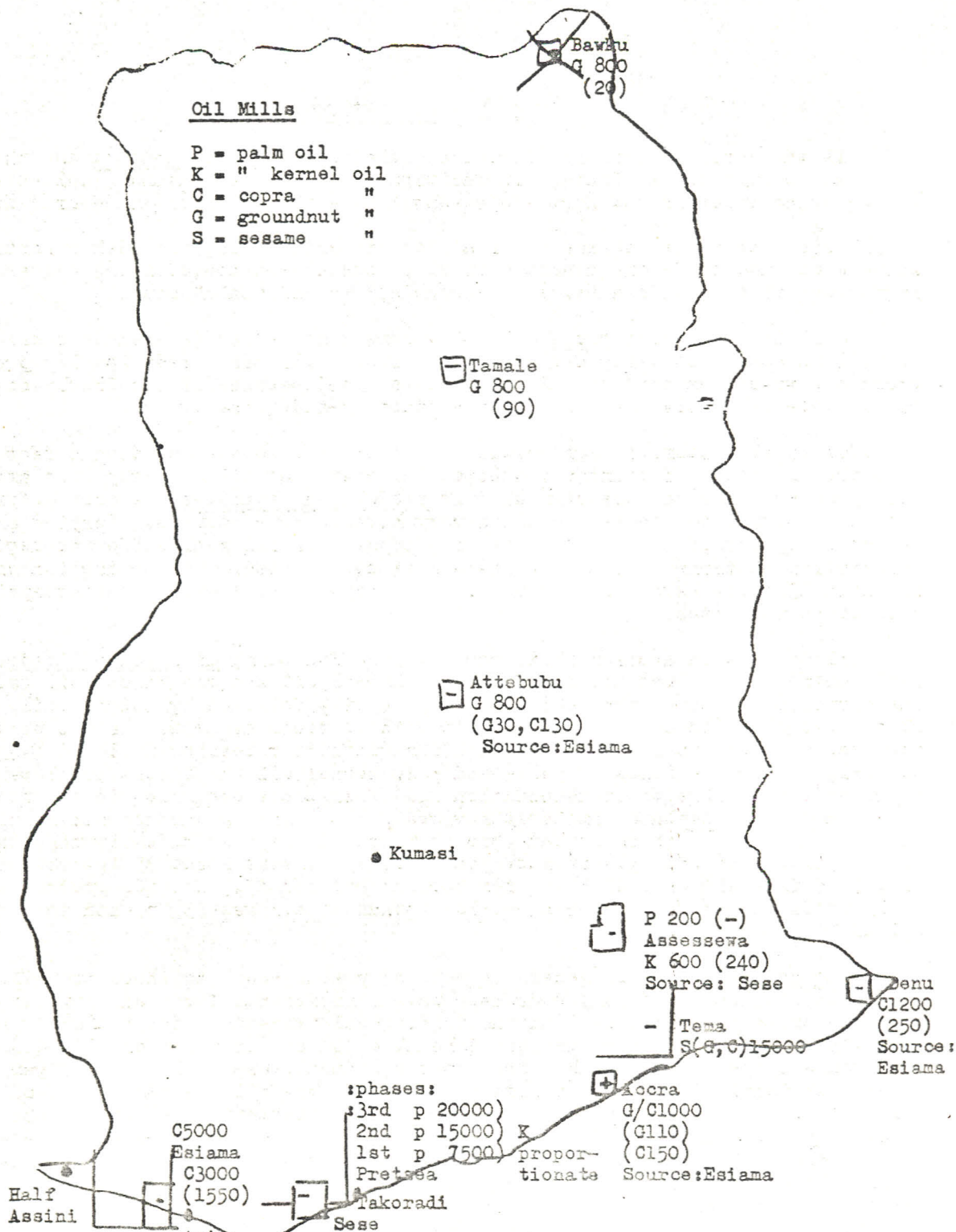
It is therefore recommended to :

1. Study and improve the village parboiling and-milling process with the aim of eliminating the infestation of paddy and rice with stones (and other foreign matter).
2. As soon as a source of stone-free parboiled rice is established, attract institutions to buy this rice instead of the more expensive and less nutritious imported rice.
3. Urge rice traders in main consumption centers to educate their suppliers in this main quality requirement for local rice and support those who co-operate by placards and certificates stating that "clean parboiled rice, free of stones" is sold at their market stand.

4. Support actions 2 and 3 by a country-wide nutrition campaign on the value of parboiled rice.

Actions 1 - 4 have been made objectives of a Rice Trade Development Unit, formed on initiative of the FRDU/FRI with participation of Nutrition Division, Agric. Extension Services, C.M.B. (Produce Purchasing Dept.), F.M.B. and G.N.T.C.

5. Procure the services of a rice parboiling and milling specialist, eventually sponsored by UNIDO (U.N. Industr. Devel. Org.) for the management of the Tamale mill. Supply the mill with top technical and commercial personnel and adequate finance for operation and eventually recommended technical changes and extensions, and let it operate as autonomously as possible.
6. Only after the Tamale mill has achieved an efficiency-level equal or nearly equal to the traditional processing trade, consider taking more of the Government parboiling and milling plants into operation, provided sufficient paddy supplies are available in the relevant area.



phases:
 3rd p 20000 }
 2nd p 15000 } K
 1st p 7500 }
 Pretsea
 proportionate

total milling capacity	total output	rate of utilization
P 3200	1750	55%
K 600	240	40%
C 4700	2100*	45%
G 2900	250	9%
11400	4340	38%

1967 nearing compl. C 5000
 1967 under construction P 7500
 " " " S 15000

* incl. 20 tons produced at Assesewa.

5. OIL INDUSTRY

All three major tropical oil seeds - the palmnut, the coconut and the groundnut - are cultivated in Ghana. In addition to these, the sheanut, collected from wild-growing trees in the northern savannah zone, is an important source of fat supply.

Besides their use as raw material for oil extraction, the edible parts of the above mentioned seeds are consumed in raw, roasted and cooked forms and serve as ingredient of various dishes, e.g. "groundnut -" and "palm" soup.

Local taste favours crude oil. Government mills had to abandon their refineries as well as costly bottling machines for refined oil. The traditionally produced crude oil is of comparatively low FFA content and because of its freshness and particular taste generally preferred to the "factory-made" one.

Due to the nature of agricultural production in Ghana and to the fact that, with the exception of groundnut, substantial shares of oil seed supplies are from wild-growing palms and trees, realistic production estimates are most difficult to obtain. Consumption surveys yielded very heterogenous results. Varying shares of self-consumption of crops by the farming population and much differing regional consumption patterns make any estimate more complicated. The production estimates in Table 33 below have been derived from a comparison of previous consumption and production estimates.

Oil traders in Accra markets reported the following division of trade, July 1967: palm oil 50%, coconut oil 25%, palm kernel oil and groundnut oil each 12.5%. The division indicates the dominance of palm oil, followed by coconut oil, and the almost complete absence of sheanut butter in southern markets. In the northern regions, the pattern is reversed, with sheanut butter leading followed by groundnut oil, negligible sales of palm- and palm kernel oil and almost complete absence of coconut oil. Due to transportation and other costs occurring in interregional trade, market prices are similarly reversal, i.e. while groundnut oil is the most expensive oil in southern markets, in the north it is palm oil. Average retail prices per bottle (680 g.) in Accra markets, 1967, were about 35 Np. for palm kernel oil, 37.5 for palm oil, 42.5 Np. for coconut oil and 47.5 Np. for groundnut oil, while at Tamale the price for a bottle groundnut oil was 35 Np. and that for palm oil 40 Np.

"Factory-made" oil is generally sold at prices equal to those prevailing for traditional oil. Since many consumers have a preference for traditionally extracted oil, the price lead is more with the traditional trade to which the mills have to adapt their prices. The mills should be able to save on transport (in drums), if they would better utilize their transport equipment, especially with regard to two-way freight. Except in groundnut oil, where the mills did not succeed to reduce moisture to an entirely satisfactory extent, the "factory-made" oils are of comparatively good quality and low F.F.A. content. However, over-long storage of oil seeds and/or oil in drums due to inadequate marketing policy frequently degrades quality and endangers the mills' reputation in the markets. An attraction for the market trade to deal with factory oil is the opportunity to buy it on credit.

With exception of the groundnut oil price, which suffers only a short seasonal low after harvest in August-September, prices of all other oils show a similar pattern of decline during the first and rise during the second half of the year, with an oscillation of 10 - 15% around the yearly average. This typical price variation is due to much increased oil palm yields during February - May and increased consumer demand during August - December, when most agricultural products which are liked in fried form (e.g. yam, plantain, beans) and herring are in season.

Local demand and production are generally kept in balance by the mentioned price mechanism, with a tendency to short supply of groundnut oil and (at least seasonal) of coconut oil. Supplies of palm- and palm kernel oil from natural palmeries has been affected by the formation of the Volta Lake which submerged large parts of palm forest, especially in the Eastern Region. However, this has been little felt in the markets and the growing industrial output by the large State Farm plantations in the Western Region is compensating for the damage. Oil importation is restricted. Occasionally disturbed by U.S. oil from aid consignments or exceptional imports of Nigerian groundnut oil, wholesale prices in coastal markets have not yet completely descended from the high level of the years of inflationary price culmination for agricultural products in Ghana, 1965/66, to the advantage of the farmer, rural processor and trader. Except in the Western Region, where dense coconut and oil palm population prevails, wholesale prices for vegetable oils in south Ghanaian markets are 50 - 100% above f.o.b. export prices.

Exports of oil seeds from Ghana are small and irregular, totalling 6000 tons sheanuts, 1800 tons copra and 300 tons palm kernel in 1967. Groundnuts are not available at exportable prices. A few exceptional shipments of palm oil, below cost price, were made by the State Farms' mill at Sese. Oil cake export, mainly copra cake, is also small, since industrial oil milling occupies only a small fraction of the predominantly rural industry and the little cake produced by these mills is partly in local demand as animal feed.

Domestic industrial demand for Ghanaian oils has been created by the establishment of a soap factory (Unilever/Ghana Government) at Tema. Because of the high price level in the domestic oil markets, the factory still imports most of its oil supplies. The prospective increase in palm- and palm kernel oil production by the State Farm mills is supposed to substitute these imports.

All industrial oil milling is by Government mills, inclusive of one small joint government/foreign enterprise. The potential share of these mills in the country's oil production, according to their production capacities and their actual share obtained in 1966/67 is shown in Table 33.

Table 33 : The Share of Industrial Oil Milling in Ghanaian Vegetable Oil Production

	estim. total production 1966/67 annual aver. '000 t	produced by oil mills 1966/67 ann. aver. '000 t	in per- cent of total prod. %	ann. capa- city of oil mills 1966/67 '000 t	in per- cent of total prod. %	ann. cap. of oil mills 1968/69 '000 t	in per- cent of total prod. 66/67 %
palm oil	15	1.75	10.2	3.2	21	7.7	51
" kernel "	7	0.24	3.5	0.6	8.5	1.6	23
coconut "	5	2.10	42.0	4.7	96	9.7	194
groundnut "	8	0.25	3.1	2.9	36	2.1	26
shea butter	5	-	-	-	-	-	-
	40	4.34	10.8	11.4	28.5	21.1	52.7

The Table indicates:

1. A large increase is taking place in industrial milling capacity for production of palm oil and palm kernel oil. Utilization of these capacities would mean quadrupling of present industrial output. Large State Farm plantations in the Western Region are increasing palmtut supplies from year to year, multiplying the increase by the introduction of high oil yielding varieties. As mentioned already, part of the increasing industrial production in the Western Region compensates for palm losses in the Volta Lake basin; another part will have to be directed into industrial consumption and export. Almost the total industrial production of palm oil will be concentrated at Pretsea State Farm, where a new mill will take over production from the neighbouring worn-out one at Sese State Farm in the course of 1968. The capacity of the mill can be increased in two stages to about three times the initially installed one. Whether a proportionate increase of State Farm plantations or the propagation of farmers' supplies (supported by nursery and extension services rendered by the State Farms) should be chosen as the means to meet the great raw material requirements of the mill in the long run, remains to be decided after the cost of palmtut production on the young State Farm plantations has been thoroughly analyzed.
2. An equally large increase of copra milling capacity has been materialized, leading to an obvious disequilibrium of demand and supplies of raw material. While approximately 40% of estimated total coconut oil production in Ghana is already industrialized and little systematic effort to increase yields from coconut palmeries has been made in the past years, it seems unlikely that much more than one-third of the expanded milling capacity will be utilized over the next 5 - 10 years. 80 - 100% of industrial copra milling (depending on the economic viability of the smaller plant at Denu on the far eastern coast line which has been struck by "St. Pauls' disease") will be done by the Esiama mill in the Western Region. The mill is well located for the exploitation of the country's largest coconut resource, the Nzima copra zone which stretches from river Ankobra to Half Assini, the farthest point west on the Ghanaian coast. This area is supposed to produce half of the country's coconut crop and its share in coconut oil production, if the quantity of its copra presently being exported could be retained, would probably be as high as 75%. A survey carried out in 1957 arrived at the estimate of an annual crop of 7,000 tons copra in the area. Present calculations of copra supplies for milling and export, supplemented by an estimated volume of traditional oil processing, make this estimate of 1957 appear to be valid still for the present production. Even if exports should cease completely and most of the traditionally processed nuts could be diverted to feed the mill, oil output of the mill could hardly rise above 4,000 tons.

The question of systematic increase of yields and acreage is particularly important, since the larger part of the palmeries was planted 25 - 40 years ago and consequently produces declining yields.

* Named after Cape St. Paul (near the Togolese border); cause not yet identified; effect: gradual loss of leaves, branches and tree top.

3. Utilization of groundnut mills is very poor and a retreat of industrial activity in the field of groundnut utilization is apparent, indicated by the reduced industrial milling capacity for the period 1968/69. The reduction took place by closing of the Bawku mill, vital parts of which were needed as spares in repairing the two remaining government mills at Tamale and Atebubu which found it difficult to import these spare parts for the East German supplied equipment.

The low output of the mills is due to the inability to attract sufficient supplies from the surrounding areas, though crops in these areas could well keep these mills running at full capacity. However, the mills discouraged farmers and supplying traders by delays of several months in the payment for supplies, due to heavy financial losses in competition with traditional processing trade. It was realized that the mill can only compete in the domestic oil market, when supported by groundnut supplies at prices well below market level. However, at such price, uniformly fixed by the Cocoa Marketing Board (C.M.B.) as sole buyer of the traditional tropical export crops and agent for the mills, supplies of good quality groundnut are hardly finding their way to the mills.

4. The overall share of industrial processing (only 10.8%) in the country's oil production is low. That this low share is not due to shortage of industrial capacities, is seen from the low overall utilization rate of below 40% of these capacities. Obviously, the traditional processing trade is deeply rooted and a hard competitor to factory operation. According to Table 33 traditional processing trade provides at present about

	97%	of all groundnut oil,
	96%	" " palm kernel oil
	90%	" " palm oil
and	58%	" " coconut oil,

consumed in Ghana.

In order to assess the further prospects of industrial oil processing in Ghana, an analysis of the competitive relation between industrial and traditional processing operations is necessary. The most relevant criteria are :

1. the extent to which the oil is extracted from the oilseed;
2. the sales value of the residual cake;
3. the cost of the processing (and trading) operation.

Criteria 1 and 2 are objects of Table 34, while criteria 3 is the object of Table 35. The issues contained in the two Tables will be discussed jointly.

Table 34 : Extraction Rates and By-Product Utilization in Ghana's Traditional Versus Factory-Scale Oil Crushing Trade

<u>raw substance and class of operation</u>	<u>average oil content in raw substance</u>	<u>rate of oil extraction</u>	<u>oil % retained in cake</u>	<u>utilization of cake</u>	<u>sales value of cake in % of oil seed purchase cost</u>
<u>Copra</u>					
traditional*	67%	38-45%	40-48%	(East:Pig feed	7%
factories	67%	55-60%	8-12%	(West:waste export	- 10%
<u>Palm nut-bunch</u>					
traditional	8-16%	10%	..	fuel	-
factory	8-22%	13-15%*	15-20%**	fuel	-
<u>Palm kernel</u>					
traditional	50-52%	40-42%	10-15%	waste	-
factory	48-50%	35-38%	9-18%	export	20%
<u>Groundnut</u>					
traditional	48-52%	38-40%	15-25%	food	35%
factories	40-52%	32-40%	8-16%	animal feed	25%

* traditional processing works on fresh nuts; for comparison, fresh nut inputs have been converted into copra equivalent.

** in "press fiber", which residue constitutes only 7-10% of bunch weight.

Table 35 : Operational Costs in Ghana's Traditional Versus Factory-Scale Oil Crushing Trade

<u>Product and class of operation</u>	<u>(I) industr. capacity utilized</u>	<u>(II) costs other than oil seed purchases in % of total production and trading costs</u>	<u>(III) (thereof in-direct costs, i.e. other than labour, fuel and packing)</u>	<u>(IV) cost as under II, calculated at 80% utilization of industrial capacities (at subsistence remuneration for traditional processor)</u>
<u>Coconut oil</u>				
traditional:	..	30%	..	22%
factories	20%	50%	(35%)	25%
<u>Palm oil and kernels</u>				
traditional:	..	45%	..	32%
factory	60%	30%	(10%)	30%
<u>Palm kernel oil</u>				
traditional:	..	22%	..	17%
factory	40%	40%	(20%)	30%
<u>Groundnut oil</u>				
traditional:	..	20%	..	14%
factories	25%	30%	(15%)	20%

Tables 34 and 35 indicate that the competitive relation between traditional and industrial (factory-scale) oil processing is differently composed in each case according to the type of oil seed crushed. The most heterogeneous relation prevails with regard to the utilization of the by-product, oil cake (Table 34). Widely differing is also the result of the two classes of operation in terms of oil extraction, only partly influenced by the quality of oil seed available to the processor (Table 34). Here a remark is necessary: A higher percentage of oil retained in the cake, in relation to the competing class of operation, does not necessarily indicate a comparatively lower oil extraction from the seed; oil losses of up to 10% (direct by spillage, leakage, frequent stoppage of industrial operation etc., or indirect by losses of oil seed in storage) may cause low oil yields in spite of relatively oil-free cake. The high degree of care exercised in traditional processing trade combined with the quick turnover of stocks in this class of operation appear to minimize those unaccounted losses, which are characteristic for most of the government oil mills.

Costs of operation appear to be generally lower in the traditional oil processing trade, with the exception of palm oil production (Table 35). Mainly responsible for this competitive advantage are: full utilization of traditional capacities, which are often working on part time basis in varying job combinations; high degree of job routine and skill; and high personal effort and responsibility in task performance. In all traditional operations except palm kernel processing, in which the village mill's charge is comparatively high, the processing trader's (and helpers's) remuneration accounts for the major part of operational costs. This remuneration, apparent as a residual amount after deducting all other operational costs and the oil seed purchasing cost from the sales returns, would indicate the following average remuneration per labour day (of an unspecified number of hours) in the traditional oil processing trade:

N ϕ 1.10 for a man
" -.80 " " woman
and " -.35 " an old woman or young girl.*

In order to estimate the competitive strength, an endurance of the traditional trade under a potential increase of competition by the oil mills, which may reduce their costs of operation by increased utilization of milling capacities, Table 35 compares the mills' cost, calculated at 80% utilization, with the cost of traditional operation, calculated at "subsistence remuneration". The latter has been tentatively calculated at

N ϕ -.60 per day for a man
" -.40 " " " a woman
and " -.20 " " " an old woman or young girl.

It is assumed that at such remuneration rates traditional operations would continue for a time period long enough to make it difficult for a mill to achieve continuity of supplies and sales for the desired full-scale operation; if, however, the mill can persistently compete at this low level of remuneration for the traditional processor, the latter will sooner or later try to turn to other more remunerative occupations, if available, or migrate from the area.

Table 36 summarizes the competitive relation between the two classes of operation supported by the information contained in Table 34 and 35.

* Cost calculations and description of traditional processing trade operations are given in Appendix 6.

Table 36 : Competitive Relation of Traditional Versus Factory-Scale Operation in Ghana's Oil Crushing Trade

(the advantageous class of operation is indicated as appropriate for each of the three main criteria)

advantageous class of operation in the production of:	<u>oil ex- traction</u>	<u>utilization of cake</u>	<u>cost of operation</u>
coconut oil	factory	factory	traditional
palm oil and kernels	factory	none	factory*
palm kernel oil	traditional	factory	traditional
groundnut oil	traditional	traditional	traditional

* the Ghana experience would limit this statement to mills supported by dense industrial and farmers' plantations, all geared to supply in bulk.

Obviously, there is a clear advantage of factory operation over traditional processing trade in the production of coconut oil as well as of palm oil and kernels. It is unfortunate, that the copra milling capacities are over-sized; thereby preventing a competitively effective cost degression in industrial copra processing which could have enabled the Esiama mill to compete the wasteful traditional trade out of supplies. The advantage of factory operation in palm oil manufacture appears to lie firstly in the greater scope of plantation- and extension-wise propagation of high yielding oil palm varieties and secondly in the opportunity of mechanized decortication of palm nut kernels (the most valuable by-product) from the hard shell after extracting the oil from the pericarp. No noteworthy cost degression can be expected with rising factory output, since the old Sese mill is completely written off and repairs and spare parts consume an increasing expense each year. The new mill at Pretsea will have to calculate higher capital cost and depreciation and is not likely to work at lower cost than the old mill for an appreciable number of years, until at least 60% utilization of the mill's capacity (ref. Table 33) is achieved.

In the production of palm kernel oil, traditional trade appears to be in a competitive position. To avoid the waste of resources occurring by the dumping of the wet oil cake, the processing section of the "Food Research and Development Unit" may advise on means to preserve the cake (e.g. by dehydration) for export or domestic use as animal food. A more favourable position might be achievable by factory-scale processing, if nuts are purchased and cracked mechanically. However, this appears to be economical only if oil palm population in the area is very dense, so as to outgrow the human capacities to crack all the nuts by hand on the farms and also to provide short transport hauls for the bulky material (3-4 volume units of kernels in the shell yield only one volume unit of kernels). The only kernel oil mill in operation at Assessewa has not found it profitable to employ its nut cracking facilities on organized purchases of kernels in the shell. Kernel processing as 3rd stage operation of a palm oil mill, on the other hand, is advisable as long as the domestic market offers a demand for the oil, since the kernels in the shell, as the by-product of palm oil milling, are provided without further collection and transport costs. The new mill at Pretsea will therefore be equipped with machines for the extraction of kernel oil. Kernel supplies from Sese/Pretsea to the Assessewa mill will then cease. The Assessewa mill, which now receives almost its

entire kernel supplies from Sese (ref. Table 37)), will then have to organize kernel supplies (shelled and unshelled) from the near-by areas, in sufficient quantities to reduce the high overhead costs per unit, or close down.

A competitive advantage throughout the three criteria of Table 36 appears to exist for the traditional groundnut crushing trade. As in the case of the kernel oil mill, the low performance of the government-owned groundnut mill is partly a result of worn machinery and lack of technologically trained management, just as the high cost of operation is partly a result of over-staffing. However, even if such shortcomings can be corrected in the course of time, the advantage of lower operational cost and more profitable utilization of the cake will most likely still remain with the traditional processing trade. This situation will not change until production has grown to such an extent that indigenous processing capacities find it difficult to cope with and/or the cake no longer finds a ready market as food. Little prospect exists at present for such development, with the production disincentive of a decreasing C.M.B. purchasing price (in accordance with world price development) from N ϕ 12/160 lbs. (1967) to N ϕ 10 (1968). The only remaining source of groundnut supplies for the mills (through the C.M.B.) will be State Farms and co-operatives which already during the last years were the main suppliers. As with rice paddy, these agricultural units find difficulties in harvesting, processing (shelling and drying) and marketing their groundnut crop. The delay in harvesting often reflects on quality, as well as lack of proper drying operation after harvest. The need of cash being aggravated by the delay in harvesting, much of their crop is sold unshelled, further reducing the farms' income by higher cost of transportation of the bulky produce over 100 or more miles average transport distance to the nearest mill. Though these bulk-producer supplies through the C.M.B. arrive at the mills at a price about 10% below local wholesale market price, the high moisture content and development of mould, the cost of further drying and re-bagging, and the heterogeneity of the often low (oil) yielding varieties from the far dispersed supply sources can lead to reductions of processing economy which more than absorb the saving on purchasing price.

Since groundnut production on State Farms can hardly be expected to rise, in view of the difficult financial position of these Farms and the decrease in the C.M.B. purchasing price, and co-operative members may more than before prefer to market their crops individually at a higher than the C.M.B. price, C.M.B. purchases in 1968/69 may well be at a lower level than in 1967. The latter already were only around 600 tons, i.e. not sufficient to feed even one of the three groundnut mills (including the groundnut/copra mill in Accra) at 50 percent milling capacity. In expectation of further idling of staff at the mills and high financial losses by operation at low utilization of capacities, and in view of the basic disadvantage of industrial groundnut milling (ref. Table 34 - 36), it seems advisable to suspend operation at Atebubu and Tamale for the time being and convey all C.M.B. supplies to the mill in Accra. There is no disadvantage in transporting groundnuts to the south for processing, since all the groundnut oil and cake produced in Accra can be sold there and in other places of the Eastern Region and along the coast.

While the previous discussions have dealt with most of the problems confronted by the industry and suggested some policy decisions, the need and means to concentrate more copra supplies at the Esiama mill deserves some further considerations. It has been discussed that total coconut production in the Nzima area (7000 tons in terms of copra), if all serving the mill, could not employ the mill at more than 50% of its capacity. It has further been indicated, that domestic demand for coconut oil is

fairly high and that at least in the second half of the year, when fish supplies rise, the market could take more coconut oil than can be supplied. This interdependence of fish supplies and coconut oil consumption is due to the priority given to coconut oil in the frying of fish which is the quickest means of short-term preservation of fish and very popular on the coast where fried fish is consumed in combination with kenkey. Since supplies and consumption of fish per head of the Ghanaian population are increasing, the demand for coconut oil will similarly increase beyond the rate of population growth. It has, on the other hand, been indicated that the larger part of the coconut groves in the main (above mentioned) supplying area is ageing, with declining yields. It has been hinted that the only other substantial supply zone (Keta-Aflao in the east) is for the time being crippled by "St. Paul's disease".

Against this background, the wasteful method of traditional processing (from fresh coconuts), by which 25 - 30% of the oil is lost to a cake which (in the main area) is not even utilized as animal feed (ref. Table 34), is highly undesirable.

Another waste (of transport equipment, fuel and labour) is caused by the policy of using copra from the Nzima area to substitute for lacking local oil seed supplies to mills in other regions in order to justify their existence, while the Esiama mill is underemployed.

Finally the role of copra export as part of an overall copra resource policy has to be analysed.

The distribution of W.R. copra by the C.M.B. during 1967 is shown in Table 37.

Table 37 : Distribution of Nzima Copra, 1967

	<u>Copra from Nzima</u> (tons)	<u>indigenous supplies</u> (tons)	<u>other supplies</u> (tons)	<u>distance of mill from Esiama</u> (miles)	<u>average distance of mill from main markets</u> (miles)	<u>total transport agric. producer to consumer</u> (miles)
to Esiama mill	1748**		none	0	120	120
" Accra "	100	none	500 ground nut	185	0	185
" Denu "	466	none	70 palm kernel	300	115	415
" Assessewa "	20	none	500 palm fr. ("Sese)	270	85	355
" Atebubu "	400	80	ground nut 20 kernel	360	200	560
" oil mills exported marketed through C.M.B.	<u>2734</u> <u>1800</u> 4534					(to port 65)
Balance (estim.):						
Traditional oil crushing trade* copra sales outside C.M.B.	1200					100
coconut trade*	300					..
home consumed*	500					100
	<u>466</u>					0
	7000					

* weights in copra equivalent

** small amount compared to other years; high opening stocks 1967 of approx. 750 tons enabled the mill to keep on the usual level of operation.

The Esiama mill has now a capacity of 13,000 tons copra. The mill has modern equipment and is in the optimum position to use the Nzima copra resource. There is therefore no economic reason why Nzima copra should be shipped to any other part of the country. Since the mills at Atebubu and Denu are at present not able to attract any noteworthy amount of indigenous oilseed, their operations ought to be suspended (ref. also recommendation on page 83), while the Accra mill, which after the proposed closing of the mills at Tamale and Atebubu will be the only miller of C.M.B. groundnut supplies, may concentrate its operation entirely on groundnut oil production.

Exports of copra should be reduced to about 500 tons or any lower amount which would be needed to keep in active contact with overseas buyers.

The proposed measures would secure 90% of C.M.B. copra purchases, about 4000 tons, for the Esiama mill, thereby raising its scale of operation from 20 to 30% of milling capacity. On this basis the mill can enter an effective policy of competition for copra supplies which at present are absorbed by the traditional trade. The aim should be to attract 900 out of the estimated 1200 tons share of the traditional processing trade and 200 out of the estimated 300 tons share of free copra trade, thereby increasing supplies to the mill to over 5000 tons and scale of operation to 40% of capacity. The result would be a cost depression from 50 to 37.5% (ref. Table 35).

This and the recent abolition of sales tax (10% of sales value, paid by Ghanaian manufacturers until late 1967) would enable the mill to effectively reduce its selling prices. The accrued saving of 22.5% could be distributed as follows:

- 2.5% to improve profitability of the enterprise
- 5% to balance the devaluation effect on imported cost factors
- 15% to reduce sales prices.

Since prices for cake export (10% of total sales volume) can be assumed to remain the same, oil prices may be reduced by 16.5%, provided raw material cost remain stable.

Before such price reduction is put into practice, it has to be considered, whether the expected cost saving shall in full be used to decrease selling prices or whether part of it shall be used to increase the copra prices paid to producers. Producer and consumer prices being at a comparatively high level, the main benefit should go to the consumer. Furthermore, coconut oil supplies in domestic markets will increase with the proposed reduction of copra exports and with the expected diversion of coconut resources from traditional into industrial processing trade with its 40% higher oil yields (ref. Table 34). The two factors will lead to a 10 - 15% increase of domestic coconut oil supplies which, especially during the first half of the year, may have difficulty to be absorbed without a decrease in prices. In the second half of the year, however, the producer should have an extra incentive for the processing of his nuts into copra. Such incentive would be most useful against the background of an increased demand for fresh nuts by the traditional oil processing trade, in accordance with the seasonal increase of coconut oil consumption, and under the less favourable weather conditions for the sun-drying of nuts to copra during the more humid part of the year.

It may therefore be considered to abandon the present practice of unchanged purchasing and selling prices throughout the year and implement the 16½% net cost saving as follows:

Table 38 : Proposed Seasonal Variation of Sales- and Purchasing - Price Policy in Nzima's Industrial Oil Processing Trade

	<u>sales price</u> (oil)	<u>purchasing price</u> (copra)
	in % of present prices	
January - June 15th	83.5%	100%
July 15th - December	93.5%	110%

The break in purchasing operations of one month is suggested in order to reduce the attempt of speculative hoarding, which might occur in spite of the fact that the recurring price rise in July would be implemented without previous announcement. The time of the break is the time of heaviest annual rains when copra production is almost impossible. It may be considered to use the same time period as collective annual leave for the staff of the Esiama mill as well as of the C.M.B. and co-operative buying depots in the area.

The development of the Esiama oil mill has suffered from disturbed relations between the mill and its suppliers. The unauthorized use of C.M.B. supply credits for investment into milling capacities by the Esiama management has much contributed to this unfavourable relationship. Since most of these investments were ill-advised, i.e. neither in accordance with available oil seed resources nor with trade and consumer preference (costly machines for refining and bottling), the debts for C.M.B. supplies grew further instead of their gradual amortization out of milling profits. The diversion of part of C.M.B. copra supplies to other buyers and the repeated ostentatious interruption of supplies to the mill for several months can only aggravate the problem. The only way to recover the supplier credit sunk into the mill is by supplying as much copra as possible in order to achieve a profitable scale of operation.

Since this is a long-term policy and the C.M.B. has a justified interest in the control over the realization of such policy, it should be considered to offer share capital to the C.M.B. as part-compensation for the accumulated supply credit. Of the 1 million N¢ authorized share capital, approximately half is still to be issued. Since total investment including working capital has grown to the extent of the authorized share capital, this should be fully issued now. N¢ 400,000 could be offered to the C.M.B, as compensation for approximately two-thirds of its supply credit to the mill. The rest of approximately N¢ 150,000 could be offered in small shares (e.g. N¢ 20 each) to growers in the area.

As a long-term Government policy, increased attention has to be given to the Nzima coconut resources, especially with regard to the compensation for declining yields of the old groves by new plantations. An annual increase of 5% in total yields will be required in order to cope with the demand development in the domestic oil market. Any further increase will benefit export earnings. The Extension Service of the Ministry of Agriculture, in collaboration with local co-operatives, individual farmers and the Agricultural Development Bank should survey the present situation and draw-up a development program for the Nzima copra industry.

No financial and personal efforts should be spared to detect the cause of St. Paul's Disease, which destroyed the coconut groves on the eastern Ghanaian coast line, and protect the Nzima coast against this terrible threat.

Summary and Recommendations

1. Ghana's oil economy is basically self-sufficient. There is, however, a new bulk-demand for industrial oil (soap manufacture) which needs to be balanced by increased output of hard oils.
2. Consumer taste prefers crude to refined oils. Investments by oil mills in refining and bottling installations have up till now scarcely been used.
3. 90% of Ghana's oil is produced by traditional methods at farm and village level.
4. Industrial oil mills, all government-owned (one in partnership), work at low rate of utilization, which makes it difficult for them to compete with the traditional processing trade. In addition, the taste of their products is generally less liked for various reasons (residual moisture content, rising F.F.A. content due to seasonal over-stocking, etc.). Only in copra milling and in palm oil production from dense plantation-supplies can an advantageous position of factory-scale processing with regard to milling economy be observed.
5. Large extensions of industrial milling capacities are being invested in palm- and copra oil production. While the former will be supported by advanced investments in oil-palm plantations, no parallel effort has been made to increase copra supplies which are already falling short for existing capacities.
6. The narrow supply basis for the main copra oil mill, at Esiama (Nzima area), is further reduced by uneconomic shifting of Nzima copra to mills in other regions which prove unable to attract local supplies. This is a complete waste of transport and milling costs, since the under-utilized Esiama mill could process these quantities at little additional expense, while closing of the unemployed mills would save large amounts of standing expenses.
7. Copra supplies to the Esiama mill have suffered serious interruptions owing to strained relations between the mill and C.M.B., (supplying agents of all copra for industrial use and export), since the mill became highly indebted to the Board by using short-term supplier's credit for large investments into fixed assets.
8. The supply and demand cycle in Ghana's oil trade requires seasonal adjustment of sales and purchasing prices by the Government mills.
9. Valuable protein concentrates are wasted in dumping of wet palm-kernel and coconut cake (the latter only in the Nzima area) in the traditional oil extraction process. Implementation of methods to preserve this cake for export or domestic feedstuff demand, would be desirable.
10. Ghana's copra resource on the eastern coast line is crippled by St. Paul's Disease. The largest resource in the West, Nzima, consists mainly of ageing palmeries. In view of the high domestic demand and the good export market for copra, attention to these resources is urgently required.

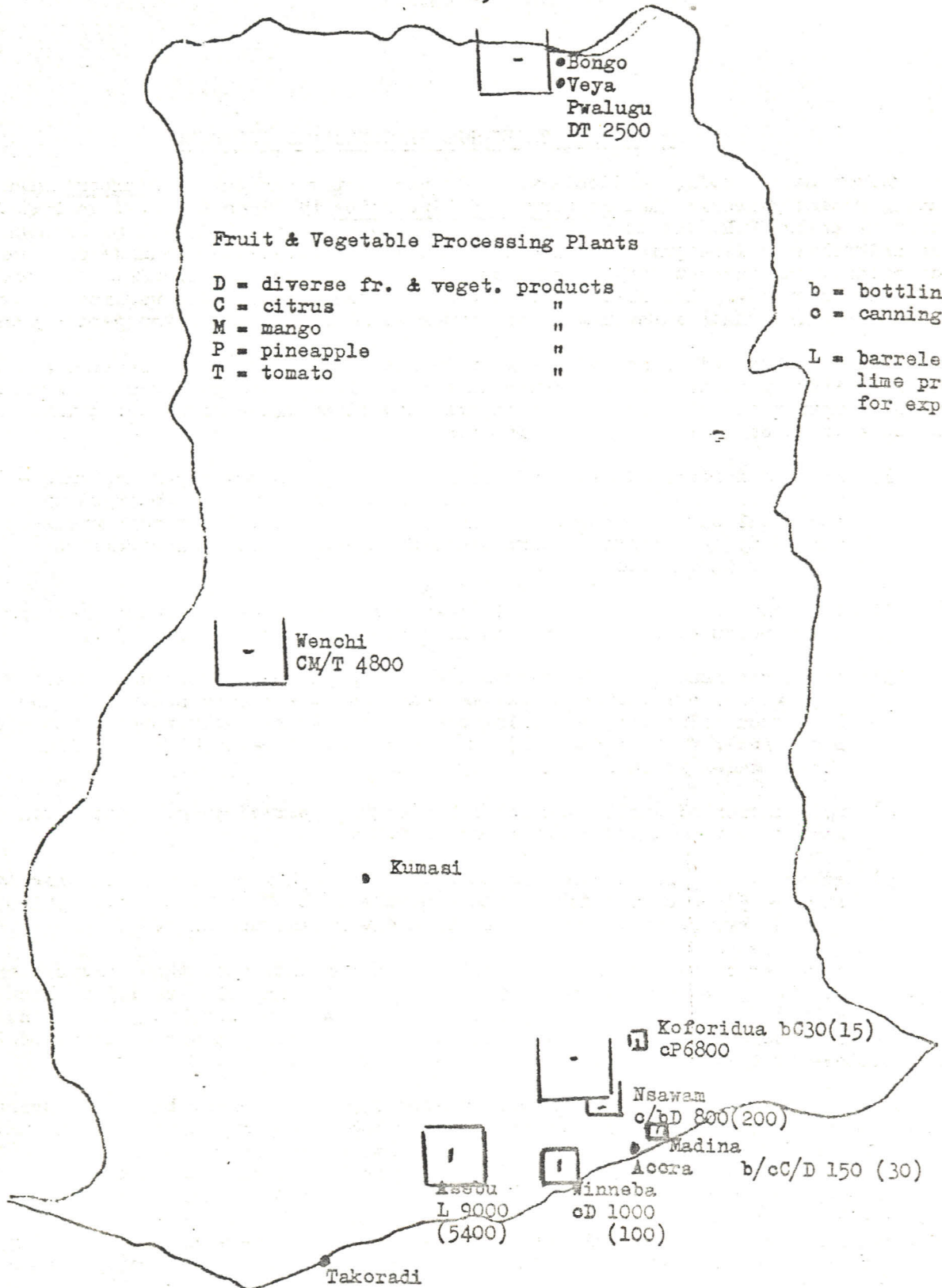
It is therefore recommended to :

1. Concentrate all Nzima copra supplies on the Esiama mill, i.e. discontinue uneconomic shipments of Nzima copra to other Government mills.
2. In anticipation of a cost depression with increasing turnover, reduce sales prices for Esiama oil and increase the off-season copra purchasing price in order to obtain a greater market share in the competition with traditional coconut processing trade.
3. Fix oil seed purchasing prices and sales prices for oil produced by the Government mills in accordance with the seasonal variation of supply and demand, instead of the present annually fixed uniform prices.
4. Secure constructive co-operation between copra suppliers and the Esiama mill by offering share capital of the mill to C.M.B. (as part-compensation for credited copra supplies) and to growers (in form of N\$ 20 bonds).
5. Close down or suspend operation of the oil mills at Denu and Attebubu, both being virtually unemployed without copra supplies from Nzima.

Consider suspending operation of the Tamale mill, if the low turnover and milling economy, experienced up to now, continue throughout 1968.

Prepare the mill at Assessewa for the need to obtain palm kernel supplies locally, since the mill's main supplier - the Sese palm-oil-mill - will soon be replaced by its successor, the modern mill at Pretsea which includes a kernel - oil mill.

6. Launch a development program for the Nzima copra industry (with participation of A.D.B.), aiming at replacement of ageing palmeries and increased yields. Employ international specialists (and/or join specialist research efforts in neighbouring countries) for the investigation of St. Paul's Disease and the application of measures to protect the Nzima plantations against the disease.
7. With the aid of the F.R.D.U./F.R.I., study and implement methods of utilizing the valuable oil-cake presently dumped in the traditional production of coconut - (Nzima area) and palm kernel-oil.



	total capacity	total output	rate of utilization
1966/67 ann. aver.	c/b 1950	345	17%
	L 9000	5400	60%
	10950	5745	52%
1967 nearing completion	C 14000		

6. FRUIT AND VEGETABLE PROCESSING INDUSTRIES

After cocoa, coffee and cola the only noteworthy agricultural export from Ghana during recent years is that of barrelled lime juice by "Rose & Co., Lime Products, Ltd." at Asebu, C.R. The company processed and shipped in 1966, 1.1 million gallons raw and filtered lime juice (ø sh 4/6 per gallon c.i.f.) 29,000 pounds oil (sh 40/- per pound) and minor quantities of cuts and skins (halves and shreds). A "rombaluse" plant has been newly installed under separate financing, for the washing-out and drying of skins which subsequently are exported as raw material for pectin production.

That in spite of an inflationary price rise of domestic cost factors and unremunerative export returns at an unrealistic official foreign exchange rate (until the devaluation in July 1967) the enterprise could continue to export without loss, can be attributed to the following factors:

- 1) limited domestic demand for the raw material, lime; supplies, built-up for factory demand over several years, could not be absorbed by the local market; therefore, their price remained relatively undisturbed by the general upward trend of agricultural produce prices in domestic markets.
- 2) shipment of a crude product in inexpensive wholesale package, keeping the foreign exchange component in f.o.b. cost prices below 30%.
- 3) low investment costs by restriction to only necessary investments, e.g. wooden structures as far as feasible, clean airy sheds instead of closed halls for processing operations; as a result total investment (incl. working capital) amounts to only one-third of potential annual sales at full capacity operation;
- 4) utilization of small farmers' efficiency supported by good extension services, instead of running plantations;
- 5) sober overall management and fair dealing with farmers who as a result of 1) - 5) receive a farm price equivalent to 50% of the f.o.b. price fetched by the products derived from their lime supplies.

The devaluation has strengthened the economic position of this valuable enterprise. With new plantings coming to yield, production may rise to 1.5 million gallons by 1968. The management's policy is to raise lime supplies, by intensifying its extension services, in order to reach the full capacity plant - output of 2 million gallons by 1971/72.

Turning to Ghana's canneries, the outlook darkens considerably. The following report on the canning industry was prepared by the expert for a joint initiative by FAO, U.S. Aid, DSI and Academy of Science Institutes and served as a basis for the jointly issued "Preliminary Analysis of the Agricultural and Economic Viability of State Canneries," a paper which greatly contributed to Government decision towards a firm go-ahead with the Pwalugu tomato canning project. While in the jointly issued paper a number of horticultural aspects were added which were not specifically the object of the expert's report, this contained more detailed market and technological information which meanwhile has been further substantiated. Especially, domestic demand estimates have been confirmed by a market analysis conducted under the expert's supervision and concluded in August 1967 (quoted on page 91).

The presently operating canning (and bottling) plants, all in the market since more than 4 years, have one problem in common: unsatisfactory sales. Though only approximately 20% of the production capacity of these plants is being utilized, stocks of finished products at the larger ones are amounting to half a year's sales volume. Reasons for this calamity are :

- a. smallness of the inland-market;
- b. high production costs, precluding any export possibility;
- c. sub-standard quality products;
- d. stiff competition of imported products in spite of duty-barrier.

Concentrating the discussion on the three dominant product groups,

1. pineapple products,
2. tomato products, and
3. citrus products,

the above mentioned factors a - d apply as follows:

- (1) a + b
- (2) c + d (+b)
- (3) d + c (+b)

If quality obstacles and competition of imported products could be eliminated and raw material supplies secured, the production capacity of the presently operating plants could conveniently supply

100% of the inland demand for pineapple products,
100% " " " " " citrus " and
33% " " " " " tomato "

at current retail prices.

The demand for the three product groups has been analysed and estimated as follows:*

	<u>demand</u> tons	<u>local supplies 1966</u> tons
pineapple products	100-140	115
citrus "	350	110
tomato "	1,500	30

* A comprehensive analysis of the domestic demand structure for these product groups has been compiled in the F.A.O. Report "Inland Market for Ghana-made Fruit- and Vegetable-Manufactures" by R. Schuerman, Associate Expert, Accra, August 1967.

Only the demand for tomato products is of high elasticity, i.e. it would readily expand with decreasing retail prices. However, even large-scale production of tomato products in Ghana will result in ex-factory cost prices near to the present retail price level.

While in view of the sizeable inland market tomato products offer themselves for a large-scale canning project, technological difficulties are experienced in obtaining good-quality products by canning indigenous tomato varieties. High acidity, resulting in bitterness of the canned products, and discolouration in processing are the main disadvantages observed.* Further it is observed that there is higher waste,** compared with conventional standard, in the processing of local varieties. The latter factor increases the price for the net can input which is already high due to strong competition of demand for fresh-consumption and to dispersed production necessitating haulage distances averaging 50 - 80 miles. In view of the high raw material intake price, purchases can only be afforded during the center period of the season when prices are lowest.

The present share of locally produced tomato products in the country's consumption, 95% in form of puree, is only 2 - 3%. Even this quantity is readily absorbed only when trade stocks of competing foreign product are exhausted. This situation would change as soon as the above mentioned quality obstacles could be eliminated. However, the other limitation for an expanding production, the scarcity of low-price raw material outside the short seasonal peak supply, would still remain.

Citrus and pineapple products have only a small domestic market which is to a considerable extent provided by institutional and expatriate consumption. Ghanaian consumers prefer fresh fruit. Both fruits have two extended seasons, and there are other fruits, such as mango, banana and papaya, which can serve as substitutes during the relatively short off-season. The higher consumption of citrus products, compared to pineapple products, derives from the main citrus product, squash (from orange and lime), which has no equivalent among the pineapple products. Local producers of citrus products, especially squashes, are gradually expanding their market share and make some profit in competition with 100% taxed imported products. Local pineapple processors are protected by a complete ban on importation, however, the market appears to be near saturation.

In spite of the difficulties and limitations experienced by the operating plants, three large new canning projects have been put up by Government and are nearing completion. The total investment, rather evenly distributed over the three projects, will amount to approximately 6 million N¢, compared with approximately 1.2 million N¢ invested in the existing industry.

The production program of the three projects is analyzed below, with special regard to the share of foreign exchange expenditure in production cost, the prospective maximum share of in-land sales in planned total output, and the prospective loss on export sales at world market prices.

* However, these off-colours and flavours can be caused by processing mistakes e.g. brown colour by use of partly immature fruits or stacking of sealed cans in hot condition (the latter also causing a scorchy flavour). A brief outline of primary criteria in producing tomato puree is provided by Tropical Products Institute Report No. 43: "The Preparation of Canned Tomato Puree".

** Due to the irregular size, folded skin, hard core and plentiful seeds of the local varieties the extraction of solids for puree production is generally only 4%.

Table 39 : The Three Canning Projects: Market Prospects.

<u>Location</u>	<u>Product</u>	<u>production capacity</u> (annual output) tons	<u>for. exch. in prod.</u> cost %	<u>prospect. inland sales</u> %	<u>prospect. loss on export sales</u>
Nsawam:	pineapple slices	4000	50	2-4	20
	" juice	2800			
Wenchi:	mango jam	2000	65	2-4	30
	" cream 160 oz.	1600	40	0-3	?
	tomato puree 8 oz.	1200	33	40	50
Pwalugu:	tomato puree 2 1/2 oz.	1500			
	" " 3 1/2 "	1000	33	40	50

Above calculation is based on the assumption that agricultural raw material can be supplied in the quantities and at the average price stated below:

Table 40 : The Three Canning Projects: Raw Material Requirements

<u>Location</u>	<u>Product</u>	<u>season's raw mat. requirem.</u> tons	<u>Length of season</u> days	<u>aver. daily requirem. during season</u> tons	<u>max. payable aver. farm price</u> NP./lb.
Nsawam:	pineapple (juice + slices)	12000	120	100	1.5 (1.2)*
Wenchi:	mango jam	1000	90	15	1.0 (0.6)*
	" cream	2800		30	
	tomato puree	8000	150	55	2.0 (0.85)*
Pwalugu:	tomato puree	16000	150	110	2.0 (1.0)*

The raw material requirements are for outranging the presently available resources in the project areas, as can be compared below:

Table 41 : The Three Canning Projects: Raw Material Resources

<u>Location</u>	<u>Product</u>	<u>aver. daily raw mat. requirement during season</u> tons	<u>presently available av. daily supplies during season (estim.)</u> tons
Nsawam:	pineapple	100	2 - 8
Wenchi:	mango cream	30)	4 -12
	mango jam	15)	
	tomato puree	55	2 - 8
Pwalugu:	tomato puree	110	4 -12

* Prices in brackets are hypothetical factory-gate prices, as stated in the machine supplier's feasibility report. They had to be dropped as unrealistic.

The problems indicated in Table 39-41 not being complete yet, there is also uncertainty as to the suitability of available mango and tomato supplies for processing. No trials have apparently been conducted with local varieties either at Wenchi or at Pwalugu. The difficulty experienced with local tomato varieties in South Ghana might well apply to those around Wenchi and Pwalugu. The common type mango grown around Wenchi and all over Ghana is comparatively small and very fibrous, both characteristics resulting in high waste and probably other disadvantages in processing. The non-fibrous Ceylonese "Jaffna" and "Rupree" varieties, propagated in Ejura area since more than a decade, are now being introduced in the Wenchi area; but many years will pass, until substantial crops will be available.

Local pineapple varieties, Sugar Loaf and Sweet Cayenne, have been canned for the domestic market without major technological problems. However, the Ghanaian products appear to be poor in acids and have to be tested with regard to international quality standards for canned pineapple products.

Another problem of the pineapple project is location. Though the existing cannery at Nsawam is operating since 1960, providing a reliable outlet for the farmers' pineapple crop at the reasonable farm price of £15/ton up to 1963 and £18 thereafter up to date, the response in the area has been negligible. To-day, 90% of supplies come from areas in the Central and Western Region 90 - 140 miles distant from the factory. This makes it quite clear, that the new plant would be better located somewhere north of the Cape Coast-Takoradi Road at a location which after thorough research would prove most centrally located within the main growing region. The high transport expense on the present long hauls forms the main reason for the estimated 20% excess of calculated production cost over the prospective ex-factory export price for the new factory's products.

Reviewing the information so far enlisted, the following conclusion can be drawn:

1. All projects are facing grave shortcomings in raw material resources.
2. All projects, run at economical scale, would produce far in excess of the inland market.
3. All projects will be unable to compete in the export market.
4. All projects will be tying up considerable amounts of foreign exchange in unsold stocks.
5. Two projects, Wenchi and Pwalugu, are still under doubt as to suitability of the local raw material varieties in the respective areas for canning.
6. One project, Nsawam, is wrongly located.

If no investment had yet been made in the three projects, all would have to be condemned. Under the circumstances, however, all projects nearing completion, a compromise evaluation, with the aim of materializing at least one of the projects, is being applied in the following discussion.

Among the three product groups, tomato puree appears to enjoy the least problematic outlook, with the comparatively lowest share of foreign exchange component in production

cost, a domestic demand for 40% of the combined plant capacity Wenchi-Pwalugu, and the comparatively shortest maturing period for the raw material. In view of the discrepancy between production capacity of the two new factories and inland demand for tomato puree, production should be concentrated at one of the two projects in order to secure the operation of at least one plant on an economic scale, in the long run. The choice between Wenchi and Pwalugu tends to the latter, for the following reason:

- (a) Competition of tobacco, the earlier introduced cash crop with guaranteed outlet, will keep back extension of tomato cultivation around Wenchi.
- (b) Tomato gardening in the Frafra and adjacent areas (Pwalugu intake zone) is expanding steadily from year to year. Relatively young in the area's history, the expansion of this crop on gardening scale might grow to a multiple of its present size in a few years.
- (c) Several small scale irrigation projects and one large one, being carried out by Government in the Frafra area, are apt to boost the expansion of tomato cultivation.

The specifications for the Pwalugu plant machinery and equipment state that incorporation of the production of 8 oz. tins, or other sizes, in the production program is possible with the addition of "a few inexpensive tools" only. It is consequently possible to give up the tomato section of the Wenchi plant and thereby secure practically the whole domestic demand for Pwalugu which then can raise its output to the level of approximately 60% of production capacity, provided raw material supplies can be increased systematically. Provided the Veya dam irrigation project progresses successfully, and plant research and propagation work as well as cultivation of 1200 acres (one-third of the irrigable land below the dam) can be completed in due course, the factory might be able to reach the above recommended production target by 1970/71. This calculation is based on a low yield target of 5 tons/acre under extensive cultivation at Veya, providing 6,000 tons, plus 3,000 tons i.e. about 300% increased farmers' supplies (ref. Table 41). The relation should change in the course of the following years, ultimately leaving a factory plantation at Veya of not more than 300 acres, with improved yields of 10 tons/acre under intensive cultivation securing 25 - 30% of the factory's requirements. The irrigated plantation may be regarded as a necessary evil to secure the greater part of supplies in the beginning and later, at its reduced size, to safeguard the cannery against complete dependency on growers. The cost of tomato production on the plantation will hardly be covered by the factory purchasing price. The cost of irrigation will be very high, while annual yields cannot be extended beyond the limits set for tomato cropping by the specific temperature requirement of the plant; flowering is severely retarded, as soon as the daily minimum temperature exceeds 70°F or the daily maximum exceeds 90°F.* Though temperature oscillations are comparatively favourable in the North, it is still doubtful if two good crops per season can be achieved. It is therefore advisable, not to calculate on higher annual yields than 10 tons/acre which is the minimum for a break-even under intensive cultivation and at the scheduled factory price for tomato supplies (not covering irrigation cost), according to horticultural cost-benefit studies.**

The project will have to face two major problems with regard to raw material supplies in the near future. One is the availability of labour for the Veya irrigation scheme, the other one competing tomato demand from southern Ghana.

* Personal communication by Dr. Jevremovic, Regional FAO Horticulturalist;

** Dto; such break-even would not include the cost of water supply for irrigation.

The 1960 population census counted not more than 40,000 men of working age in the Frafra district. Half of this number might be available for tomato gardening, after the essential subsistence crops have been harvested by October/November. Part of these, estimated 2000 - 4000, are already engaged in gardening near their compounds or villages. An equal number might tend to join this occupation after market prospects have improved. According to Antwi's Survey* there is still utilizable valley land of more than twice the presently gardened area. The remaining 12,000 - 14,000 might not all be willing or able to take plantation employment at a place several miles from their villages. It must be reminded that a number of government-provided irrigation schemes in the area have never been utilized by the surrounding villages. While the Bongo pilot irrigation scheme employs 10 farmers per acre, a well organized large-scale scheme might well do with less. However, a 1,200 acre tomato plantation below the Veya dam, under intensive cultivation methods, might still absorb 5 - 8,000 men, not to speak of other crops on the remaining 2,400 acres of the scheme. In view of the limited labour force it appears therefore advisable to consider extensive, labour saving methods of cultivation for this particular project.

The northern tomato crop comes in during the off-season in the South, i.e. the South with its concentrated purchasing power is a strong competitor as buyer in the northern markets. Due to high losses in transport under present road conditions as well as unsatisfactory packing and handling methods, prices paid in northern markets by south-bound trade are still low. This will change when packing and handling methods can be improved and the new north-to-south main road via Kintampo has been tarred. Tomato shipments to the South will then multiply at more remunerative returns. This may threaten the Pwalugu canning plant in two ways:

1. It might be forced to offer a higher raw material purchasing price, resulting in a price increase and subsequently decreasing sales of the product (high price elasticity of demand).
2. The improved supply of the South with northern fresh produce during the off-season may further reduce the demand for the canned product (high substitution co-efficient).

This competition of demand for the fresh market will always be a threat to any plan for a stable canning output. In years with low yields, supplies at reasonable prices for canning may be hard to obtain. To reduce this threat, the following policies are suggested:

- a) to keep purchases and sales prices flexible, i.e. adjust purchase prices weekly and sales prices quarterly to the changing supply and demand position, thereby yielding reserves during favourable periods in order to balance losses during less favourable ones;
- b) to gear plantation crops with the aim to harvest the greater part early and late in the season;
- c) to develop a network of "progressive" farmers, who receive credit and intensive horticultural extension services against the commitment to deliver their entire crop to the cannery, at the latter's current purchase prices.

* Report on northern Ghana, Tomato Survey, Oct. 1959, Dept. of Agric., Accra.

The competing demand from the South serves on the other hand as a valuable safeguard against a complete waste of farming efforts in case the canning project should not succeed in the long run. This is one of the reasons why materialization of the project, after 75% of the investment in the processing and agricultural wing has been committed already, may be recommended. Condition for such recommendation, however, is a complete ban on imported tomato puree from the moment sufficient supplies can be provided by the plant.

Mango products are a very small item in international trade. The total annual importation of mango products into Britain, the main buyer, is in the order of 1,200 tons. More than half of this quantity is in form of chutneys, followed by canned mangoes. Mango cream, -pulp, -juice, and -jam are items of still extremely little importance.* The capacity of the Wenchi project for the production of 3,700 tons of mango-cream and -jam represents probably a multiple of world trade in these products.

Though it is admitted in the supplier's "Economic Survey"*** (1963) that "the local market of Ghana is not satisfactorily researched", it is "assumed" in the same survey that besides a considerable share of mango cream production "all the quantity of candied mango" (i.e. 2000 tons of mango jam) "would be consumed by the local market". The survey continues: "The candied mango is even on the local market in Ghana a new merchandise and the consumers should be induced to buy this article, first."

Had the Government insisted on at least a rudimentary market survey before launching this ill-advised investment, it would have found that the total consumption of jams and marmalades in Ghana is in the range of 50 - 75 tons per annum i.e. less than 5% of the project's optimistic sales budget. Of this small quantity the greater share is held by citrus marmalades. Chances of diverting the marmalade consumers (mainly expatriates and institutions) from imported brands to jams and marmalades from local fruits, are already being exploited by the existing canning industry which suffers from severe overstocking of pineapple jam and marmalades.*** With its high foreign exchange component in production cost (ref. Table 39), there is no prospect of jam exportation at cost price. Government attempt to substitute the main imported cost factor, sugar, by local production will result in higher sugar prices due to high production costs of the two Ghana sugar factories (ref. chapter 3).

Considering the outlined situation, it appears advisable to eliminate mango jam from any large-scale canning program, while it may well be added as a minor product to the production program of the existing small canneries.

Turning to mango cream, the other mango product to be produced at Wenchi, inland market prospects are even lower than for mango jam, but production cost may be more in line with export prices due to the absence of sugar in the canning recipe for this product and the canning in wholesale units of 160 oz. Also, this product is probably less affected by the high fibre content of the local mango variety. The problem, however, is the unrealistic scale of production. It can hardly be assumed that more than 10% of the planned factory output in mango cream could be sold by Ghana on the still very limited world market for this product.

* For more extensive information compare Daisy E. Kay: "The market for Mango Products," Tropical Products Institute Report No. G17.

** "Project of the Tomato and Mango Canning Factory in Wenchi - Ghana, Economic Survey." Zagreb - Yugoslavia, 1963. Reproduced by National Investment Bank, Ghana.

*** For extensive analysis of the situation, see FAO Report (Reference on page 91).

In view of the discrepancy of market prospects with production scale, combined with the low suitability of the available mango variety in the area and the long period (probably more than a decade) required to establish a supply resource from suitable exotic varieties, it is not advisable to take the mango canning wing of the Wenchi project into operation. Considering further the advice given on page 95 of this report, i.e. to concentrate production of tomato puree, the other wing of the project, at Pwalugu, the Wenchi project loses any economic basis. Until the market situation for tomato- (domestic demand) and mango products (foreign demand) changes drastically, or large-scale processing of a different raw material e.g. citrus becomes feasible in the area, construction and installation work on the still un-completed Wenchi project and especially recruitment of staff should be suspended immediately.

This should not discourage from very essential efforts in further mango research, since the mango is one of Ghana's dominant tree crops. The failure of the Wenchi investment only demonstrates the neglect of those important pre-investment activities. A mango research and development unit should be created within the existing research force, mainly carried by members of both the Food- and Crops-Research Institute, combining horticultural, technological and market research activities in the interest of the sound establishment of an export orientated mango industry in Ghana.

Pineapple export in fresh and/or processed form should be a worthwhile proposition for Ghana where natural conditions appear to be very favourable for this crop and large areas are acquainted with its cultivation. However, though locally canned pineapple products, in absence of foreign competition, are accepted in the domestic market, the acceptance of the prevailing locally cultivated varieties (Sugar Loaf and Sweet Cayenne) in fresh and canned form in export markets has still to be tested.

A single casually made sample shipment of Sweet Cayenne yielded a rather depressing judgement by the Tropical Products Institute, London. The main negative observations, coarse tissues and low acidity may have to be related to choice of overgrown (particularly large) fruits and spoilage in process at time of arrival due to wrong cutting and packing. A second sample shipment, this time of both varieties, to the T.P.I. should be made under improved conditions. Locally canned pineapple juice, analyzed by the F.R.I., Accra, possessed only half the ascorbic acid value compared to international standard requirements. This again might be due to the canning of overripe fruits, excessive exposure of juice before sealing of cans etc. Systematic canning trials and analysis will be started by the F.R.I. processing and analytical laboratory as soon as the former's equipment is complete. As soon as the acceptability of the presently cultivated local varieties in fresh and/or canned form in consumer countries is established, further efforts in the organization of fresh fruit exportation and large-scale canning operation can be recommended.

Since 95% of the Nsawam project's planned output can only be sold abroad, and only if competitive with international standard requirements, commencement of operation and staff recruitment should be further suspended until an export market is secured. Idling of staff over a prolonged period would have a bad and lasting effect on working efficiency, and deployment in case of discontinuation of operations would be a hardship which ought to be avoided by careful consideration of the project's feasibility before the start.

Another aspect which needs serious consideration before further installation expense is invested in the Nsawam project, is its location. According to the supply structure of the existing cannery at Nsawam, described on page 94, the new plant has to change its location before it can hope to operate successfully. A newcomer to the world trade in pineapple products must take care to put all production factors into their optimum, otherwise he will not survive. It is, however, difficult to find the optimum location for the cannery before wide-spread purchasing operations have been conducted. Supplies over the last years indicate that the plant should be located at least 100 miles further west. But, once the plant would be established there, new and probably more important supply zones may crystallize further west, which have formerly not been reached by the incentive of the far distant outlet.

The question of location is not only important with regard to quantity and price of supplies, but likewise or even more with regard to quality. It has been suggested by experts, that pineapple grown in the more humid and less sunny forest area of the Western Central and Western Region may show a more favourable sugar/acid ratio than those grown in the Eastern Region where the present canneries are located. A survey, assisted by horticultural expert advice should be conducted throughout the pineapple growing areas in the Eastern, Central and Western Region as soon as possible, to provide the following information:

1. varieties grown;
2. chemical analysis of fruits
 of
 small size,
 medium " and
 large "
 at
 early mature stage,
 mature " and
 late mature " ;
3. acreage under pineapple;
4. average size of farm;
5. yields and seasonal distribution;
6. average fruit sizes and weights and quantitative assessment of deviations from the average;
7. farm - and market prices and their seasonal fluctuation;
8. trends and potentialities with regard to expansion of pineapple cultivation by private growers;
9. adaptability of growers to advanced methods of cultivation.

The total survey area is to be divided into growing zones of not more than 50 miles diameter. The information enlisted is needed for each zone separately. The F.R.I. will provide the services of its Food Analysis section and, if requested, of its Economics Section to assist in the survey.

The survey, if carried out well advised and carefully, may yield all important information needed to decide on the feasibility and location of a pineapple canning plant with regard to raw material supplies. Simultaneously, it will yield information for private or Government enterprises interested in fresh-pineapple export operation. In fact, such operation would test the solidity of the survey information and thus safeguard any decision with regard to an optimum location for a canning plant. The eventual financial loss in the fresh-fruit purchasing and trial shipment operation will be small compared with the loss resulting from a wrong location of the canning plant, especially since the expense on the fresh-fruit operation entails only a very low foreign exchange component. It may not be necessary to stress that also in fresh-fruit export operation marketing arrangements, supported by sample- and followed by trial-shipments, have to be made first.

The world market for fresh pineapple is not larger than approximately 60,000 tons, rather stagnating and therefore difficult to enter for a newcomer. The U.S.A. are the main buyer. However, their supplies are naturally provided from nearer sources in Mexico, Latin America and the West Indies. The potential market for Ghanaian export, Britain and Northwest Europe, does not take more than approximately 12,000 tons*. It cannot be assumed that Ghana could acquire more than 5 - 10% of this market, i.e. 600 - 1,200 tons. However, the new markets in Middle Europe, especially in countries with close trade links with Ghana, such as Yugoslavia, Hungary, Czechoslovakia and Poland, could probably be opened for air-shipped Ghanaian fruits.

The world market for canned pineapple, 5 - 6 times larger than for fresh pineapple, was up to recently expanding, but appears to have reached saturation point, at least temporarily. Britain and West Germany are the leading buyers, together importing about 100,000 tons.** To enter this market with 6,500 tons, the exportable output of the Nsawam project, would not be easy and would probably require support by an internationally well introduced brand.

Fresh and processed pineapple exports are supplementary and can be interrelated to both operations mutual advantage. For practical information of the operation of fresh and canned pineapple export a visit to the Ivory Coast should be useful, where a quantity of 6-800 tons fresh and 12-18,000 tons canned pineapple annually is being exported to France and other "Common Market" countries. However, when using this effort as an example, the high subsidies allocated to the pineapple industry in Ivory Coast, through preferential import prices paid by France, have to be taken into consideration.

Traditional methods of preservation and processing of fruits and vegetables are sun-drying (pepper, okro, plantain, cassava) and fermentation (leaves, seeds, fruits). Since drying does not involve costly preservation additives and a well-dried product can be packed in relatively inexpensive containers, the technical improvement of traditional methods and the development of new dehydration products, e.g. (for domestic consumption) instant fufu, tomato powder, palm nut paste, or (for export) banana powder, deserves all encouragement. The FAO Food Research and Development Unit (Ghana counterpart: Food Research Institute) and the Crops Storage Unit of the Crop Research Institute are experimenting simple production methods for an instance powder from yams and for palm nut paste. Parallel efforts in co-operation with Ghana University, Department of Food Science and Technology, are made to develop a balanced instant fufu from various blends (according to consumer preferences) of plantain-, yam- and cassava powder. While drying is generally considered as a costly process with regard to fuel input, the situation in Ghana, with practically unlimited fuel

* The world market for fresh pineapple is analyzed in T.P.I. Report No. G10: "The production and marketing of pineapples".

**For detail analysis compare T.P.I. Report No. G14: "A review of world production and trade in canned pineapple."

wood resources in most parts of the country, is favouring any kind of heat processing. This is proven by the absolute dominance of heat preparation and preservation processes (e.g. smoke-curing of meat and fish) in Ghana's food economy.

A new factor has entered the food processing field with the abundant supply of high quality alcohol from the molasses distillery of the new sugar factory at Asutsuare. Though probably beyond the borderline of fruit and vegetable processing, attention is drawn to the widespread growth of citric grasses in south Ghana.* In conjunction with low cost supply of alcohol, the extraction of citric acids from these grasses (under intensive cultivation) could probably become a new foreign exchange earner for the country.

* Personal communication, Chief Agriculturist, State Sugar Products Corp., Accra.

Summary and Recommendations

1. As traditional means of processing, drying and fermentation of vegetables (pepper, konkonte, garri) are widely in use where the moisture content is not too high as in the case of tomatoes and most fruits.
2. Imported means of preservation, i.e. mainly canning and bottling, are practiced by a few small canning and bottling plants. However, these plants, though underutilized, have sales problems, since the demand for these products proves very limited and of high elasticity with regard to price and quality.
3. The main products so far canned (or programmed for canning) in Ghana, citrus, pineapple, mango and tomato appear to have certain characteristics which makes them less suitable for canning (low sugar - acid and high fiber content of fruits, high content of insoluble solids in tomato).
4. Since in addition to the disadvantages mentioned under 3 canning costs contain a high share of imported material, export of canned fruit and vegetable products from Ghana does not without thorough study appear an economic proposition.
5. Of the three large new government canning plants now more or less ready for trial runs, only one, the tomato cannery at Pwalugu, can be supported by domestic demand. Of the other two, for Wenchi (mango and tomato) neither the domestic nor the export market offer sufficient sales prospects to justify canning operations, while Nsawam (pineapple) faces too high raw material cost for an export price calculation, due to wrong location of the plant implying long-distance hauls for pineapple supplies.
6. Being secured from the demand aspect, Pwalugu shares the problem of insufficient raw material supplies with the other two projects. Main problem is the competing demand for fresh consumption from markets in southern Ghana which are under-supplied during the months of the northern campaign. For quick establishment of irrigated government plantations below the Veya dam, a problem of labor supply might arise.
7. Substantial exports of fresh and canned pineapple from Ivory Coast to France and Germany (though partly at subsidized prices) are an indication that exportable quality may be cultivable also in Ghana, particularly in its south-western part.

Fresh fruit export can be organized without much foreign exchange involvement and could be used as forerunner and supply-indicator to locating a canning operation. Both operations could subsequently remain interrelated to mutual benefit.

It is therefore recommended to :

1. Suspend, for the time being, all plans for taking the Wenchi plant into operation. However, start comprehensive research work on Ghana's mango resources, their properties for canned and fresh export marketing and possible introduction of new varieties. The establishment of a Mango Research and Development Unit is recommended (participants Food- and Crops Research Institute).

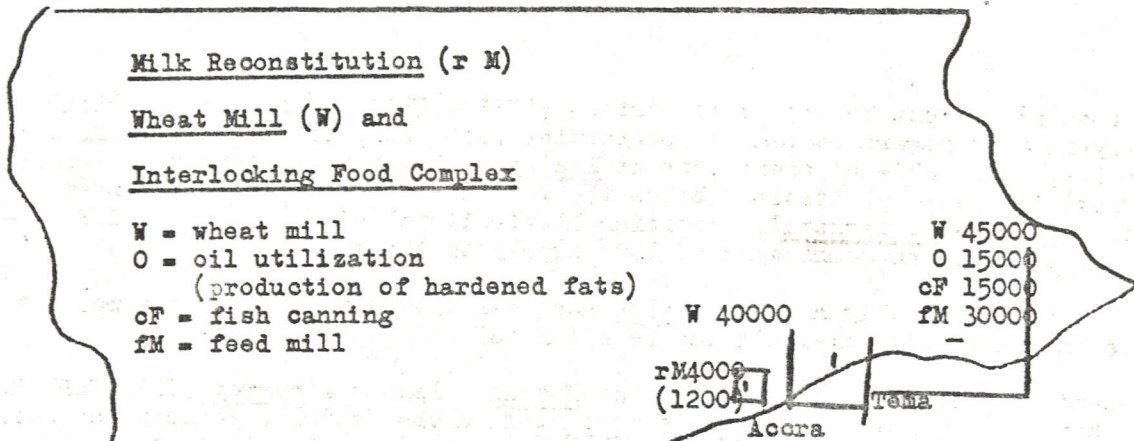
2. As soon as current horticultural trials (USAID, CRI) assisted by chemical analysis with regard to canning properties (FRDU/FRI) have yielded positive results, start all-out operations at Pwalugu. Establish extensive (labour-saving) irrigated plantations below the Veya-dam. Enter contract agreements with "progressive farmers", providing horticultural advice, seeds and fertilizers against the commitment of 100% supply to the cannery.

Though initially a higher price has been promised, in the long run not more than 2 Np./lb. ex-field can be afforded.

3. Suspend commencement of operations at Nsawam. Launch a survey (CRI, FRDU/FRI, FAO hortic. expert?) of pineapple resources in the Central, Western and Eastern Region with regard to horticultural productivity and suitability for canning, as specified on page 99.

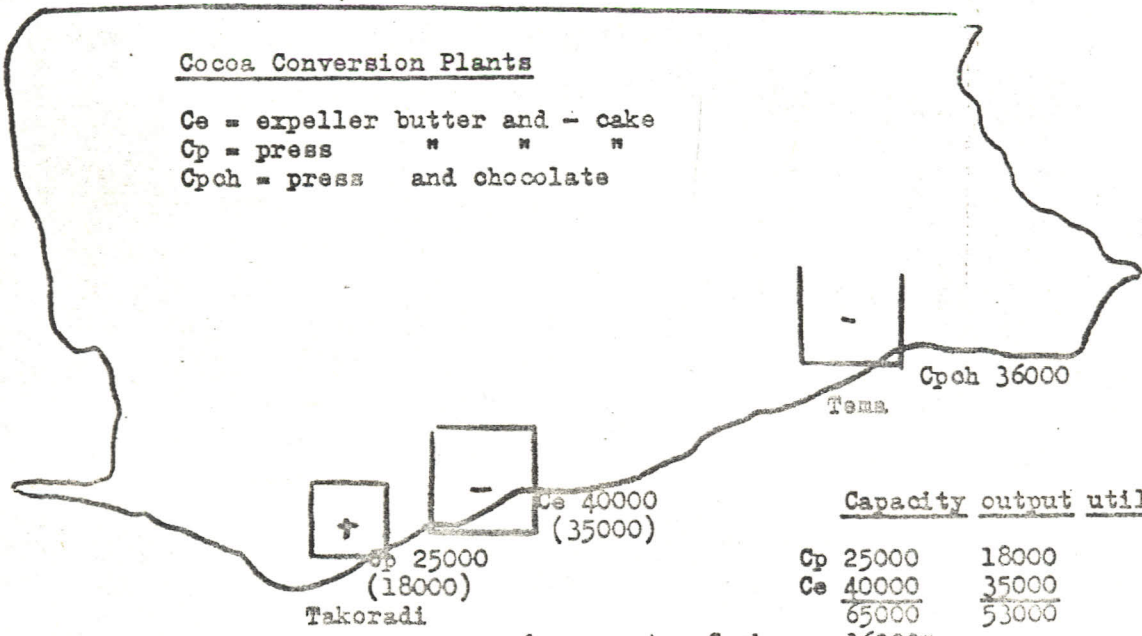
Based on the results of the survey, decide to either:

- a) retain the present location or
 - b) determine a new location or
 - c) delay the determination of an alternative location, until fresh-fruit purchasing operation for export has provided sufficient indication for a good supply area.
4. Send a delegation to Ivory Coast to study pineapple horticulture, extension service, and assembly for fresh-fruit export and canning.
 5. Intensify research into the improvement of existing and development of new rural dehydration methods, in particular for the preservation and reduction of tomatoes, root crops, plantains and bananas (FRDU/FRI).



	capacity	output	utilization
1966/67 ann. aver.	rM 4000	1200	30%
1967 nearing completion	W 40000	(started operation Feb. 68)	
under construction	W 45000		
	O 15000	(incl. in oil industr. map)	
	cF 15000	(" " fish " ")	
	fM 30000		

Remark: It is planned to increase the capacity of the milk reconstitution plant in Accra by approx. 100%.



	Capacity	output	utilization
Cp	25000	18000	72%
Ce	40000	35000	87%
	65000	53000	82%

* some unspecified amounts of semi-finished cocoa products and chocolates have been produced at Tema in 1967.

7. WHEAT MILLING AND BAKERY

Bread is an exotic item in Ghanaian diet, introduced by foreigners and still consumed to a large extent by these. An inquiry into bakery trade in Accra is reflected in the statement of a representative of the trade: "If we had to depend on sales to Ghanaians, we could close out bakeries." The "foreigners", who consequently were indicated as the core of bread demand, consist of two groups:

- 1) those whose native diet contains bread as a basic staple, e.g. natives from Arabic and European countries;
- 2) those whose native diet does normally not include bread, but who cannot or not conveniently obtain their native staple food (e.g. kuskus) at their working or trading place in Ghana; e.g. Haussas, Zabramas, Nigerians.

Though the first group can be assumed to record the highest bread consumption per head, the second group, including 85-90% of foreigners in Ghana, is of the greater weight in total bread consumption. The high migration rate between West African countries is reflected in the results of the 1960 population Census which identified 12.5% of Ghana's total population as foreigners. In towns, where average bread consumption per head is a multiple of that in rural areas, the influx of foreigners is also higher, e.g. 23% of Accra City population by 1960 were foreigners.

Based on these considerations, it may be assumed that at least one-third of bread consumption in Ghana is by foreigners. Of the remaining part, a considerable share goes into institutional consumption, such as army, hospitals, educational institutions and other government and private catering responsibilities. The comparatively high share of bread in institutional consumption is due more to convenience and prestige aspects on the part of the catering management than to specific liking for bread on the part of the recipients. Institutional consumption has much increased during recent years and may well absorb more than 10% of bread consumed in the country.

Deducting the consumption by foreigners and institutions from total bread consumption, hardly more than 50% remain as bread consumed by Ghanaian households. This is confirmed by household budget inquiries in Ghanaian households, which lead to estimates of total bread consumption covering less than 50% of an assumed total bakery output according to wheat flour imports.*

Against this background, the sharp decline of wheat flour importation after the introduction of an approximately 100% import duty in 1961 indicates a high price elasticity of demand for bread by Ghanaian households.

* This may in part also be due to under-recording of consumption outside the homes. The snack food character of bread is underlined by the bakers' observation of doubling of daily sales around pay days, as well as of 30% increased sales during the wet months May to June when hot tea and bread is sold in the streets at evening time.

Table 42 : Wheat Flour Imports and Consumption per Head of Population
1961 - 67. (Introduction of 5 Np./lb. import duty by end of 1961)

	<u>annual</u> <u>wheat flour</u> <u>imports</u>	<u>population</u>	<u>flour</u> <u>consump.</u> <u>per head</u>	<u>by Ghanaian</u> <u>consumers</u> <u>outside insti-</u> <u>tutions</u>	<u>weight</u> <u>of one</u> <u>"shilling</u> <u>bread"</u>
	'000 tons	in mill.	lbs.	lbs (estimate)	oz
1961	61.5	6.86	20.4	12	16
1962/63	40.0	7.22	12.4	6	10
1964/65	36.0	7.6	10.6	5	8
1966/67	52.0	8.0	14.5	7	8-12

The Table shows, how the weight reduction of the "shilling bread" (and proportionately of other popular sizes), as reaction of the bakery trade on the introduction of the above mentioned duty rate, caused an even sharper decline in consumption, assumed to be most accentuated on the part of Ghanaian household consumption. The figures confirm the bakers' observation that in spite of the reduced volume "no more breads were sold".

Since then industrial bakeries, almost exclusively owned by Lebanese, claim further decreased sales. Their number shows little increase in spite of the substantial growth rate (5-7.5%) of urban population. It is hard to find a buyer for a bakery. Few of them show a higher than 30% utilization of invested capacities. They claim high over-prices which they have to pay for flour from unconventional suppliers during shortages under the import license system, particularly frequent during 1964/65, the cause of the further reduction of bread weights. They point out several increases in production costs (salaries, fuelwood, rent, electricity, social security, taxes) and the high commission demanded by the bread sellers, at present 25% of retail price, all not permitting them to increase the bread weight after the control price for flour dropped by more than ten percent in the course of sales tax and duty relaxation in 1966/67. Most of the industrial bakeries therefore still sell the "shilling bread" weighted 8 oz. At the present wholesale flour price of 10 Np./lb. and a sales commission of 2½ Np. per "shilling bread" this would indicate a baker margin of approximately 125% on flour price for ingredients, production costs, overheads and trade profit. The size of the margin reflects the low utilization of capacities implying relatively high overhead and profit charges per sales unit.

Great competitors to the industrial bakeries are the "mummy bakeries"; i.e. women who, aided by family members, process small quantities of flour (e.g. 1 - 5 bags a week) in their homes and sell the bread through their children avoiding the use of bread sellers. These "mummy bakeries" can offer a "shilling bread" of 12 ounces weight, calculating a 100% margin, of which only a small amount is absorbed by expense costs, the rest being family income. Whenever flour supplies are abundant, as during most of 1966/67, they bake 12 oz. breads and thereby take away chances of potential sales increase by industrial bakeries. If flour scarce, the "mummies" are most affected, since government regulation demands distribution of imports to licensed bakeries only. The "mummies", most of whom do not fulfil the requirements for a license, then have to pay high over-prices and reduce the bread weight accordingly. However, during 1966/67 they had good access to normal supplies and due to their competitive strength could increase their share in urban bread sales from an estimated 25% to probably 35 - 40%, while the comparatively low bread sales in rural areas have always been almost exclusively provided by them.

To counter the mummies' competition, industrial bakers advocate a change from present maximum control price system to a system of controlled fixed prices and weights. Only quality would remain the object of competition. Though such regulated competition would favour quality, it would also cement the high baker's margin. More in line with consumer interest would be a decrease (by competition) in the number of industrial bakeries, securing a better utilization of capacities by the remaining ones. These could at reduced baker's and seller's margin, combined with superior quality, successfully compete against the increasing sale of "mammy" bread.

Since half of a decade Government has decided on the materialization of a wheat mill project as the central part of an industrial food complex at the harbour town Tema. This "Inter-locking Food Complex" is under construction since 1964, however due to various circumstances it is still not completed. The milling section of the complex is to provide the capacity for an annual through-put of 63,000 tons wheat, i.e. the production of about 45,000 tons flour (assuming 72% extraction).

While this mill is still under construction, a foreign investment in a similar milling capacity of about 40,000 tons flour has been concessioned in 1967. With remarkable promptness, construction of the foreign-owned mill has been completed within 6 months and the first flour was produced in February 1968. The product did not meet the full appreciation of the bakers, however it is hoped that after a few months the quality will be adjusted to the needs of the local market.

As in other cases of import substitution, there will always remain a residual share of imports for special needs or as requirement for the blending of the local product. Such import share serves as a competitive control over quality and price of the local product in a positive way and should be maintained. Under this perspective, the size of the mill appears to be well advised.

Whether the mill will be a profitable enterprise, depends very much on the domestic demand potential for the by-products, semolina and bran. If a large part of the by-products has to be shipped back to overseas countries, the mill can hardly operate at a profit either in commercial or in foreign exchange terms, with a domestic cost component of less than 5%. The domestic demand for feed bran will be limited in view of the low intensity of animal husbandry and the increasing domestic supplies of oil cakes and rice bran. A comparison of c.i.f. prices for wheat and wheat flour (present rate 1.4) has to consider the additional cost of bags in the case of wheat importation for flour milling, especially in a country such as Ghana, where yarn for the production of flour bags has to be imported. Certainly, profitability can only be achieved at full utilization of milling capacities.

In view of the foregoing, it appears that it might not be feasible to take a second mill into operation. Re-export of wheat in form of flour and by-products will most likely not be possible without heavy commercial and foreign exchange losses, also bearing in mind that the economy of the neighbouring territories is affiliated to France, a wheat exporting country.

To invest surplus capacity in a government industry which entirely depends on imported raw material and offers only little employment benefit (the new mill is staffed with 38 Ghanaians and 9 expatriates) would be contrary to a sound national economic policy. It would influence government policy to favour increased bread consumption in order to achieve full-scale operation of milling capacities, while at the same time domestic staple foods are in abundant supply.

Table 43 gives a comparison of prices and nutritional values of white bread and kenkey.

Kenkey is fermented, firm maize dough, wrapped in corn sheaths and thoroughly boiled after wrapping. It is commonly sold in balls of 8 - 12 and 12 - 18 ounces, the weight varying with seasonal fluctuations of the maize price. Kenkey is the leading convenience food and an important staple in Ghanaian diet. It is eaten hot and cold, outside and in the homes where it is often kept up to one day for convenience. It is kept available every morning and evening in fresh prepared, hot form by numerous hawkers all over town and in villages. Its function is fully comparable to that of bread in northern countries. It has a strong hygienic advantage over bread by the fact that it is sterilized in the wrapper prior to sale.

Besides kenkey there are other popular products of baked or cooked dough from maize, rice, millet and plantain with similar properties as convenience food.

The price survey was conducted in Accra. The price difference widens in favor of kenkey with increased distance from the coastal harbor.

Table 43 : Comparison of Price and Nutrition Value of Kenkey and Bread sold in Accra during 1967.

<u>price per pound:</u>	<u>kenkey</u>	<u>bread</u>
maximum monthly aver., Np.	4.9	20*
minimum " " NP.	3.5	16
annual aver., Np.	4.3	18
<u>average moisture content:</u>	66 %	35 %
<u>price per pound dry substance:</u>		
maximum monthly aver., Np.	14.4	31**
minimum " " NP.	10.2	25
annual aver., Np.	12.6	28
<u>nutritional value/lb. dry subst.***</u>		
Calories	1805	1800
Protein, g	43.9	55.7
Fat, g	9.5	5.4
CHO, g	386.0	381.9
Ca, mg	54	68
Fe, mg	11.3	6.3
Thiamine, mg	1.178	.634
Ribofl., mg	.308	.213
Nicot., mg	7.7	5.44

* including 0.6 Np. import duty
 ** including 0.9 Np. import duty
 *** kenkey analysis by Nutrition Division National Institute for Medical Research.
 Bread analysis from FAO food tables.

The conclusion is that a similar amount and composition of nutrients is provided in form of kenkey at less than half the price than in form of bread. In addition kenkey offers the advantages of

1. being sold hot;
2. higher moisture, so that it can provide a meal without added drink;
3. hygiene by sterilization in wrapper shortly prior to sale.

Against this background, bread may be regarded as a luxury and wheat flour imports as an appropriate source of Government revenue. It is regrettable that the reduction of import duty on wheat flour from 5 Np./lb. to 1 Np./lb. together with the abolition of 5% sales tax following the devaluation of the New Cedi has in balance led to a 10% decrease of importer's wholesale prices. This effect is the opposite of the declared aim of the devaluation. It is recommended to adjust the import duty on the two commodities to 1 Np. per pound wheat and 2 Np. per pound flour at the next opportunity.

The expert has interested the Food Consumption Survey section of the F.R.I. and the Nutrition Division of the Ministry of Health to study the diets in institutional catering in Ghana with concern to the potential replacement of imported by domestic foods, especially with regard to the high consumption of wheat flour and bread in these institutions. Any improvement in favor of the use of domestic produce will depend on the availability of efficient food contractors who can secure a regular supply of fresh domestic food. The Food Economics and Marketing section of the F.R.I. should join the project as soon as the dietary policy is worked out and availability of supplies is focussed.

The only remarkable import of bakery products is that of biscuits. Ten years back in the range of 600 - 800 tons, importation fell back since the establishment of biscuit manufacture in Ghana, 1957, to an annual average of about 300 tons. The factory (Pioneer Biscuit, Kumasi) steadily increased its output and sales up to 1963, and could again record a 15% increase over the period 1966/67. Present annual production is about 1,500 tons biscuits and supplementary toffee production, coffee roasting, bottling of cooking oil and sweet wine, with a total turnover of over 1 million Np, 90% obtained from biscuits. The company is presently investing in a second "sweet line" for hard-boiled and medicated sweets and a chewing-gum line. A rough overall calculation shows a foreign exchange saving of 30% on import substitution by operation of the factory. The enterprise is well managed and as such profitable. The management is aware that improvements in quality and especially package of the products have still to be achieved in order to stand competition of foreign brands unprotected by import duty and -restriction.

The F.R.I. research officer responsible for bakery development could investigate the possibility of using domestic vegetable fat, probably on shea-butter basis, in biscuit production, with a view to a potential replacement of the comparatively high annual fat imports, about Np 70,000 per annum, presently consumed by the factory.

Summary and Recommendations

1. Ghana is facing the establishment of two wheat flour mills, each of them large enough to supply the present level of domestic demand. Since under-utilization as well as exportation would lead to losses in local and foreign exchange, it can not be recommended to take the second mill (part of the Interlocking Food Complex) into operation.
2. Rather than invest government funds in an industry which must depend on increasing importation of the raw material, a policy of reducing wheat flour (i.e. mainly bread) consumption is desirable. Bread is one of the least essential though very expensive components in Ghanaian import-food diet. Main bread consumers are foreigners and institutional catering. In Accra, 1967/68 similar amounts of nutrients were available retail at half the price in form of kenkey, compared with bread.
3. Institutions, which, besides foreigners are the main consumers of many imported foods, need to become more imaginative in using the variety of local food preparations which are apt substitutes for their present bread servings. FRDU/FRI and Nutrition Division have started to co-operate for a campaign in this direction.
4. The recent reduction of duty rate on wheat flour importation from 5 nP to 1 Np/lb. has jeopardized the planned effect of the devaluation. Adjustment of duty rates for wheat flour and wheat to 2 Np. (flour) and 1 Np. (wheat) per pound is recommended.
5. Industrial bakeries complain about competition by "mammy" bakers. However, the root of their difficulties is under-utilization of invested capacities and other overheads. Their competitive position will only strengthen after some have given up. The freer the competition, the quicker this process will be completed.

8. MILK RECONSTITUTION

After rice and wheat flour, milk is the next costly item on Ghana's high food import bill. Volume and value of milk imports about doubled during the past ten years from an average annual c.i.f. value of 2.8 mill. N¢ in 1958/60 to over 5 mill. N¢ in 1966/67. This development indicates the general consumer appreciation for milk and the inability to substitute this commodity from domestic resources. The increase was favoured by a low duty rate throughout (12.5% 1962-67, free since devaluation) and rising domestic food prices.

Table 44 : The Rise of Milk Imports 1958 - 67

(1963 - 65 are omitted due to irregularities caused by large imports of milk powder from various aid sources)

	1958/60	1961/62	1966/67
	(annual average in '000 cwt.)		
fresh (bottled, steril.)	6	6	5
canned (mainly evapor.)	120	170	270
canned, sweetened	13	28	25
dry	21	37	43
	<u>160</u>	<u>241</u>	<u>343</u>

The firm upward trend is rather evenly distributed over all forms of milk imports. The only exception appears to be bottled and "tetrapak" milk, recorded as "fresh milk" in national import statistics. However, this impression has to be corrected by considering the increasing quantities of reconstituted filled milk in "tetrapak", produced in Ghana since 1960 by Fan Milk Ltd. This production from imported dry milk, amounting to about 21,000 cwt reconstituted milk per annum in 1966/67, has certainly taken over a large share of the increasing "fresh milk" demand.

While the economy in reconstituting milk from powder has been realized by many Ghanaian households,* the demand of the majority is concentrated on evaporated milk, most popular in the standard 6-oz. can. Most Ghanaian households consume milk in only small quantities. The approximate 1967 consumption per average Ghanaian household of 4 - 5 members, in terms of evaporated milk, was 80 6-oz. cans. This means that the average household buys every four to five days one 6-oz. can evaporated milk or its equivalent in dried or "natural" form. Average daily household consumption is accordingly 1.2 oz evaporated or about 4 oz. reconstituted or "natural" milk. Such quantity is too small to bring the potential benefit of milk reconstitution from powder into bearing.

In order to assess the nutrient value offered by the various forms of milk presently available in the Ghana market, prices have to be related to dry substance. Table 45 is compiling importer wholesale prices (for large consignments) converted into prices per ounce of dry substance. The dry substance is normally composed as follows: 31% fat, 27% protein, 37% lactose, 4.5% minerals, and vitamins.

* Ghanaian households, though, consume only a fraction of the large amounts of dry-milk imports, and this mainly in form of baby-foods (not separated in Ghanaian import statistics). The larger amount enters institutional consumption inclusive school feeding programs, bakery and ice cream production, and expatriate household consumption.

Table 45 : Importer's Wholesale (or ex-factory) Milk Prices, converted into prices per Ounce Dry Milk Substance

	<u>Price per ounce pro- duct</u> Np.	<u>Dry milk substance in product</u> %	<u>Price per ounce dry milk substance</u> Np.
<u>filled milk, reconst.</u> (8 ³ / ₄ oz. tetrapak)	0.72	11.6*	6.2
<u>long life milk</u> (20 oz. tetrapak)	1.0	12.5	8.0
<u>sterilized milk</u> (14 oz. can)	1.0	12.6	7.9
<u>sweet condensed milk</u> (14 oz. can)	1.7	26.5	6.4
<u>evaporated milk</u> (6 oz. can)	1.26	26.5	4.7
<u>whole milk powder</u> (1 lb. can)	3.6	97	3.7
dtto. (5 lb. can)	2.9	97	3.0
<u>skim milk powder (cwt.)</u>	1.15	96	1.2

* including vegetable oil in replacement of butter fat.

The analysis in Table 45 could be a challenge to milk importing countries to save on import value by establishing reconstitution industries. It also indicates the strong competitive position of evaporated milk among the liquid milk imports, the explanation for its dominance in consumption. While milk powder is successfully competing with evaporated milk in baby feeding, large households and catering, a bulk replacement of liquid milk imports will only be possible by the establishment of a canning industry for reconstituted evaporated milk. For a limited distribution radius in urban areas "tetrapak" for "natural" type milk, pasteurized for quick consumption or U.H.T. processed ("Long Life Milk"), may occupy a fair but not dominant share of the market.

Concentrating for the present study on the major challenge, the canning of reconstituted evaporated milk, it will be realized that this brings no clear economic advantage, if whole milk powder is used. The canning cost must be figured at approximately 2¹/₂ Np. per 6-oz. can or 1.6 Np. per ounce dry milk substance which would absorb the saving in reconstitution. A slight under-utilization of the plant, a potential danger in view of the probably high sensitivity of demand to the unavoidable change in taste will already result in losses. The risk of technological difficulties, which are supposed to frequently occur in reconstituting to the density of evaporated milk, is not covered.

The project receives a positive outlook, for the economist, only when production of filled milk is considered. By using skim milk powder in compound with local vegetable oil, the 6-ounce can may be sellable retail 25% below the present price, while the net foreign exchange saving may be about 40%.

Table 46 tries to give a tentative break-down of production cost and trade margin for a 6-oz. can filled milk of the evaporated type.

Table 46 : Tentative Break-Down of Production Cost and Trade Margin for Filled Milk in Ghana.

(6 oz.-can, dry substance 26.5% including 9% veget. fat)

assumed Plant Investment: N¢ 1.5 mill.
" " Output : 60 mill. 6 oz.-cans

	<u>cost</u> <u>per can</u> Np.	<u>in % of</u> <u>retail value</u> %
investment (interest and depreciation)	0.25	4
operational cost	1.15	19
packing material	1.3	21.5
skim milk powder	1.25	21
veget. oil	0.65	11
other ingredients	0.1	2
contingencies	0.4	6.5
trade margin (wholesale and retail)	<u>0.9</u>	<u>15</u>
minimum retail price at Accra	6.00	100

However, this cost break-down is theoretical and may in practice turn out less positive, especially as a result of possible technological difficulties leading to interruptions of operation; waste and reduced output. A further risk is the price development for skim milk powder which has shown sharp fluctuations in the past. Investments into filled milk production may therefore have to be secured by long-term contracts with milk powder suppliers, eventually inviting those to participate in the investment.

A more serious shadow falls on the undertaking by the prevailing nutritionist view which condemns the feeding of filled milk to infants and is not entirely positive with regard to its consumption by adults either.

A third open question is still the consumer acceptance of the new and probably less pleasant taste.

To provide a better basis for the consideration of such a project, the Food Consumption and Planning Section of the F.R.I. could be very helpful in :

- a) investigating the structure of milk consumption in Ghana, i.e. distribution over age groups and uses, and
- b) conducting consumer taste panels, applying the discussed product to the various uses of milk and recording the degree of acceptance.*

The material for these taste panels could be provided in form of actually canned samples by the F.R.I. Processing Section.

* The product may be tested at various levels of vegetable fat component. Since milk protein, minerals and vitamins are the essential nutrients, while the vegetable fat component is of doubtful nutritive value, the fat content should be lowered to a minimum required for a full taste product.

Summary and Recommendations

1. Milk imports rose more than 100% over the last decade.

The nutritive values of milk have acquired widespread popular recognition and are, in this ideal composition, difficult to substitute by domestic products. The dominant item is canned evaporated milk in 6-oz. tins.

2. Since freight and package cost per unit dry substance reduce with increased dehydration, reconstitution from imported milk powder becomes economically attractive.

Since the dominance of canned evaporated milk in 6-oz. tins is based on the existing consumption habits, influenced by the absence of household refrigeration, it is recommended to concentrate on the production of an equivalent (i.e. canned evaporated) reconstituted product.

While the mentioned cost savings are hardly sufficient to compensate for the higher canning cost in Ghana, the change (if only slight) in taste and potential technological hazards, the savings are more than sufficient when skim milk powder is used in combination with local vegetable fat (filled milk). The foreign exchange saving by such process may be estimated at 40%.

3. Nutritional arguments are raised against feeding of filled milk to infants. Before further plans for investments in large-scale reconstitution and canning plants are made, a survey into the composition of Ghanaian milk consumption, in particular of evaporated milk, with regard to age groups and uses is required. The FRDU/FRI in co-operation with Nutrition Division would be competent agencies to carry-out such a survey. In addition, these agencies may organize taste panels to test the acceptability of filled milk.

9. COCOA CONVERSION

One of the most recent developments in the international food industries field is the attempt of cocoa producing countries to convert a substantial share of their annual crop into cocoa products (butter, liquor, powder, cake) in order to raise the export earnings derived from their cocoa crop. Nigeria has built 3 plants of a combined milling capacity of 60,000 tons beans, of which one plant started operation in 1966. Ghana has added two new plants to one old established mill, increasing total national milling capacity to 100,000 tons (25% of its annual crop).

The new plants are government investments. It is unlikely that private investment would have moved into the industry, while at the same time the owners of the old mill, Gill & Duffus, had decided to discontinue milling operations due to persistent losses over a large number of years. Fortunately for the company, the Ghana Government bought 51% of the shares and entered into a partnership agreement, according to which the mill is to process beans for account of the Cocoa Marketing Company (C.M.C.), the export trading wing of the Cocoa Marketing Board (C.M.B.), at a fixed milling fee per ton.

Under this partnership agreement, the old mill yielded increasing profits with rising output from year to year, while the C.M.C. experienced rising losses. The latter were, on average, at the height of the milling fees paid, i.e. the conversion process did not add to the export value of the beans, except for a compensation of the 2 - 3% wastage of beans in the process. Financial results over the period 1962-67 are shown in Appendix 7.

The same problematic situation applies to the new government mill at Takoradi which started operation in early 1965, though there appears to be a better chance of profitable operation in the production of pressbutter as compared to expeller butter, the main product of the old mill. Pressbutter enjoys a higher appreciation in the market and its production yields a much higher valued cake since this is free of shell particles. However, these advantages are almost compensated by the considerably higher production cost experienced by the new mill. Until 1967, it has not been possible to recover any appreciable amount of the foreign exchange component (approximately 60%) in processing cost in the sales price for the cocoa products. Preliminary results of the government mill's operation in 1967 and anticipated results in 1968 show a slightly improved situation. 25% of the milling margin in 1967 and 50% in 1968, i.e. most of the foreign exchange component, appear to be covered by a more favorable butter-beans price ratio. However, a foreign exchange gain, the main motive of the investment, is still out of sight. The question, if such gain will ever be yielded by the industry, is of great concern to the Government, which has to decide about further investments into costly completion works on the third and biggest of the three mills, at Tema.

The Tema project includes a chocolate factory, a cube sugar plant and cocoa storage silos for the storage of 200,000 tons cocoa beans. Total investment, when completed, may rise well above 20 million N£. Works on the project appear to be 50% completed. Without a thorough technical and economic evaluation carried out by two independent internationally acknowledged consultants,* no further government funds should be invested into the project. Special consideration should be given to the following points:

* Each providing technical, technological and economic expertise.

I. Technical :

- 1) the type, scale and technical standard of the milling equipment with regard to processing economy;
- 2) the feasibility of the plant design with regard to produce flow from arrival of beans to dispatch of products;
- 3) the topographic feasibility of the project's location (waste water and sewerage disposal);

II. Technological :

- 1) the feasibility of cocoa storage in the plant's huge silos (192 silos, each holding 1000 tons)
- 2) the feasibility of collection and transportation of cocoa pods to Tema for the utilization of by-products derived from the pods.
- 3) the feasibility of cocoa beans fermentation in silo storage.

III. Economic :

- 1) the past, present and prospective future trend of the butter/beans price ratio in the international cocoa market, keeping in mind the following approximate break-even ratios for Ghana's cocoa conversion plants:

e.g. cocoa beans	butter/beans c.i.f. price ratio at approximate break-even points		
£ 150	2.86	(2.6*)	(2.73**)
£ 200	2.7	(2.5)	(2.6)
£ 250	2.6	(2.44)	(2.52)
£ 300	2.53	(2.4)	(2.46)

* foreign exchange break-even ratio, pressbutter production
 ** foreign exchange break-even ratio, expeller-butter production

- 2) present and prospective future trends in the import duty- (and other taxation) policy of consumer countries with regard to cocoa beans and cocoa products;
- 3) the reason for a) an apparent higher milling-cost margin and b) an apparent less favorable position with regard to low cost cocoa supplies, as compared with mills in consumer countries;
- 4) the feasibility of speculative silo storage for substantial parts of Ghana's cocoa crop, under consideration of storage- and capital cost, storage risk and losses of weight and quality in storage;

- 5) the impact of a potential change, from collecting fermented beans to collecting the whole pods, on farm income and national transport resources;
- 6) the feasibility of chocolate production for export, in view of the fact that the Ghanaian market takes only a fraction (approx. 10%) of the incorporated chocolate plant's output at one-shift operation;
- 7) the feasibility of cube sugar production at Tema, as an independent side line of the project (ref. chapter 3, "Sugar," page 49 of the present report, where cube sugar manufacture by the Asutsuare sugar factory is recommended).

10. THE "INTERLOCKING FOOD COMPLEX"

This project, as already mentioned in chapter 7, page 107, has entered its fifth year still under construction. Approximately half of this time construction works were suspended, due to pending financial negotiations with the supply contractors and industrial promoters responsible for the key-ready establishment and initial operation of the Complex, Messrs. Drevici. The project is over-shadowed by growing doubts on part of the Government about its overall economic feasibility. To whatever agreement the pending negotiations may lead, it is realized that the project in its half-ready state suffers more corrosion and other losses with progressing time.

The project was started as a £ 5 mill. object, but, if completed, might turn out to be much more expensive, due to the over-long extended construction period.

Table 48 gives a projection of production capacities incorporated in the project against the background of the domestic market for the supply of raw materials and the demand for the finished products.

Table 47 : The "Interlocking Food Complex", Supply and Market Prospects

	raw material requirement	in % of available supplies	product output	in % of open* domestic demand
	'000 tons	%	'000 t.	%
wheat mill	63	imp.	45	225 (450**)
fish cannery (incl. fish meal prod.)	30	200	15-20	250 (350)
oil mill for margarine and other hardened fats	15	2000	6	1000 (1200)
feed mill	30	500	30	2000 (3000)
can making shop	..	imp.	180 mill.cans	300 (400)

* i.e. after deducting supply capacities occupied by other local producers.

** figures in brackets indicate the percentage based on a demand after deduction of a residual import share which is normally difficult to substitute.

The table indicates that the complex is unrealistic in respect to its capacities which in all sections require a multiple of presently available domestic supplies and open demand in order to be utilized to a reasonable extent.

The wheat mill, heart piece of the complex, will have to share the Ghanaian market with its lately introduced competitor, a foreign owned mill of similar capacity which started operation in February 1968. It is questionable, if the Government should try to let the two mills compete for the limited domestic market, thereby both operating at half of their capacity with the result of great losses in local and foreign currency. Besides, it can be expected that the government product will have difficulty to obtain an equal market share, since part-ownership and management of the private mill is Lebanese, sharing the same nationality with the dominant group of industrial bakers in the country (ref. chapter 7, page 106). The possibility of flour

exportation at prices covering at least the foreign exchange component in production cost will hardly exist, by reasons explained already in chapter 7, page 107.

The fish cannery requires more raw material than total Tema herring landings as estimated for 1971. Not more than half of these landings will be available for industrial demand, in view of the high demand of the traditional smoke-curing trade (ref. chapter 2, page 41). The collection of herring catches from the scattered canoe landing places along the Ghanaian coast for the cannery can hardly be feasible. Since furthermore the domestic market for canned fish is far too limited for the planned output, the much smaller "Tema Fish Complex", also under suspended construction, appears to be the more realistic investment (ref. chapter 2, page 40/41).

The oil utilization plant appears to have very little economic basis. The situation of the Ghanaian oil industry has been analyzed in chapter 5. Since copra milling capacities are already over-expanded and groundnut mills on the point of closing down due to lack of supplies, (ref. chapter 5, page 79), there is no reason to believe that this plant at Tema can be fed with domestic oil seed supplies to any noteworthy extent. The promotor advocates plantation of sesame in the Accra plains, but so far nothing has been achieved in this venture. The domestic market for hardened fats is extremely limited (annual average importation in 1966/67 was only 1000 tons), similarly in other countries in the region. While Ghana is not among the oil-exporting countries, production of hardened fats for export should be out of question.

The feed mill is dependent on the by-products of the other sections. Its supply problem features the low utilization prospects for their production capacities. Even at the low output resulting from such reduced supplies, the mill would already face marketing difficulties. Imports of feed compounds 1961/66 varied between 2000 - 7000 tons depending on the level of local agricultural prices (especially of maize) and reached the low level of about 1500 tons in 1967, a year with plentiful maize supplies throughout. During these years, a number of small private and State Farm mills have been established on the basis of increased supplies of oil cakes, rice bran, grain and offal fish. With the operation of the above mentioned competing wheat mill the market for animal feed will soon be saturated. Export chances to neighbouring countries are low, considering the comparatively high price level of domestic raw material.

The can-making shop is depending on the demand of the cannery, which at full utilization would take about two-thirds of this section's output. The rest would be free for the supply to other canneries. However, food-canning in general appears to enjoy very little demand potential in Ghana (ref. chap. 1 page 18, chap. 2, page 41 and chap. 6, page 92).

Large new canneries with incorporated can-making shops are idling.

It appears, that the challenge of potential cost and other advantages accruing from the interrelation of various food- and by-product industries organized in one technically complex super-plant have persuaded the planners of this Food Complex to over-optimistic assumptions. Whether at the low utilization of capacities envisaged in the foregoing discussion, the benefits of the complex infrastructure will materialize or rather turn to undesirable overheads, can only be answered after a thorough study of the technical and technological specifications of the Complex, which are at present not obtainable.

The foregoing discussion may serve as an introduction to the problems faced by this project. A thorough feasibility analysis by independent consultants appears here as in the case of the Tema Cocoa Complex urgently required, before more government funds are invested.

APPENDIX 1

Table 48 : Livestock and (slaughter) Meat Trade Calculation
before and after devaluation, 1967.
 (Importation of Zebu cattle of good medium
 weight, live 630 lbs., carcass 300 lbs.)

	1967 before deval. (amounts in brackets = Np. per lb.)	1967 October	Sources financing the deval- uation effect.
1 Price at border, per head of cattle	£ 29 = Np 58	= 83	
2** Export duty, Pugu	£ 3 = Np 6	= 9	Np
3 Import price, if paid in Upper Volta currency on delivery at border	£ 32 = Np 64	= 92	+ 28
4* Exporter's surcharge (for uncertainty, time, incon- venience and expense in- volved in the official exchange and transfer procedure)	£ 6 = Np 12 (£ 1.8.-)	= 4	- 8
5 Import price against Ghana currency, subject to offi- cial exchange and transfer procedure (4)	£ 38 = Np 76*** (33.8.-)	= 96	
6 Import duty	Np 6	6	
7 Sales tax	Np 10	10	
8 Income tax	Np 7	7	
9 Transport, handling and draal charges (Ghana)	Np 13	13	
10* Death tool (and emergency slaughter) 3%	Np 3	2	- 1
11* Agent's commission (border and Kumasi)	Np 5	2	- 3
12 Agent's commission (Accra)	Np 4	-	- 4
13* Exporter's (non-transferable) allowance out of trade profit at Kumasi	Np 3	-	- 3
14 Purchase price for wholesale butcher	Np 127	135	
15* Slaughter (and transport) costs and wholesale butcher's profit margin	Np 7	5	- 2

Table 48 cont'd.: Livestock and (slaughter) Meat Trade Calculation
before and after devaluation, 1967
 (Importation of Zebu cattle of good medium
 weight, live 630 lbs., carcass 300 lbs.)

	1967 before deval. (amounts in brackets = Np. per lb.)	1967 October	Sources financing the deval- uation effect. Np
16 Bulk wholesale of by-products	Np 20	20	
17 Carcass wholesale price, Kumasi	Np 114 (38)	120 (40)	
18 per lb. meat equivalent (28% bones)	(53)	(56)	
19 retail margin	(7)	(4)	- 7
20 retail price per lb. boneless meat, Kumasi (Accra same price, livestock transport cost Kumasi-accra borne out of retail margin.)	(60)	(60)	

* estimated;

** see foot note to Table 1, para. 10, Memorandum;

*** transferred is still £ 38, the difference probably financed by agent's credit, in order to utilize the transfer quota to its full extent.

APPENDIX 2

Table 49 : Bolgatanga Meat Factory : Crude Break-Down of Monthly Costs

	incompletely staffed and organized initial operation at low output (1967) Nf	projected cost at full one-shift utilization of capacities Nf
salar. & wages (other than management)	7,000	11,000
fuel	3,000	9,000
repairs & mainten.	1,000	6,000
Nagodi holding ranch	500	2,500
other expenses (insurances, travel, etc.)	<u>5,000</u>	<u>7,500</u>
	16,500	36,000
management	<u>3,000*</u>	<u>4,000</u>
	19,500	40,000
depreciation lorries (2½ - 4 years)	4,500	7,000
depreciation plant mach. & equipm. (7 years)	<u>5,000</u>	<u>5,000</u>
	29,000	52,000
depreciation buildings (20 years)	2,000	2,000
interest on investment including working capital (8 %)	<u>8,000</u>	<u>9,000</u>
	39,000	63,000

* calculated cost; present management personnel is on grant by the West German Government.

APPENDIX 2 (cont'd.)

Table 50 : Projected Break-even Slaughter Rates at Fully Established Operational Frame.

Suppositions :

- a) cost estimates of Table 49;
- b) limitation of corned beef production to 500,000 cans per annum, equivalent to a slaughter of about 200 steers per month: use of inferior forequarter cuts, fat and offal meat, thereby lowering cost of fill and packing material to a level of approximately 40 Np.;
- c) adjustment of corned beef control price (retail) from 45 to min. 50 Np.;
- d) meat price calculation as at present:

livestock input	28 Np./lb. carcass weight
allowance for processing costs	12 " " " "
allowance for transport costs	8 " " " "
selling commission	5 " " " "

wholesale (brutt) delivered
in Ksi/Accra/Takoradi (50-56) 53 " " " "

20 Np. allowances x 275 lbs. (average carcass weight)
= Np 55.- per slaughter

	projected approx. cost of operation <u>'000 Np</u>	break-even slaughter rate (meat production) steers	additional slaughter for corned beef steers	total slaughter steers
expense costs	36	650	200	850
management	<u>4</u> 40	730	200	930
depreciation: plant & transport	12 <u>52</u>	950	200	1150
depreciation buildings & interest on investment	11 <u>63</u>	1150	200	1350

APPENDIX 3

A comparison of refrigerated and live-weight transport

(1) Investment in transport at Bolgatanga

	I	II	III
Type	MAN 405 Cattle lorry (with locally built structures)	MAN 405 Refrigerated lorry with com- plete body imported	MAN 405 Truck/trailer with complete body imported
free Bolgatanga	N¢ 9000	N¢ 16000	N¢ 32000
chassis carrying capacity	4.5-5 tons	4.5-5 tons	8 (?) tons
payload	4.5	4 (or less)	6-7 (?)
loads experienced	12 cattle = 3-3.5 tons	<u>c h i l l e d:</u> 12 carcasses + some by-products = 2-2.5 tons	30 carcasses + most by-products = 5.5-6 tons

(2) Cost comparison, live-weight and chilled transport

Chilled transport

Life of truck/trailer: 3 years
Weekly trips to Accra
= 150 x 1,200 miles = 180,000 miles
Cost per trip
(with full load: 30 slaughtered animals)

Depreciation	N¢ 210
Interest on investment (10% : 2 = 5%)	36
Insurance, incl. load and licence	80
Maintenance & repairs	100
Tyres	50
Fuel and lubricants	75
Driver and co-driver	20
Administration	20
	<u>N¢ 591</u>

591 : 30 = N¢ 19.70
+ value loss of intestines, etc. 9.00

N¢ 28.70
Calculation of cost on
trip to Kumasi
= 2/3 of 28.70 = N¢ 19.00

Live-weight transport

Paga-Kumasi
Charges per head

Lorry transport	N¢ 10.00
Death, emergency slaughter weight-loss max.)	3% 1.80
Loading & unloading	-.60
Council fee	-.10
Holding ground 10 Np/day x 5	<u>-.50</u>
	<u>N¢ 13.00</u>

APPENDIX 4

Extract
from

"Plan of Extension of Plantations and Financial Estimate Covering
the Period 1967 (October) - 1971 (Feb.), Asutsuare Branch, S.S.P.C."

- Note 1) The calculated price per ton farmers' cane, delivered at factory, has been changed from N ¢ 6 to N ¢ 7 in view of the present report's recommendation, which is in the process of implementation.
- 2) Establishment expenses have been eliminated. Of the items "spares & mainten." and "fuel & lubr.", which are not broken down with regard to new establishment and re-establishment, only half the amounts stated in the "Financial Estimates" have been included in this "extract" which reflects running plantation costs after completed establishment.

Premises, on which the "Financial Estimates" have been based:

- | | |
|-----------------------------------|---|
| 1) cane yields : | plantation 23 tons |
| | farmers' 25 " |
| 2) sugar yield : | 9% of cane |
| 3) alcohol yield : | 3% of molasses |
| 4) labour productivity: | |
| in re-establishment cultivation : | 0.4 acre/man-year |
| in harvesting operations : | 1.2 ton/man-day |
| 5) sales value : | |
| sugar (refined) | N ¢ 140/ton (present price ex factory) |
| alcohol | N ¢ 1.60/gall. " " " " |

1970/71 PLANTATION (6,800 acres under cultivation; last acreage planted by Feb. 1970, total acreage harvested by Feb. 1971)

Wages permanent labour	N ¢ 700,000	
Wages harvest labour	" 100,000	
Salaries (managerial & technical staff)	" 600,000	
Spare parts & maintenance	" 175,000	
Fuel & lubricants	" 290,000	
Fertilizers & chemicals	" 260,000	
Running expend. on irrigation, etc.	" 45,000	
	2,170,000	
Permanent running expenses per ton cane	" 14.50	
" " " " " sugar		N ¢ 159.00
Sales value of molasses alcohol		" 31.00
per ton sugar production		<u>128.00</u>
Sales value of one ton sugar		" <u>140.00</u>
Sales income over agricultural running expens.		" 12.00
per ton sugar production		" 12.00
x 14,040 tons		" 168,000

APPENDIX 4 (cont'd.)

1970/71 FARMERS' SUPPLIES (4,800 acres under cultivation; last acreage planted by Feb. 1970, harvested by Feb. 1971)

Price per ton delivered at factory		Np	7.00
per ton sugar production		"	<u>77.00</u>
Sales value of molass. alcohol		"	<u>31.00</u>
		"	<u>46.00</u>
Sales value of one ton sugar		"	<u>140.00</u>
Sales income over cost of cane		"	<u>94.00</u>
	x 10,800 tons		
Sales income over running expenses		Np	1,015,000
(plantation)		"	<u>168,000</u>
			<u>1,283,000</u>
- factory running expenses			<u>830,000</u>
			<u>453,000</u>
in % of total sales income			
(Np 4,245,000)			10.6 %

Discussion : While the positions "permanent labour" and "salaries" appear to be unusually high and ought to be lower by 1970/71 under the assumption of rising productivity, the premise of 9% sugar yield from cane appears to be optimistic. It is also uncertain, whether the whole output of alcohol can be sold at the present inland market price of Np 1.60. E.g., while a saving of 25% on labor and 33% on salaries would provide Np 400,000, a short-fall of sugar yield by 0.5% (8.5 instead of 9%) and of average sales income from alcohol by 40 Np. per gallon would result in a loss of Np 415,000 in sale income. Advance cost price calculations should not speculate on a more favorable relation of running expenses to sales income than the one resulting from the "extract" calculation.

APPENDIX 5

Local Rice Processing at Ejura

(contributed by E. Appiah-Danquah, Technical Assistant,
Economics and Marketing Section, F.R.I.)

In Ejura rice is either pounded or milled. Before pounding or milling, the paddy is parboiled. Parboiling consists of (i) soaking, (ii) steaming and (iii) drying.

- (i) Soaking : The quantity of paddy intended to be milled or pounded is soaked in water. If the paddy is very dry, it is soaked for about two days; if not, it is soaked for about a day. During soaking any immature paddy floats on the surface of the water. This is collected and thrown away.
- (ii) Steaming : As soon as the fire is prepared, the steaming-pot (usually a big iron pot) is put on it. The paddy is either removed from the water with a perforated aluminum pan or poured into a basket so that most of the water could drain off before it is finally put into the steaming pot on the fire. It is then covered with a sack in order that most of the heat could be kept inside. As soon as the husk cracks, the paddy is removed for drying.
- (iii) Drying : Where there is no tarpuline or big mat on which to dry the steamed paddy, the ground is well swept to be used. The steamed paddy is poured and thinly spread on the ground for drying. Direct sun is avoided. When the steamed paddy is a bit dried, it is collected into a bag and stored in a room or on a verandah for at least one night so that the heat inside the bag will gradually dry the paddy. The next morning it is either pounded or milled. A quickly and hastily dried parboiled paddy often breaks into pieces when milled or pounded.

Home-pounding

This is the traditional method of removing the husk and bran-layers from the rice. The parboiled paddy is put into a mortar and pounded with a pestle till the husk and bran layers are removed from the rice. By winnowing the pure rice is separated.

Home-Pounding is to any larger extent practiced only at harvest, when the paddy is abundant. Rice intended for sale is almost all milled.

Milling

This is the use of power machinery for separating the rice. When the machine is sparked, the parboiled paddy is put into the hopper through which it passes into the mill where it is milled. Finally the rice drops into a pan on the ground and it is collected.

APPENDIX 5 cont'd.

Where the mill cannot blow away the removed husk and bran-layers from the rice, human labor is employed. At an open place, the milled rice is put in a big calabash or pan and lifted shoulder-high or above the head. From this position the rice is allowed to drop carefully into another big pan or calabash on the ground while the breeze is taking away husks and bran and other foreign material. This act of winnowing is repeated for a number of times till only clean rice is left. The rice got is again examined for the removal of heavy foreign matter, which could not be taken by the wind.

Time schedule observed

soaking	24 - 48 hours
steaming	40 - 60 minutes, between 6 - 8.00 a.m.
drying	4 - 6 hours, between 7 a.m. - noon
milling	25 minutes
winnowing	30 minutes

Remarks : A difference was observed at Bolgatanga, where no soaking took place, but a mild steaming process of approximately 4 hours' duration.

APPENDIX 6

Traditional Oil Extraction Trade

1. Coconut Oil (place of observation: Esiamama)

Mature nuts (in the husk) are bought in lots of 250 from farmers. They are dehusked and split into pieces with the help of labourers and ground into a trask at one of the universal village mills. Under frequent adding of cold water the trash is squeezed by hand for 2 - 4 hours, the greater part of the oil draining out with the water as a milky liquid. This is allowed to settle over night. The oil is then skimmed off and thoroughly boiled (the husks serving as fuel) in order to remove moisture. The washed-out trash is dumped near the sea. The average yield of 250 nuts is one small drum containing 4 1/4 gall. of oil. This presents an extraction rate of 41%.

cost of 250 nuts (2 Np. each)	N¢ 5.00
freight farm to processor	" 0.20
dehusking and splitting	" 0.25
milling charge	" 0.40
freight to market (Takoradi)	" 0.60*
	" <u>6.45</u>
wholesale price per drum (Takoradi)	" 8.20
processor's remuneration (2 women)	" 1.75

* 6 drums at -.40 + trader's fare 1.20

2. Groundnut Oil (places of observation: Attebubu, Bolgatanga)

A bag of 180 - 190 lbs. or part of a bag (in large pans of 60 - 65 lbs) is bought from a trader in the local market. The nuts are thoroughly cleaned and all bad ones picked out. They are then roasted, mixed with sand, in a large iron bowl under continuous stirring. Subsequently, the dry skin is removed by rolling under a stick, while spread on the ground. The skimmed nuts are head-loaded to a mill where they are ground into a paste. The processor is responsible to the miller for thorough cleaning of the mill before and after this operation. Normally processors group their milling tasks to save on cleaning work. The paste is returned to the processor's compound where it is stirred in wooden mortars until most of the oil content is collected. Of the remaining paste-cake some is formed into bigger balls, which are sold to be used in the preparation of groundnut soup. Most of the cake, however, is formed into small balls and/or rings, which are fried (or rather boiled), submerged in a large pan filled with the oil which had been extracted from the cake. This process yields further extraction of oil from the cake, until the cake is left with an oil content of 16 - 22%. The small balls which have become rather firm in consistence, are sold from house to house and in the markets by the processor along with her oil or by her children. Besides their oil content, they contain 40 - 50% protein. Some quantities of kula and considerable amounts of oil are sold wholesale for shipment to the south. The calculation below is applying wholesale prices.

	124.5 lbs.	groundnuts yielded	
	50 "	oil	= 40%
and	65 "	kula	= 52%
	9.5 "	weight loss can be accounted as moisture loss, bad nuts sorted out, and waste in processing.	

APPENDIX 6 cont'd.

cost of nuts		N¢ 10.75
transport		" -.10
fire wood		" -.20
milling charge		" -.50
pepper for kula		" -.10
		" <u>11.65</u>
sale of oil	N¢ 10.00)	" 13.65
" " kula	" 3.65)	
processor's remuneration (2 women, 1 young girl)		N¢ 2.00

3. Palm Kernel Oil (place of observation: village near Assessewa)

Kernels are collected from farms in the area, normally measured by kerosine tins. They are fried in large iron pots with added oil (1 bottle per kerosine tin). More oil is collected from the fried nuts than has been added. The nuts are then carried to a village mill where they are ground into a trash. This trash is mixed with some water and actively boiled and stirred over an open fire for 3 - 4 hours. Continuously oil mixed with water is skimmed off and small amounts of water are added. Finally the remaining cake, at an oil content of between 10 - 18%, is dumped in the forest. The milk is left to settle, then skimmed and boiled to remove the moisture.

cost of 12 tins (each 32.5 lbs. kernels) at N¢ 1.55	= N¢ 18.60
milling charge	= " 2.00
freight of oil to Assessewa market (incl. trader's fare)	= " -.80
	N¢ <u>21.40</u>
sale of 4 1/4 tins (each 37 lbs. oil) at N¢ 5.60	= " <u>23.80</u>
processor's remuneration (1 woman occupied for approx. 3 days, incl. collection of kernels and fire wood)	" <u>2.40</u>
157 lbs. oil yield from 390 lbs. kernels	
= 40.3%	

4. Palm (fruit) Oil (place of observation: village near Assessewa).

The processor, who is often owner of palms, has his "factory" (244 gall. drums mounted on mud-built ovens) established under the shade of a tree in the forest. If he can not collect sufficient fruit from his trees, neighbouring farmers will sell fruit to him. They bring the bunches to the drums, where the nuts are chopped off and filled into the drums. Payment is made per filling. Some water is added to the nuts and these are kept boiling for a number of hours. The oil is skimmed off and more water is added, until most of the oil is extracted from the fruit fiber. The processor is assisted by his sons. The kernels in their hard shell have been separated in course of the process. They are picked out of the remaining fiber which is used as fuel. The shell is cracked by the old women in the family, a very time-taking work followed by the equally labourious separation of kernels from the broken shell.

cost of fruit (2 drums = 650 lbs.)	= N ^o 10.00
transport of 10 gall. oil (90 lbs.) to Assessewa	= " <u>-.60</u>
	= " <u>10.60</u>
sale of 10 gall. oil at N ^o 1.50	= " <u>15.00</u>
processor's remuneration (4 men)	= " <u>4.40</u>
kernel yield from 8 tins kernel in shell: 2 tins kernel at N ^o 1.40 (keeping 4 old women occupied for 2 days)	= N ^o 2.80

90 lbs. oil from 650 lbs. nuts = 14% extraction rate assuming
70 - 75% nuts in full bunch weight, the extraction rate of oil from
full bunch = 10%.