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Preface

This study of the vegetable oil milling industry in East Africa is concerned primarily with the state of the industry in Uganda, together with a comparative analysis of the industry in Tanzania and Kenya. Its scope has been limited to the so-called soft edible oils, of which cottonseed oil is the most important in the three territories.

The study was undertaken while I was an Assistant Research Fellow at the East African Institute of Social Research, Makerere University College, Kampala, Uganda. The Fellowship was financed by the Rockefeller Foundation.

I am indebted to the many oil millers in East Africa and Messrs. V.V. Vasant who gave evidence on the present state of the industry. I am also grateful to the many others in Government and in the Lint Marketing Board of Uganda and the Lint and Seed Marketing Board of Tanzania who provided me with invaluable information.. I would also like to thank those with whom I worked at Makerere, particularly my research director, Mr W.T. Newlyn, my colleagues in the East African Institute of Social Research, members of the Department of Rural Economy and Mr V.R. Apte of the Department of Agricultural Chemistry; also the typist who prepared the manuscript for the press.

Diana M.S. Coles,
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CHAPTER I

INTRODUCTION

A distinction is often made between oils and fats according to their differing sources, the oils and fats being grouped into vegetable oils, animal fats and marine oils. This report is concerned with the extraction of vegetable oils from oilseeds, firstly in Uganda, and then in Tanzania and Kenya, and does not cover the animal and marine oils, although it is realised that these oils and fats are consumed in East Africa.

The Food and Agriculture Organisation of the United Nations classifies oils into 'hard' and 'soft' oils, hard oils being those oils which take a solid form under normal temperature at or below 15°C.[1] Oils may also be classified according to their end uses, but as modern techniques can make oils which were formerly only useful as industrial oils into edible oils, this classification is not always useful.[2]

The principle oils and fats for use as food given in the O.E.E.C. publication[3] are edible animal fats and soft edible vegetable oils. These latter include olive oil, groundnut oil, soya bean oil, rape-seed oil, cottonseed oil, sesame oil and sunflower seed oil. Oils such as coconut oil, palm oil, palm kernel oil, shea butter oil, marine animal fats and tallow may be used for both food and soap manufacture. Oils such as linseed oil, castor oil and tung oil are only used for industrial purposes.

The vegetable oils produced in Uganda mainly fall into the soft edible vegetable oils category. Some castor oil and shea butter oil is produced but only in very small quantities.

Thus the report which follows is mainly concerned with the production of soft edible vegetable oils in Uganda, and the comparisons which follow for Tanzania and Kenya are also limited to these same oils. It is known that some palm oil, palm kernel oil and coconut oil is produced along the coast in both Kenya and Tanzania, but these oils are outside the scope of this study.

A comparison of the total production of groundnuts, cottonseed and sesame seed in the three East African countries and all Africa and the world is shown in Table 1.1. No significant quantities of the other oilseeds which yield soft edible oils are produced in East Africa.

Table 1.1

Production in '000 Metric Tons

	1948/9-1952/3	1962-3	1963-4	1964-5
Groundnuts				
Uganda	153*	163*	163*	163*
Kenya	3	4	4	-
Tanzania	20	17	20	18
All Africa	2,390	4,380	4,340	4,250
World	9,500	14,500	15,000	16,700
Cottonseed				
Uganda	134	143	151	178
Kenya	4*	6	6	6*
Tanzania	20	56	67	100
All Africa	460	600	650	710
World	13,900	20,300	21,300	21,900
Sesame seed				
Uganda	30.5	28.0*	30.0*	-
Kenya	-	1.6	1.5	1.0
Tanzania	5.0	8.8	10.1	4.8
All Africa	100	130	130	130
World	1,800	1,500	1,500	1,700

* Estimates

Source: Food and Agriculture Organisation of the UnitedNations, Production Yearbook Volume 19 (F.A.O. Italy, 1966)

The figures of Table 1.1 show that East Africa, and in particular Uganda, is a major producer in Africa of cottonseed and sesame seed, and also produces large quantities of groundnuts. But it will be found later that most of the groundnuts and sesame seed produced in East Africa are not used to make vegetable oils. East Africa produced over a third of all Africa production of cottonseed over the periods 1948-53 and 1962-5, and most of this cottonseed was retained for crushing within East Africa. The largest source of this cottonseed was Uganda, on which a major part of this study will be concentrated.

The F.A.O. Commodity Review, 1966,[4] notes that there has been an increase in oilseed production throughout the world, in the 1960's, most of this

increase being in the developing countries, where it was mainly home consumed. At the same time the total production of oils and fats in the world remained static, with decreased production in the developed countries being balanced by increased production in the developing countries. It is estimated that the seed crushing industry has expanded by 50 per cent over the past decade, this trend being particularly important in the developing countries in recent years. It is thought that this trend in the developing countries will continue provided that outlets for the oil can be found. It is pointed out that these oils compete in many import markets with oils produced by tariff protected industries. It is noted that cake does not present the same problems of marketing. F.A.O. projections to 1970 show that if the production of soft oils continues to expand in the 1960's as it was expanding in the 1950's, a surplus of soft oils would develop in the United States. But for the low-income countries, production would not be able to keep pace with the growing demand, although Africa, it was thought, would still remain a net exporting area.

The chapters which follow on the extraction of soft edible oils in East Africa describe one of the more important sources of these oils in Africa. The development of the extraction industries, their operation in the 1960's, and the relationship between supply and demand in each country of East Africa are considered. Projections of supply and demand are made in order to discover whether the supply and demand for soft oils in East Africa will remain balanced in the future.

One final chapter is added at the end of the report on the use of oilseed cake as a human foodstuff. This case study is included because of the importance to developing countries of providing a low cost, high-protein food for prevention of malnutrition. It is felt that vegetable cake could have an important part to play in the provision of such a high-protein food in East Africa.

Footnotes

1. Organization for European Economic Co-operation, The Main Products of the Overseas Territories. (O.E.E.C., Paris, 1957)
2. Ibid
3. Ibid
4. Food and Agriculture Organisation of the United Nations, Commodity Review, 1966 (F.A.O., Italy, 1966)
5. Food and Agriculture Organisation of the United Nations, Commodity Review, 1962. Special Supplement Agricultural Commodities - Projections for 1970. (Eliograf, Rome, Italy, 1962)

CHAPTER II

BACKGROUND INFORMATION TO THE UGANDAN OIL MILLING INDUSTRY

A. Historical Background to the Industry

The earliest oil mill in Uganda is believed to date from 1929, and according to evidence obtained from the Registry of Companies,[1] only five oil milling firms were incorporated prior to 1940, although it is not known whether these five firms were crushing oil at this time. The 1938 Commission of Inquiry into the Cotton Industry[2] mentioned that at that time there were a number of oil mills in Uganda, but that the extraction of oil from cottonseed had not proved successful for the following reasons:-

a) the small scale of operations
b) the competition with sesame oil
c) variable prices for oil
d) the cost of freight and packaging
e) the lack of an outlet for cake
f) the need to delint seed before crushing

Thus in the pre-war period most of the cottonseed produced in Uganda appears to have been burnt. However, with the sudden demand for oil created by the war-time era, the position with regard to the crushing of cottonseed was to drastically alter. In particular, there was a large demand for oil to feed the military forces then stationed in Africa, and this led to a renewed interest in all vegetable oilseeds.

The Industrial Investigation Committee[3] of 1944 found a total of twenty-four firms engaged in flour and oil milling, but most of the firms were reported to be small uneconomic units. There appear to have been five licensed and five unlicensed oil mills in Uganda at that time, including three which were to become the biggest firms in Uganda in 1966.

The 1943 Defence (Controlled Produce) Regulations[4] gave effective control over the oil milling industry to the Government by requiring that the millers must hold a licence in order to crush oilseeds. Further, the erection of new oil mills became controlled under the Control of Industries Committee,[5] and the sale of both oil and cake was undertaken by the Government.

Almost from the beginning the necessity and efficacy of the Oilseeds Control was questioned. In 1945, it was suggested that oilseeds should be freed from the control and be sold through produce buyers,

although prices for exported seed, oil and cake should still be controlled. However, no changes were made. In 1946, the oil milling industry was removed from the Control of Industries Order, meaning that any firm could now erect a new oil mill without official permission. This did not necessarily mean, though, that the miller was entitled to an allocation of oilseeds, which were still under the control of the Vegetable Oilseeds Controller.

The Government's reason for freeing the oil milling industry from the Control of Industries Order, while still maintaining control of the allocation of oilseeds, seems to have been motivated by negotiations between Lever Bros. and the Government with a view[6] to Lever Bros. constructing an oil mill in Uganda. This action, though, was most unfortunate, as following the withdrawal of the oil milling industry from the Control of Industries Order, a number of firms installed milling capacity only to find that they were then unable to obtain an allocation[7] of seed from the Vegetable Oilseeds Controller.

The need to maintain the control over allocations of seed was justified by the Government on three counts.[8] Firstly, it was justified because of the need to maintain supplies for the Ministry of Supply in Great Britain. Secondly, it was justified because of the need, it was thought, to limit the amount of seed crushed in East Africa to the minimum requirements for oil in the area, and thirdly because of the need to maintain control over seed and oil prices in the immediate post-war period.

Such constraints meant that the Vegetable Oilseeds Controller was faced with the difficult task of deciding whether to allocate the available seed for crushing in East Africa to the thirteen millers existing prior to the release of the industry from the Control of Industries Order, or whether to allow the twelve new mills, which had been erected since the Order was repealed, to have a share in the allocation. The decision was made that the new mills should not be given allocations of seed, as the crushing of smaller amounts of seed by a larger number of firms would lead to uneconomic operation.[9] At the same time an attempt was made to remove unsatisfactory millers from the industry by excluding firms who obtained less then 20 gallons of refined oil from each ton of cottonseed. But the average output of refined oil by millers in 1965 was found to be 32 gallons per ton of cottonseed and it is doubtful therefore whether any firms were excluded under this regulation.

A new legal notice was introduced in 1948,

which allowed only replacement of existing machinery by the oil millers.[10] This prevented any further firms from entering the industry, but did nothing about those already in existence who had not been able to obtain an allocation of seed. By 1950, the control of the oil milling industry had become such an administrative burden to the Government that renewed efforts were made to free the industry from all controls. At last, in 1953, the industry was finally freed from all controls, and responsibility for the sale of cottonseed was placed in the hands of the Lint Marketing Board which had been established in 1949.[11] Other oilseeds were to be sold through the produce traders on a free market.

The attractiveness of the oil milling industry to the Asian community in the immediate post-war period is explained by the apparent profitability of the industry at that time. The price formula for determining the price to be paid to the miller for his oil was calculated in 1947 on the basis that the millers produced on average 16 gallons of oil from each ton of cottonseed.[12] This was changed to 24 gallons per ton of seed in 1950. These formulae were in fact very favourable to the miller and yielded a high profit, which is not surprising as much higher yields of oil could be obtained from the cottonseed. In 1965, the millers were found to be obtaining around 32 gallons of oil per ton of seed crushed. In addition to this factor, the market for oil was guaranteed by the Government in the immediate post-war period, and thus the industry was doubly attractive to the millers at that time.

However, those who had obtained entry into the industry in the war and immediate post-war period were to experience a period of intense competition, in particular in the purchasing of their cottonseed when the industry was finally freed from all controls in 1953.

The millers were now required to bid for their cottonseed at monthly intervals during the cotton season at auctions arranged by the Lint Marketing Board. Initially two zones were used for the sale of cottonseed, the B.P. 52 variety only being sold to millers west of the Nile, while the S. 47 variety was only sold to millers east of the Nile. This meant that for the seasons 1953-4 to 1957-8 there were separate competitive groups of millers east and west of the Nile, the eastern group being led by the Jinja millers, and the western group by the Kampala millers.

During the first season when cottonseed was sold through the Lint Marketing Board, 1953-4, agreement was reached through the Uganda Oilmillers

Association as to the sharing of the seed amongst the millers, but in the 1954-5 season no agreement could be reached amongst the millers, and the cotton-seed was auctioned and sold to the highest bidders.

There was intense competition for cottonseed amongst the millers at the auctions, and prices paid for seed were very high. In the 1957-8 season the millers west of the Nile formed another pooling agreement, and prices paid for cottonseed west of the Nile showed a considerable fall as compared with prices east of the Nile.

These zoning arrangements, based on the fear of the Government that varieties of seed for planting might become mixed if millers were free to crush both varieties of seed, were revoked from the 1958-9 season onwards, and this now meant that there was one competing group of millers for all the cotton-seed. This marked the beginning of the sharp decline of oil mills in Kampala, as the Jinja millers now began to outbid the Kampala millers at the auctions. Prices paid for cottonseed continued to rise; and more and more of the smaller millers found themselves in financial difficulties. At this time the larger millers appear to have been off-setting their losses on oil milling against their profits from some other enterprise, and thus were able to survive this period of abnormally high prices for cottonseed.

An attempt was made by the millers through the Uganda Oilmillers Association to form a third pooling agreement for the 1961-2 season, so that allocations of seed could be made to all millers and also so that seed prices might be held down. However, after the first few auctions of the season the agreement was broken, and in later seasons no further pooling agreements were made.

The intense competition for cottonseed continued, and a number of milling firms went into voluntary or forced liquidation. The Jinja millers continued to dominate in the purchases of seed, and more and more Kampala millers ceased to operate. The responsibility for the Uganda Oilmillers Association fell into the hands of the Jinja millers in 1965, and since that time no Chairman or Secretary has been appointed to the Association, which may be considered in 1966 as defunct. There is therefore now no voice for the grievances of the smaller millers.

In 1966, the industry appeared to be dominated by four large millers in Jinja, often termed "the big four". There seems to be some measure of agreement between these firms and the 14 or so others which still operate in Uganda. In the 1965-6 season, 70,000 out of a total of 100,000 tons of cottonseed

were sold by private treaty by the Lint Marketing Board to one of the "big four". The cottonseed was then divided amongst the millers in proportion to their purchases in the previous season and those in the earlier part of the 1965-6 season. However, there is no reason to believe that this group of millers will continue to agree amongst themselves. Meanwhile, in 1966, there are a large number of mills that remain silent in both Buganda and the Eastern Region. Some millers have sold their machinery, while others hang on hoping that oil milling conditions may become more favourable in the future.

The waste of resources involved in the shutdown of these oil mills is unfortunate, and lessons should be drawn from the factors which led to this wastage. The main factor appears to have been the high profitability of oil milling in Uganda when the industry was under Government control in the immediate post-war period. This led to a clamour amongst Asian businessmen to enter the industry, and ultimately when the industry was freed from all controls to a mass entry of firms, leading to the intense competition, rising prices for seed, and the inevitable losses. Another factor was the inability of the Government to cope with the situation as it arose. A warning of what was to follow first came when the industry was removed from the Control of Industries Order, and around twelve new oil mills were immediately erected, but even though the Government was troubled by allocating small amounts of seed to a larger number of firms even then, they did nothing to prevent further entry of firms into the industry.

While one feels sympathetic towards those millers who have been forced out of the industry, as will be seen later, even the eighteen remaining firms in 1965 were operating at well under capacity, and there would seem to be no case for continuing to support a periphery of small firms in the industry by allocating cottonseed amongst all who claim to be oil millers.

B. The Growth of the Industry

The number of firms recorded in the Registry of Companies with oil milling as an activity in their Articles of Association, together with the dates of incorporation of the firms give the figures in Table 2.1.

Table 2.1

Period	No. of Firms entering Industry	No. of Firms leaving Industry*	Year	Cumulative No. of Firms
before1940	6	-	1940	6
1940-45	12	-	1945	18
1946-50	8	1	1950	25
1951-55	18	-	1955	43
1956-60	5	4	1960	44
1961-65	1	9	1965	36

* This represents firms going into liquidation

Source: Registry of Companies Kampala, Uganda.

These figures have two limitations. Firstly, a number of firms which have now been liquidated may have been excluded, and secondly some of the firms may no longer be engaged in oil milling. There is no means of telling from the files in the Registry of Companies whether an oil mill is still active.

However, if these figures are considered together with the figures of the number of purchasers of cottonseed from the Lint Marketing Board, it is possible to find the percentage of these mills which were at any point in time, active in oil milling. These figures are shown in Table 2.2.

Table 2.2

Year	No. of Ugandan Purchasers
1955	35
1957-8	11
1958-9	12
1959-60	24
1960-1	20
1961-2	34
1962-3	20
1963-4	16
1964-5	18
1965-6	17

Source: Private Communication with the Lint Marketing Board.

Table 2.1 shows that new entrants to the industry reached a peak in the 1951-5 period, immediately after the industry was freed from all controls. This evidence is backed up by that given by the eighteen operative millers in 1965 for their purchases of expellers over the period 1940-65. This is shown

in Table 2.3.

Table 2.3

Period	Actual No. of Expellers Bought	Cumulative Total of Expellers
1940-45	10	10
1946-50	22	32
1951-55	58	90
1956-60	25	115
1961-66	12	127

Source: Evidence from the millers.

After the 1951-5 period, the number of new firms entering the industry declined, and the number of firms leaving the industry due to voluntary or forced liquidation steadily increased.

In 1955, thirty-five out of a total of forty-three (or 81 per cent) of the firms purchased some cottonseed from the Lint Marketing Board. By 1960, only twenty-four out of forty-four (or 55 per cent) of the firms purchased cottonseed, while in 1965 eighteen out of thirty-six (or 50 per cent) of the firms purchased cottonseed.

Thus the impression is one of a declining oil milling industry both in terms of the absolute number of firms registered with oil milling as an activity in the Registry of Companies and in terms of the activity of those who were registered. These conclusions are in no way invalidated by the surprisingly high number of firms purchasing cottonseed in the 1961-2 season. In that season thirty-four out of approximately forty firms purchased cottonseed, yielding a considerably higher percentage of active firms than in either 1960 or 1965. However, this much greater participation by the firms in the industry was a direct result of the pooling agreement in that season organised through the Uganda Oilmillers Association.

C. Supplies of Seed to the Industry

1. Cottonseed. Cottonseed is the major oilseed used in the oil milling industry in Uganda. All cottonseed has been the property of the Lint Marketing Board since 1953, and it is from this Board that the millers make their purchases. The total amounts of 'AR' and 'BR' seed sold to the millers by the Lint Marketing Board are shown in Table 2.4. These include small sales of seed to Kenyan millers in some years.

Table 2.4

	'AR' Cottonseed	'BR' Cottonseed[a]	Total (Tons)
1954-5	87,651	-	-
1955-6	110,500	-	-
1956-7	114,595	-	-
1957-8	107,381	-	-
1958-9	125,410	-	-
1959-60	105,190	13,322	118,512
1960-1	108,321	9,638	117,992
1961-2[b]	35,709	8,592	44,301
1962-3	101,055	11,604	112,659
1963-4	104,982	13,283	118,265
1964-5	118,714	13,116	131,830

a. Prior to the 1959-60 season sales of 'BR' seed, i.e. stained cottonseed, were not registered through the L.M.B.

b. This was the year of flooding.

Source: Lint Marketing Board, Annual Reports 1955-65, (Uganda Argus Ltd., Kampala, Uganda)

All imports of cottonseed are banned, lest such imports should lead to a mixing of varieties in Uganda, and exports of cottonseed have ceased because of the high ruling prices in Uganda. Evidence from traders indicates that prices for cottonseed in Uganda must fall to around Shs. 300 per ton in order to make exports outside East Africa profitable. However, since the 1958-9 season, prices for 'AR' cottonseed in Uganda have been continually above this level. A few Kenyan firms have made small purchases of cottonseed in recent years, although, except for the 1961-2 season, prices for cottonseed in Uganda have been consistently above those in Kenya. There have been no sales of cottonseed to Tanzania. Figures for exports and sales to Kenya are shown in Table 2.5.

Table 2.5

	Exports of Cottonseed Outside East Africa (tons)	Sales of Cottonseed to Kenya (tons)
1955	37	-
1956	14,606	-
1957	1,396	-
1958	402	298
1959	-	-
1960	39	-
1961	-	-
1962	-	132
1963	-	229
1964	-	-
1965	-	-

Source: East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya, 1955-65. (Commissioner of Customs and Excise, East Africa)

Tables 2.4 and 2.5 indicate that a very high percentage of the marketable surplus of cottonseed in Uganda is sold to the Ugandan millers. It seems unfortunate that no imports of cottonseed were allowed for oil crushing in the light of the excess capacity in the industry. In the early 1950's, when the industry was critically short of seed, supplies of seed were readily available in the Mwanza region of Tanzania. A large oil milling industry has now emerged centred on Mwanza, and the opportunity to obtain supplies of seed from Mwanza Region has been lost.

As noted earlier, prices paid by the millers for cottonseed have been strongly influenced by the intense competition amongst millers to obtain seed. These average prices are shown in Table 2.6 It will be noted that no distinction has been made between the two varieties of cottonseed since the 1958-9 season.

Table 2.6 (Shs./Ton)

Season	'AR' Cottonseed BP 52	'AR' Cottonseed S 47	'BR' Cottonseed
1953-4	310	285	-
1954-5	570	484	-
1955-6	400	376	-
1956-7	452	438	-
1957-8	281	364	-
1958-9	363	359	-
1959-60	467		424
1960-1	468		392
1961-2	354		396
1962-3	455		342
1963-4	403		244
1964-5	499		373
1965-6	513		-

Source: Lint Marketing Board, Annual Reports, 1954-65, (Uganda Argus Ltd., Kampala, Uganda)
Also private communication with the Lint Marketing Board.

It is interesting to note, from Table 2.6 the effect which pooling agreements have had on the prices of cottonseed. The 1957-8 pooling agreement in the BP 52 zone led to a fall of over Shs. 170 in the price received for BP 52 cottonseed as compared with the price of the previous season, while prices in the S 47 zone only fell around Shs. 70. The 1961-2 pooling agreement led to a 24 per cent fall in the price as compared with the previous season, the price returning to almost its 1960-1 level in 1962-3. Another interesting effect of the pooling agreement in 1961-2 was that 'BR' seed prices actually exceeded 'AR' seed prices on average. The higher price for 'BR' seed was the result of a short crop in that year. Initially 'AR' prices were low due to the pooling agreement, but when the agreement broke down in the latter part of the season, and the millers realized the severe shortage of cottonseed for crushing, prices bid for 'BR' seed rose sharply and actually exceeded those paid for 'AR' seed in the earlier part of the season.

Cottonseed prices reached an all time high in the 1965-6 season. Prices of Shs. 595, 575 and 545

were received for seed sold at the first three auctions of this season, Shs. 595 being a record price for cottonseed in Uganda.[12] The remaining seed, as mentioned earlier, was sold by private treaty at Shs. 490, giving an overall average price of Shs. 513 for the season. The prices at the first three auctions indicate that intense competition for seed still continued in the industry.

It is also interesting to compare the number of firms making purchases of cottonseed (see Table 2.2) and the changes in price. In 1960, the number of purchasers doubled as compared with the previous year and cottonseed prices rose by 30 per cent. Apart from that year, the number of purchasers does not seem to have been an important factor in determining cottonseed prices.

The intense competition for seed, leading to high prices has undoubtedly been in the best interests of the Lint Marketing Board. In every year since the Lint Marketing Board became responsible for the sale of cottonseed, the accounts of the Board have shown a trading loss on cotton lint offset in part or wholly by a trading profit on cottonseed. These figures are shown in Table 2.7.

Table 2.7

(in £)

	Trading Losses on Cotton Lint	Trading Profits on Cottonseed	Gross Trading Loss
1954-55	320,640	1,578,144	-1,257,504
1955-56	656,697	1,222,389	- 565,692
1956-57	1,379,936	1,544,476	- 164,540
1957-58	3,507,545	834,776	2,672,769
1958-59	3,454,748	1,087,149	2,367,599
1959-60	619,242	1,778,822	-1,159,580
1960-61	2,326,711	1,552,091	774,620
1961-62	1,732,102	229,625	1,502,477
1962-63	4,149,060	1,353,835	2,795,225
1963-64	1,983,651	1,401,523	582,128
1964-65	4,122,447	2,256,359	1,866,088

Source: Lint Marketing Board, Annual Reports, 1955-65. (Uganda Argus Ltd. Kampala, Uganda) See Trading Account.

It is particularly interesting to study these figures in the light of the price figures given in Table 2.6. Low prices in 1957-58 and 1961-62 caused trading profits on cottonseed to fall below £1 m, while the 1964-65 price of Shs. 499 raised profits on cottonseed to more than £2 m. As the price which the Government can offer to growers for their seed cotton depends partially on cottonseed prices, strong competition amongst millers has helped to

maintain these prices.

The price margin between 'AR' and 'BR' seed in the period 1959-60 to 1964-5 varied between Shs. 43 and Shs. 159 excluding 1961-2. The difference in the amount of oil produced from one ton of 'AR' and 'BR' cottonseed is around 67 lbs of oil, which, valued at 90 cents per lb, gives a margin of around Shs. 60 in favour of 'AR' seed. However, the cake may be of inferior quality in the case of 'BR' seed. It is doubtful whether there is a cost advantage in the crushing of 'BR' seed, otherwise presumably competition for 'BR' seed would narrow the margin between 'AR' and 'BR' prices. What is probably happening is that millers are mainly concerned with obtaining 'AR' cottonseed, and that the competitive force is not so great in the 'BR' market, as 'BR' seed forms only 10 per cent of the total cottonseed available. The exception to this was in 1961-2, when as the millers realised the shortness of the crop, intense competition developed for 'BR' seed, and 'BR' prices actually exceeded 'AR' prices.

In Table 2.8 changes in the prices of cottonseed paid by the millers are compared with changes in the prices of cottonseed cake and of oil.

Table 2.8

Season	Prices of 'AR' Cottonseed[a] Expressed as % of previous yr	Prices of cottonseed cake[b] as % of previous year	Prices of oil[c] as % of Previous year
1954-5	176.9	109.5	-
1955-6	74.1	92.1	-
1956-7	114.8	89.7	-
1957-8	72.7	69.5	-
1958-9	113.9	138.4	-
1959-60	129.8	103.0	-
1960-1	100.2	90.4	-
1961-2	75.6	112.8	-
1962-3	128.5	109.4	80.6
1963-4	88.6	95.7	110.1
1964-5	123.8	105.4	140.7
1965-6	102.8	-	84.9

Sources: a. Table 2.6. Average of BP52 and S47 prices used for 1954-8.

b. Calculated from quantity and value data given in E.A. Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya, 1955-65. (Commissioner of Customs and Excise East Africa)

c. Calculated from figures given by millers.

The figures of Table 2.8 indicate that millers appear to be aware of the ruling price for cottonseed cake in the world market, and are to some extent influenced in their bidding at the auctions by these prices. For the eleven years considered, cottonseed prices and cake prices only moved in opposite directions in the seasons 1956-7, 1960-1 and 1961-2. The 1961-2 perverse movement was undoubtedly caused by the pooling agreement in that year.

Unfortunately only a limited amount of data is available on oil prices, but the four years given do not indicate a direct relationship between cottonseed prices and oil prices. This is probably to be expected, as oil prices are very flexible and may change overnight, and therefore the miller is unlikely to consider current oil prices when deciding the price he is willing to bid for cottonseed. However, the miller may consider the previous season's oil price, but there is insufficient data available to put this to the test.

Table 2.9 shows the share of the total amount of cottonseed taken by 'the big four' and the remaining purchasers.

Table 2.9

Season	% of 'AR' Seed Taken by 'The Big Four'	% of 'AR' Seed Taken by Other Purchasers	No. of Other Purchasers [a]
1957-8	95	5	7
1958-9	87	13	8
1959-60	71	29	20
1960-1	74	26	16
1961-2	63	37	31
1962-3	74	26	18
1963-4	80	20	13
1964-5	75	25	16
1965-6	78	22	14

Source: Private communication with the Lint Marketing Board.

a. Kenyan millers are included in this total, but only account for very small percentages in the seasons 1961-2 to 1965-6 inclusive.

These figures indicate the extent to which 'the big four' dominate the seed purchasing market, accounting for 77 per cent on average of the purchases of all millers from the Lint Marketing Board over the period 1957-8 to 1965-6. It is almost certainly these four firms who dictate the prices in the market, and whose lead other millers must follow if they are to purchase any seed. If the smaller mill-

ers were to offer lower prices at the auctions, they would be outbidden by 'the big four'. However, the smaller firms usually have higher operating costs and less opportunity to offset their losses in oil milling against profits from another enterprise and so are unable to outbid 'the big four' at the auctions. In this situation, the smaller millers must become followers of 'the big four' if they are to make any purchases of cottonseed at all.

'The big four' can hold a monopsony position in the seed buying market, while prices continue at a high level. Tanzanian millers are not permitted to import supplies of cottonseed, and while prices in the Lake Area continue to be lower than those in Uganda, the Lake Area seed will obviously be more attractive to the few Kenyan millers who purchase cottonseed than the Ugandan seed. Further, high prices prohibit competition for seed from the exporters. Thus 'the big four's' hold on the market is virtually assured while they are willing to pay high prices for their seed, but a fall in prices could well lead to not only increased competition from other millers in Uganda, but also to increased competition from Kenyan millers and exporters.

2. Groundnuts. Groundnuts are of only comparatively minor importance to the Uganda oil milling industry, because of the difficulty of obtaining supplies at a price which enables them to be crushed profitably. They are purchased by the millers on the free market.

In 1965, 600,000 acres of groundnuts were planted in Uganda yielding around 178,600 tons of groundnuts.[14] A large proportion of these groundnuts were consumed directly in the producing areas. The groundnuts which came on to the market were either sold for consumption shelled or unshelled in the towns, sold for export shelled and graded or were crushed by the oil millers.

No figures are available for the quantity of groundnuts purchased for consumption, but this is believed to account for a large percentage of the marketed groundnuts. Indeed, it appears more profitable for the millers to purchase groundnuts, shell the nuts and then re-sell, than for the millers to crush the groundnuts.

If we consider the product of one ton of groundnuts -

2240 lbs of groundnuts gives:
806.4 lbs oil (36 per cent rate)[15]
and 1232.0 lbs cake (55 per cent rate).[15]

Valuing the oil at Shs.1 per lb and the cake at Shs. 620 per ton (these are the highest prices likely to be obtained) the revenue would be:

from oil	806.40
from cake	341.00
Total Shs.	1,147.40

Allowing for crushing costs at Shs. 60 per ton[15] this gives a total revenue of Shs. 1087.

The average prices for shelled groundnuts are shown in Table 2.10.

Table 2.10

Season	Price in cts/lb	Price in shs/ton
1961-62	48	1075.20
1962-63	44	985.60
1963-64	48	1075.20
1964-65	69	1545.60
1965-66	60	1344.00

Source: Department of Agriculture, Entebbe, Monthly Price Bulletins for 1961-6) (Unpublished) Prices taken for Kampala.

Note: The season applies to the groundnut season operating from the middle of the year.

Even allowing a margin of Shs. 25 per ton for shelling costs, it would have been barely profitable for millers to crush groundnuts in most years, and would certainly have been far less profitable than shelling and re-selling from mid-1964 onwards.

The prices received for exported groundnuts together with the quantities exported are shown in Table 2.11. (Sales of groundnuts to Kenya and Tanzania have only amounted to a few hundred tons)

Table 2.11

	Export Price f.o.r. Mombasa Shs/Ton[a]	Export Price less Transport Cost to Coast Shs/Ton[b]	Quantity Exported[a] in Tons
1960	1156	1084	9507
1961	1182	1110	9179
1962	952	880	7247
1963	1052	980	3500
1964	1174	1102	3804
1965	1556	1484	316

Source: [a] East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya 1960/5 (Commissioner of Customs & Excise, E. Africa)

[b] East African Railways and Harbours Tariff Book No.4 Part II (Aread Lithographic Printers, East Africa) Cost from Jinja to Mombasa.

These figures show that export prices are in most years insufficiently high as compared with local prices to make large scale export of groundnuts attractive. A comparison of the returns from crushing and those from exports indicates that in some years exports have been more worthwhile. However, it would seem that it is local prices rather than export prices, which are having the major influence on the quantity of groundnuts crushed by the millers. A further factor limiting the quantity of groundnuts crushed in the 1960's may be fear on the part of the millers over selling their groundnut cake if it contained aflatoxin. The millers would therefore tend to shell and re-sell groundnuts rather than crush them.

In 1963, a total of 6,200 tons of unshelled groundnuts was purchased by the oil millers, and probably around 5,500 tons were actually used during that year.[16] The amount of groundnut cake sold through the Kampala Produce Exchange in 1963 was 1,483 tons.[17] Using a 55 per cent extraction rate for cake from groundnuts, this would imply that around 2,700 tons of groundnuts were crushed by the millers in 1963, leaving a total of 2,800 tons which the millers shelled and then re-sold.

In 1964 the millers used around 5,300 tons of unshelled groundnuts.[18] (A price of 29 cts per lb was assumed.[19]) A total of 1,577 tons of groundnut cake was sold through the Kampala Produce Exchange in that year,[20] and only 590 tons are recorded for total sales in the trade figures.[21] Again using a 55 per cent extraction rate, these figures indicate that in 1964 around 2,900 tons of groundnuts were crushed, and around 2,400 tons shelled and re-sold by the millers.

In 1965, the oil millers claimed to have crushed nearly 5,000 tons of groundnuts, but only 1,050 tons of groundnut cake were sold through the Kampala Produce Exchange in that year,[22] and the trade figures only show total sales by Uganda of 800 tons of cake.[23] Thus it seems unlikely that more than 2,000 tons of groundnuts were crushed in 1965, and the 5,000 tons probably refers to purchases for crushing and shelling and re-sale.

Thus in recent years, the millers appear to have been purchasing around 5,000 tons of groundnuts each year, 2-3,000 tons of which are crushed, and the remainder of which are shelled and then re-sold.

3. Other Oilseeds. These include sesame seed, sunflower seed, shea butter nuts and castor seed, all of which are only crushed by a small number of millers in very small quantities. The seeds are purchased by the millers on the free market.

The most important of these lesser oilseeds in

Uganda is sesame seed, which as far as the millers are concerned is very similar to groundnuts. In the early days of the oil milling industry in Uganda, sesame seed appears to have been more important than it is now, but no exact figures are known. In 1965, the millers claimed to have crushed only around 400 tons of sesame seed. The reason given by the millers for not crushing larger quantities of this seed, was that they could not obtain supplies of the seed. What is probably meant is that supplies cannot be obtained at such a price as to make crushing profitable.

The average prices received for sesame seed in Kampala are shown in Table 2.12.

Table 2.12

Season	Price in cts/lb	Price in Shs/Ton
1961-2	49	1097.60
1962-3	56	1254.40
1963-4	52	1164.80
1964-5	51	1142.40
1965-6	61	1366.40

Source: Department of Agriculture, Entebbe, Monthly Price Bulletins, 1961-6, (Unpublished)

Note: Season operates from July to June.

Assuming that the same revenue would be received as from crushing groundnuts i.e. 1087 Shs. per ton, from mid-1961 onwards the revenue would be insufficient to offset the cost of purchasing the sesame seed.

Some clue as to the amount of sesame seed crushed may be obtained from considering the sales of sesame oil for export and to Tanzania and Kenya. Unfortunately no estimates of the amount of sesame oil produced and consumed in Uganda are available. The figures for sales to other countries are shown in Table 2.13.

Table 2.13

Year	Total Sales of Sesame Oil to Other Countries in Tons	Amount of Sesame Seed Required to Produce This Oil (36% rate) in Tons
1960	10.8	30
1961	60.2	167
1962	-	-
1963	0.4	1
1964	14.6	41
1965	10.0	28

Source: East African Customs and Excise Annual Trade Reports of Tanganyika, Uganda and Kenya, 1960-5 (Commissioner of Customs and Excise, East Africa)

These figures only put a minimum, though, on the amount of sesame seed crushed. It is thought that probably 500 tons is the maximum amount likely to have been crushed in any year. While prices for sesame seed remain above 50 cts per lb, it is unlikely that crushing of this seed will increase.

Only two millers in Uganda claimed to have crushed sunflower seed at some time, and in 1965 only one firm was crushing this seed. This firm was experimenting with the seed, and had crushed 15 tons. Only small amounts of sunflower seed have been sold to other countries by Uganda.

Shea butter nuts are obtained from a tree often growing wild in parts of Northern Uganda. The crop appears to be very spasmodic, and it appears that millers may crush a few hundred tons of this seed to provide oil as a base for soap manufacture. (The oil produced is not an edible oil.) The cake is used for manure.

A total of four firms in Uganda had at some time crushed this seed, and in 1965 the millers claimed to have crushed 250 tons.

Only one firm in Uganda has crushed castor seed, this firm crushing around 100 tons each year. The oil is used for industrial and medicinal purposes, and the cake for manure. Crushing of castor seed is rather specialized and expellers used for this purpose must be very thoroughly cleaned before being used for crushing of other seeds. Possibly one of the major reasons for the limited scale of castor seed crushing is the established export market for the seed. (Only small amounts are sold to Kenya and none to Tanzania). Quantities exported together with prices are shown in Table 2.14.

Table 2.14

	Exports of Castor Seed in Tons	Price in Shs/Ton f.o.b. Mombasa
1960	1684	1076
1961	1720	1090
1962	2581	876
1963	2505	828
1964	1967	900
1965	1618	858

Source: East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya, 1960-5. (Commissioner of Customs and Excise, East Africa).

These prices are favourable when compared with the average price for castor seed in Uganda. See Table 2.15.

Table 2.15

	Price in cts/lb	Price in Shs/Ton
1961	39	873,60
1962	29	649.60
1963	33	739.20
1964	34	761.60
1965	29	649.60
1966	33	739.20

Source: Department of Agriculture, Entebbe, Monthly Price Bulletins, 1961-6. (Unpublished) Average prices for Kampala.

Even allowing for the cost of transport of Shs. 75 per ton to the coast, export of castor seed would have been profitable throughout the period 1961-5. If, though, prices continue to fall on the export market, crushing may become more worthwhile. Even so the skill and care required to crush this seed may limit its crushing to a small number of firms.

Footnotes

1. Private communication.
2. Report of the Uganda Cotton Commission, 1938. (Government Printer, Entebbe, Uganda, 1939.)
3. Information from Sir Amar Maini's Files, Makerere University College Library. (Unpublished)
4. Ibid
5. Ibid
6. Ibid
7. Ibid
8. Ibid
9. Ibid
10. Ibid
11. Ordinances and Subsidiary legislation, 1949. (Government Printer, Entebbe) p.251.
12. Sir Amar Maini's files, op.cit.
13. Private communication with the Lint Marketing Board, Kampala.
14. Work for Progress, Uganda's Second Five-Year Plan, 1966-1971. (Government Printer, Entebbe)
15. Evidence from the millers.
16. Statistics Division, Ministry of Planning and Community Development, Survey of Industrial Production, 1963. (Government Printer, Entebbe, October, 1965.)
17. Kampala Produce Exchange, Monthly Reports, 1963. (Unpublished).
18. Statistics Division, Ministry of Planning and Community Development, Survey of Industrial Production, 1964. (Government Printer, Entebbe, December, 1966.)
19. Department of Agriculture, Entebbe, Monthly Price Bulletins, 1964. (Unpublished) Average Price for Jinja.
20. Kampala Produce Exchange, Monthly Reports, 1964. (Unpublished).
21. East African Customs and Excise, Annual Trade Report of Tanganyika, Uganda and Kenya, 1964. (Commissioner of Customs and Excise, East Africa).

Footnotes

(contd.)

22. Kampala Produce Exchange, Monthly Reports, 1965. (Unpublished)

23. East African Customs and Excise, Annual Trade Report of Tanganyika, Uganda and Kenya, 1965. (Commissioner of Customs and Excise, East Africa.)

24. East African Railways and Harbours, Tariff Book No. 4. Part II (Aread Lithographic Printers, East Africa.)

CHAPTER III

THE OPERATION OF UGANDAN MILLS

A. Techniques of Production

There are three stages in the production of an edible oil from an oilseed, the first consisting of the pretreatment of the seed, the second of the extraction of the oil from the seed and the third of the refining of the oil to produce an acceptable product for edible purposes.

1. Pretreatment. Under the heading of pretreatment are included the processes of cleaning, delinting, decortication, and storage of the seed.

Seed delivered to the oil mill will often contain quantities of dirt, stones and tramp iron, which may contaminate the oil and do physical damage to the extraction machinery. One method of preventing damage from tramp iron is to have a magnet fixed to the decorticator. For removing dirt and stones cleaning machinery is required. Most of the decorticators in use in Uganda make use of this magnet device, but not many firms appeared to make use of cleaning equipment.

The delinting process only applies to cottonseed and involves the removal of the lint which remains on the seed after ginning. If this lint is not removed, the cake will have a higher fibre content, and thus be of poorer quality. Although delinting is highly desirable, it does not generally prove to be economic in Uganda with the high costs in terms of power required to operate the delinting machinery and the rather uncertain market for the product (the linters). In 1965 twelve of the eighteen operative mills in Uganda owned delinting equipment, but only eight were actually making use of the equipment. The inability to use the equipment was the result, not only of the high cost of delinting in terms of power requirements, but also of the fact that many firms had insufficient delinting equipment to delint all the seed which they were crushing.

Decortication involves the removal of the outer shell of the seed. First the husk of the seed is cracked and then the loose husk removed.[1] Although Ugandan cottonseed can be crushed without prior decortication, this usually leads to a lower output of oil from the seed and a poorer quality of cake being produced. Some millers in Uganda do, though, from time to time crush undecorticated seed. Most of the decorticators in use in Uganda consist of rotating knives and with such decorticators the correct setting of the knives is important. If the settings are too close some of the inner part of the seed will be

chopped up, while if too wide whole undecorticated seeds will slip through. It has been suggested[2] that an improved method of decortication is to set the knives so that around 70 per cent of the seed is cracked the first time through the decorticator, and then the remaining 30 per cent unhulled should be fed to another decorticator with knives set to crack the smaller seeds. In fact, only three of the larger firms in Uganda possess more than one decorticator and two of these firms claimed to use this dual method of decortication. These two firms do, though, account together for around 50 per cent of the seed crushed in Uganda.

One test of the efficiency of the decortication process is to measure the amount of oil in the husk. Technologists have suggested that the oil content of the husk should be less than 1 per cent.[3] Unfortunately, only one firm could give information on the amount of oil in the hulls, this firm being one of the two using the dual method mentioned above. They gave a figure of 0.36 per cent, but there is no reason to believe that this figure, satisfactory as it is, reflects in any way the position throughout the Ugandan industry. In fact, as none of the other firms make any such tests, it is probable that they have little idea as to the amount of oil in their husk, and thus of whether the settings of their decorticators are correct. In 1965, fourteen of the eighteen firms possessed decorticators, the remaining four firms making use of grinding mills for removing the outer shell, a rather less efficient method. One of the firms with a decorticator was crushing whole seed.

Although not strictly a process, proper storage of the seed to prevent deterioration is an important prerequisite for efficient milling. As the Ugandan millers do not hold stocks of seed from one season to another, it is short term storage which is relevant. All the millers claimed to have adequate storage to hold stocks of seed comparable with their expelling capacity in the short run. As most of the mills only crush small quantities of seed, this was not surprising, and it is not thought that inadequate storage was leading to any large scale loss of efficiency in the industry.

2. Extraction. The second stage, the actual extraction of the oil from the oilseed, may make use of hydraulic presses, screw presses (expellers) or solvent extractors. The hydraulic press process is comparatively efficient, but is a batch process and labour intensive.[4] The screw press process has in general superseded the hydraulic press, and reduces the amount of oil left in the cake to around 2 per

cent for the most modern expellers and around 6 per cent for older expellers. (As the oil is the most valuable product of the oilseed, and as cake with too high a fat content is often less acceptable, the level of profits and thus the efficiency of the industry depends on the amount of oil which can be extracted). Solvent extraction plant will reduce the amount of oil left in the cake to 1 per cent, and is thus the most efficient process of the three. However, while the capacity of a firm using expellers can be easily increased by adding to the number of expellers or decreased by putting some expellers temporarily out of action, the solvent extraction plant requires a fairly constant supply of seed, and a minimum throughput of at least 9,000-15,000 tons of seed per 300-day year in order for operations to be economic.

The older-type of expellers are used by the smaller firms in Uganda, but some modern expellers are operated by 'the big four'. One firm is considering the possibility of installing a modern solvent extraction plant. With a large number of firms operating often for only a few months of the year, and crushing only small amounts of seed, the use of expellers in the Ugandan industry seems rational. Only 'the big four' crush sufficient seed to possibly justify the use of continuous solvent extraction plant.

A total of 127 expellers were owned by the eighteen millers in 1965, the total for individual firms varying from twenty-five at the one extreme to two at the other.

The average number of tons of seed which can be crushed per expeller per year in the industry, was found by considering the number of expellers owned by each firm and relating them to the claimed crushing capacity of the firm. This gave an average figure of 1,630 tons per expeller per year for all the firms in the industry, and of 1,690 tons for 'the big four'.

Given that the expeller capacity of the older-type expellers is 10 tons per 24 hours for first crushings, and 8 tons per 24 hours for second crushings, this indicates a potential output of 1,333 tons per expeller per year. Thus the figures above are not unreasonable in the light of the fact that 'the big four' own some of the more modern expellers.

Of the expellers owned by the eighteen millers in 1965, 73 per cent were the Rose-Down expellers from Great Britain, 14 per cent were the Krupp expellers from West Germany, 10 per cent were of Indian manufacture and 2 per cent from South Africa. Opinions given by the millers as to the advantages and

disadvantages of the different makes of expellers varied. The popularity of the Rose-Down expeller may be explained, particularly in the early years of the industry, by its availability, but is probably also explained by its price. The average prices of vegetable oil crushing machinery imported into Uganda over the period 1951-65 from the four major countries concerned are shown in Table 3.1.

Table 3.1

Country of Origin	Average Price per cental 1951-1965
Great Britain	£19.9
India	£17.8[a]
South Africa	£26.7
West Germany	£26.8

Source: East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya, 1951-65. (Commissioner of Customs and Excise, East Africa.)

Note: a - includes purchases of second-hand machinery.

Although the Indian machinery appears to be the cheapest, some may be second-hand, and further, Indian machinery, in many cases a copy of the Rose-Down model, is reputed to be less efficient in terms of oil extracted.

Despite its higher price, the German Krupp expeller has become increasingly popular. Some millers claim that it is more efficient than the Rose-Down model, but no test has been made of this statement.

As mentioned earlier in this section, the efficiency of the extraction process is measured by the amount of oil left in the cake. Most millers claimed to leave only 6-7 per cent of oil in cottonseed cake, and 7-9 per cent in groundnut cake, although three firms did give a figure of 7-9 per cent oil in their cottonseed cake. No tests were done to substantiate these claims, but most millers claimed to receive at least 13 per cent oil from their 'AR' cottonseed in 1965. Assuming an oil content of 19-20 per cent for Ugandan cottonseed, the claims of the millers seem to be correct. These figures indicate that given the existing extraction machinery in the industry, the industry was operating fairly efficiently.

3. Refining and Hydrogenation.[7] The purpose of the third stage, refining, is to remove any substances which may be injurious to the consumer from the crude oil. These substances include the free fatty

acids, and colour-, smell-, and taste-giving substances. The amount of these substances in the particular oil depends on the type of oilseed being crushed and on the method of extraction.

The term semi-refined oil (as used in Uganda), refers to oil that has only been neutralized, while that of double-refined oil refers to oil that has been neutralized, bleached and deodorised. Both semi- and double-refined oil are produced in Uganda.

In the process of neutralization, caustic soda is added to the oil under certain conditions so as to remove some of the free fatty acids from the oil and the oil is repeatedly washed to remove all traces of soap. The residue containing the free fatty acids is generally used as soap-stock.

In order to improve the quality of the oil, the oil may be bleached after neutralization by adding quantities of Fullers Earth and active carbon, and finally deodorised by blowing steam through the oil at high temperatures. These latter two processes give an oil which is neutral in both taste and flavour, usually referred to as double-refined or fully-refined oil.

In some cases the miller may take the production process one stage further and hydrogenate his oil. The purpose of hydrogenation is to raise the melting point of the oil, and so make it possible to market a solid fat. The oil should be pre-refined before hydrogenation, and post-refined afterwards. Two Ugandan firms hydrogenate their oil to produce vegetable ghee and solid fats using some cottonseed oil, which unhydrogenated is in a liquid state at normal temperatures.

Normally there will be some losses when the crude oil is refined, the extent of the losses depending on the length of time for which the seed has been stored.[8] Storage over time increases the free fatty acids in the cottonseed, and thus increases the losses in the neutralization process. Overall losses for producing double-refined oil may rise from 5 per cent for fresh seed to 7 per cent for seed held in store, and for semi-refined oil from 4 per cent to 6 per cent.[9] Total losses in hydrogenation including the pre- and post-refining stages amount to around 6.4 per cent.[10]

Information obtained on the industry was not sufficiently accurate to make any estimates of refining losses by millers. Nor was it possible to test the quality of the oils and fats produced, and thus it is not possible to make any conclusions as to the efficiency of the refining process in the industry.

B. Activities of Firms

1. Refining and Hydrogenation. There were eighteen firms crushing oilseeds in Uganda in 1965, of whom only six had plant for producing double-refined oil, and two of these also had hydrogenation plant. One further mill was installing double-refining capacity to be operative in 1966.

This means that in 1965 the operation of twelve of the mills was confined to the production of semi-refined oil, i.e. oil which has been neutralized but not deodorized or bleached. This oil is inferior to double-refined oil, but finds a market for local consumption amongst lower paid groups. As will be shown later some of this oil is re-sold to millers with double-refining plant.

The four firms with double-refining plant concentrated their production almost completely on double-refined oil, while the two firms with double-refining and hydrogenation plant produced both double-refined oil and vegetable ghee. This ghee is a cheap substitute for animal ghee, and finds a ready market with those who cannot afford the animal ghee. One of the firms with hydrogenation plant was also producing solid fats in the form of shortening and margarine.

2. Soap Manufacture. Six of the firms operating in 1965 made use of the soap-stock, produced as a by-product in the oil milling process, as a basis for the manufacture of soap. Three of these firms supplemented their supplies of soap-stock with supplies of copra and palm oil purchased from outside Uganda. Five of the firms were producing ordinary laundry soap, but one firm was producing high quality toilet soap in addition. A seventh firm was planning to install plant for producing both laundry and toilet soap.

3. Grain Milling. Seven of the eighteen firms were also grain milling, maize being the most important crop milled. The link between grain milling and oil crushing results from the relationship between millers and local produce dealers often arising from some other subsidiary activity of the firm. The maize meal is usually sold locally.

4. Groundnut Shelling. This activity practised by six firms in 1965, all except one of which was located in the Eastern Region, was mentioned in Chapter II, Section C.2. Here it was pointed out that the millers shell and re-sell, either for local consumption or for export, around 2,500 tons of groundnuts each year.

5. Tin Manufacture. Two of 'the big four' firms own their own factories for the manufacture of tins for oil and ghee. The tins are constructed from tin-plate imported into Uganda, and not only supply the needs of the firms producing them but also are sold to a number of other millers in Uganda. Prices paid for the tins vary between Shs. 3.10 and Shs. 3.50 for a four gallon tin, which prices appear to be in line with the cost of purchasing similar tins from the Metal Box Co., Ltd. at Thika. One of the two firms was producing 60,000-70,000 tins each year.

6. Other Activities. Eleven of the eighteen firms also operated ginneries, three had interests in sugar plantations, while others had interests in produce dealing, coffee, sisal and tea. Two of the Jinja millers also owned oil mills in Tanzania. All 'the big four' had one of the above activities as a major activity.

7. Past Activities of Redundant Mills. In evidence from ten redundant mills, it was found that none of these firms had owned double-refining plant. Seven of the firms had milled grain, four had produced laundry soap, and two had shelled groundnuts. Only one firm had links with any other major enterprise, this firm being engaged in large-scale sisal production in Tanzania.

C. Size and Structure of Firms

In 1961 the Oil Millers Association listed their member firms into small, medium and large. Of the thirty mills listed as operative at that time, fifteen were classified as small, five as medium and ten as large.[11] However, the criterion used for this classification of firms is unknown.

In Table 3.2 the eighteen firms operative in 1965 are classified according to their total capacities and utilized capacities in that year.

Table 3.2

Capacity in Tons of Seed Crushed	Total Capacity No. of Firms	Utilized Capacity No. of Firms
Under 5,000	1	11
5,000-10,000	9	3
10,000-15,000	4	1
15,000-20,000	2	1
20,000-25,000	-	-
25,000-30,000	1	1
30,000-and over	1	1

Source: Evidence from the millers.

These figures lead to the conclusion that fourteen of the firms may be classified as small in the sense that they had capacities of less than 15,000 tons, and utilized capacities of less than 10,000 tons, the majority falling in the less than 5,000 tons grouping. The four firms with total capacities in excess of 15,000 tons and utilized capacities of more than 10,000 tons are the firms generally referred to in the industry as 'the big four'.

The total capacity of the industry in 1965 was given as 209,500 tons of seed. (This excludes the capacity of redundant firms which amounted to at least another 35,000 tons.) For 1960 the capacity was given as 196,500 tons for the seventeen firms operative in that year, but obviously this figure is subject to a greater degree of inaccuracy due to error of momory.

The utilized crushing capacity claimed by the millers was 139,950 tons in 1965 and 120,500 tons in 1960, of which around 5,000 tons in both years was accounted for by crushings of oilseeds other than cottonseed. The Lint Marketing Board quotes total sales of 118,512 tons in the 1959-60 season and of 131,830 tons in the 1964-5 season (see Table 2.4). It is also interesting to note that it is believed that only 2,000 tons of groundnuts and a few hundred tons of other oilseeds were crushed in 1965 (see Chapter II, sections C.2 and C.3). This indicates that the overall 1965 figure for all oilseeds is either exaggerated by about 5,000 tons or that the millers had an alternative source of cottonseed apart from the Lint Marketing Board.

Total, utilized and excess capacity for all firms operative in the industry in 1960 and 1965 and for 'the big four' are shown in Table 3.3, and are based on figures given by the millers.

Table 3.3

	All Firms		'The Big Four'	
	1960	1965	1960	1965
Total Capacity	196,500	209,500	100,500	107,500
Utilized Capacity	120,500	139,950	82,000	99,000
Excess Capacity	76,000	69,550	18,500	8,500
Utilized Capacity as % of total Capacity	61	67	72	92

Source: Evidence from the millers.

The figures show that 'the big four' were operating at a much higher level of utilized capacity than the industry as a whole. In fact in 1965, 'the

big four' only accounted for 51 per cent of total capacity of all firms but for 71 per cent of utilized capacity of all firms, and in 1960 they accounted for 51 per cent of total capacity of all firms but for 68 per cent of utilized capacity of all firms. The situation in 1965 is particularly striking when 'the big four' were working with 92 per cent utilized capacity while the other fourteen firms were working with utilized capacities of only 40 per cent on average, and it should be remembered that capacities of firms non-operative in 1965 have not been included in the total capacity for that year. There was considerable variation in the utilized capacities of individual small firms in 1965, utilized capacities ranging from 5-88 per cent.

It should not be concluded from the figures of Table 3.3 that there has been an improvement in the industry with respect to utilized capacity between 1960 and 1965. It should be noted that 1965 was an exceptionally good year for cottonseed, and also that non-operative firms have been excluded. If all firms operative in 1960 were included in the 1965 total capacity, this would reduce the utilized capacity for all firms in 1965 to 64 per cent.

Earlier it was shown (see Chapter II, section C.1) that 'the big four' have purchased over 75 per cent on average of the cottonseed sold by the Lint Marketing Board to the millers over the period 1957-8 to 1965-6. This figure is in line with the percentage of total utilized capacity of all firms accounted for by 'the big four' as shown above, and obtained in evidence from the millers.

The total capacity of the six firms with double-refining plant for producing double-refined oil was around 16,000 tons of oil in 1965, and was expected to increase to 30,000 tons in 1966 with the opening of a new plant and the expansion of existing plant by one of 'the big four'. 75 per cent of the capacity in 1965 was accounted for by 'the big four' all of whom owned double-refining plant, and this will increase to 80 per cent in 1966. Production of double-refined oils in 1965 was around 11,300 tons, indicating that all plant was working at 71 per cent of capacity on average. 'The big four' were operating at 90 per cent of capacity in 1965. Again the dominance of 'the big four' is evident.

The capacity of the hydrogenation plant owned by two of 'the big four' was in the region of 5,000 tons in 1965, but was expected to increase to 7,000 tons in 1967. Around 4,000 tons of hydrogenated oils and fats were produced in 1965, indicating that the plant was operating at around 80 per cent of capacity.

Perhaps the overall state of the industry is best reflected by the aspirations in 1965 of the different firms for the future. Three of 'the big four' were planning to increase their capacity if the cottonseed crop increased, one hoped to install a hydrogenation plant, and one was considering replacing their expellers by a modern solvent extraction plant.

Of the other fourteen firms, seven had no plans at all, and two were awaiting a good customer so as to take the opportunity of selling out. One firm planned to increase its capacity if the cotton crop increased, two more firms hoped to install double-refining plant, and the two already possessing double-refining plant hoped to purchase hydrogenation plant.

The dominance of 'the big four' in terms of purchases of seed, utilized capacity and output is evident. Accounting for at least 75 per cent of the activity in the industry, they appear to be the acknowledged leaders of the industry, whose pricing policy with respect to output many of the smaller firms said they followed. The dependence of the smaller firms on 'the big four' is further increased by the need to follow the bids of 'the big four' at the cottonseed auctions, and in some cases by the need to sell their semi-refined oil to be re-refined by firms with double-refining plant. (Sales for re-refining were thought to amount to 580 tons of semi-refined oil in 1965, representing about 4 per cent of the total output of semi-refined oil in that year.)

D. Labour Employed in the Industry

It appears useful to differentiate between three different groups of firms in describing the use of labour in the industry. The first group consists of the leading eight firms with respect to utilized capacity in 1965, the second group of the next six firms, and the third group of the remaining four firms.

The first group, who in 1965 had utilized capacities of from 4,000 - 44,000 tons of seed, employed mainly permanent labour with the exception of one firm which employed only casual labour. This firm appeared to have bought much more seed in 1965 than in any former years. The mills of these firms were operated on a three shift basis, each shift being of eight hours for 10, 11, or 12 months of the year. These firms crushed a total of 122,000 tons of seed of all types in 1965, and employed a total of around 1,500 people. Six of the firms employed over 100 employees each. This indicates an average throughput of 81 tons of seed per year per unit of labour

employed.

The second group of firms, who had utilized capacities from 600-3,000 tons of seed in 1965, employed mainly casual labour. The firms were run on a two shift basis for a period of time depending on the quantity of seed available for crushing and the capacity of the firm's machinery. Altogether, this group crushed a total of 10,000 tons of seed of all types in 1965, and employed a total of around 280 people. This indicates a throughput of 36 tons of seed per unit of labour employed. However this figure is not directly comparable with that given for the first group, as these firms have a shorter working year, and also the labour in these firms is often employed in other activities.

The third group of firms, who had utilized capacities from 200 - 600 tons in 1965, employed only casual labour on a one or two shift basis for a period of 1-3 months, depending on the available seed and capacity of machinery. This group crushed a total of around 1,700 tons of seed of all types, and employed a total of 133 people. This gives an average throughput of 13 tons per unit of labour employed, a low figure for much the same reasons as for group two.

Only five firms out of the eighteen in 1965 said that they paid a wage above the minimum wage as set by the Government, and this most generally took the form of a bonus for seniority, although one firm provided housing, schooling and a whole range of other services for its employees. Four of the firms paying wages above the minimum wage were in the first group of firms as classified above.

The minimum wage rates applicable in Uganda are set out in Table 3.4.

Table 3.4

	1959[a] shs	1962[a] shs	1965[b] shs
Kampala	75.40	120.00	150.00
Jinja	67.60	110.00	150.00
Mbale and Tororo	65.00	104.00	140.00
Masaka	57.00	104.00	140.00
Masindi and Soroti	-	84.50	140.00
Other Towns	-	84.50	130.00

Sources: a. Report of the Minimum Wages Advisory Board, appointed under General Notice no. 927 of 1964. (Government Printer, Entebbe)

b. Laws of Uganda, 1965, Minimum Wages Legislation. (Government Printer, Entebbe)

In addition to rates for the towns, the 1965 Minimum Wages Legislation set out a minimum rate for certain categories of employment outside the towns of Shs 75 per month.[12] Oil milling was one of the categories of employment named. A number of oil mills are situated outside the towns and therefore come under this legislation.

The figures of Table 3.4 show that although in the past the Eastern Region millers have been required to pay lower wages than the millers in Kampala, the 1965 legislation requires both Kampala and Jinja millers to pay equal wage rates. However, the millers in Mbale, Tororo, and Soroti still have a relative advantage in terms of wage-rates, and millers situated outside the towns have a considerable advantage in terms of wage-rates compared with town millers. It is also interesting to note that any Northern miller would only be required to pay Shs 130 per month, if the mill were situated in a town, giving that miller a 20 shilling wage advantage over the millers in Jinja and Kampala.

The total amount of labour employed in the industry was around 1,900 employees in 1965 of whom 1,400 (74 per cent) were permanent employees and 500 (26 per cent) casual employees. This indicates that the level of employment probably fluctuated in 1965 between 1,400 and 1,900 persons during the year, being at its maximum at the beginning of the year when the cottonseed becomes available, and decreasing to a minimum probably in September at the end of the milling season.

The 1963 Survey of Industrial Production,[13] showed an annual average labour force for sixteen oil milling firms of 1,108 employees, which fluctuated from 1,453 employees on March 31st to 808 employees on September 30th.

The 1964 Survey of Industrial Production,[14] showed an annual average labour force again for sixteen firms of 1,179 employees, and of 1,121 employees on December 31st.

Although the two excluded firms from the two surveys account for some of the difference between the figures given by the millers in 1965, and those quoted by the surveys, it seems probable that the former figures have been slightly exaggerated, and that the industry probably does not employ more than 1,000 permanent employees altogether. The

classification of firms according to number of employees for 1963 and 1965 is shown in Table 3.5.

Table 3.5

No. of Employees	No. of Firms 1963[a]	1965[b]
Under 20	5	-
20-49	3	7
50-99	3	4
100 and over	5	6
Total	16	18

Sources: a. Statistics Division, Ministry of Planning and Community Development, Survey of Industrial Production, 1963. (Government Printer, Entebbe, October, 1965.)

b. Evidence from the millers.

It seems probable from these figures that exaggeration as to the number of employees in 1965 mainly came from the smaller firms, presumably because these firms often find it difficult to differentiate between labour used for oil milling, and that used for other activities.

The total wage bill for the industry was Shs 3.0 million in 1963[15] and Shs 3.2 million in 1964.[16] The average annual payments per employee were Shs 2,740 in 1963[17] and Shs 2,810 in 1964,[18] indicating payments of Shs 228 and Shs 234 per month respectively. This indicates that on average wages and salaries were considerably above the minimum wage, but it should be remembered that salaries of managerial staff and skilled technicians are included in this average.

The number of proprietors in any firm varied widely from two to seventeen in 1965. Most of the firms were Asian family businesses, and thus the number was probably guided by family considerations as well as by the size of the non-milling activities of the firm. There certainly seemed to be no correlation between the size of the oil milling enterprise of the firm, and the number of proprietors.

E. Costs of Production and Profitability

Difficulty was experienced in obtaining reliable data on the costs of production in the industry due to the reluctance of the millers to give such information. The costs given in Table 3.6 are taken from the Survey of Industrial Production for 1964.

Table 3.6

	Consumption Costs ('000shs) 1963	1964
Fuels		
Electricity	942	921
Mineral Fuels and lubricants	320	158
Other fuels	124	289
Total	1,386	1,368
Materials		
Cotton Seeds	48,515	46,605
Groundnuts	3,973	3,442
Chemicals	581	385
Packing materials	3,465	3,130
Other materials	11,362	10,761
Total	67,896	64,323
Other Costs		
Consumable tools and parts of machinery	825	1,442
Other current costs	2,070	5,647
Total	2,895	7,089
Grand Total	72,177	72,780

Source: Statistics Division, Ministry of Planning and Community Development, Survey of Industrial Production, 1964. (Government Printer, Entebbe, 1966)

Total payments to labour in cash and in kind amounted to 3,039,000 Shs in 1963 and to 3,493,000 Shs in 1964.[19]

The millers claimed in 1965 that the costs of crushing seed amounted to Shs 50 - 60 per ton of seed crushed, including the costs from when the seed is delivered to the mill to the point at which the crude oil is produced. Other authorities on the industry suggested crushing costs of Shs 40 per ton, although if all overhead costs were included, they suggested crushing costs would be higher than this.

A rough check can be made on the costs of crushing each ton of seed in 1963 and 1964 by comparing total fuel, total labour, and consumable tools and parts of machinery (mainly spares for expellers) costs, with the amount of seed crushed in these years. This gives a figure of Shs 46 per ton of seed crushed for 1963, and of Shs 51 per ton of seed crushed for 1964. Obviously these figures are

only approximations, as some part of the fuel costs should be allocated to refining and other activities, while none of the overhead costs have been allocated to the extraction process, but these figures do seem to bear out the evidence given above.

The evidence given by the millers in 1965, together with the information in Table 3.6, give some idea of the nature of oil milling costs.

The figures of Table 3.6 show that electricity is the dominant source of fuel in the industry, accounting for over two-thirds of the total fuel bill. In 1965, total expenditure on electricity, excluding that generated by two firms from their own generators, was Shs 889,000. All the Ugandan millers were using the husk from their cottonseed to burn in their boilers, only buying wood for this purpose when the husk was finished. Thus the value of the husk to the industry as a source of fuel is considerable.

Costs for materials are obviously dominated by purchases of oilseeds, which accounted for over 77 per cent of these costs in 1963 and 1964. The total amount spent on cottonseed in 1965 was estimated as Shs 62,746,872 (based on production of seed and seed prices in 1965), this increase over the 1963 and 1964 levels being in part due to the increase in the amount of seed crushed, but mainly due to the higher prices in that year. The total amount spent on groundnuts for crushing in 1965 (based on amounts crushed and average prices in Jinja [illegible]) was probably around Shs 1,792,000, but this is not comparable with the figures given in Table 3.6 as groundnuts for shelling and re-sale are not included.

The consumption of chemicals by the industry in 1963 and 1964, most of which would have been used for refining the oil, indicates a consumption of 36 Shs of chemicals per ton of crude oil refined in 1963, and of Shs 22 of chemicals in 1964. Data given by the millers in 1965 was highly erratic, varying from 3 - 349 shs per ton of crude oil refined. One factor affecting these figures is the consumption of chemicals by the soap factories often attached to the oil mills. Two of the mills in Uganda producing double-refined oil quoted the cost in terms of chemicals used for double-refining as Shs 45 and Shs 48.75 per ton of crude oil double-refined. Obviously, the costs for producing semi-refined oil, which only requires caustic soda, would be very much less.

The cost of tins for the oil constitutes much the greater part of the packing materials costs listed, although sacks for the cake and packing mat-

erials for some of the other products produced will also be required. The 1963 and 1964 figures for packing materials in Table 3.6 yield figures of shs 3.65 and shs 3.10 per tin of refined oil produced. With the average price of a tin being shs 3.25, these figures are not unreasonable. In 1965, the millers claimed to have spent a total of 3,896,000 shs on packing materials, which represents a total of shs 3.60 per tin of refined oil produced.

The costs of other materials include the costs of other oilseeds apart from cottonseed and groundnuts, and the costs of materials for other activities of the firms such as maize milling. No estimates of such costs are available for 1965.

The cost of consumable tools and parts of machinery is thought to mainly consist of spares for the expellers. The 1963 and 1964 figures in Table 3.6 indicate an outlay of shs 7.25 per ton of seed crushed in 1963 and of shs 11.80 in 1964. The totals given by the millers in 1965 varied from shs 1.60 to shs 20 per ton of seed crushed. These costs are likely to vary considerably from year to year, and an average over a period of years would probably yield a more realistic figure, but unfortunately such an average is not available.

When the grand totals of consumption costs given in Table 3.6, together with labour costs, are compared with the gross outputs (gross outputs of shs 78,880,000 and shs 79,417,000 are given for 1963 and 1964 respectively in the survey of Industrial Production, 1964 [21]) this gives a positive balance of shs 3,664,000 in 1963 and shs 3,144,000 in 1964. Unfortunately this includes the returns from all the activities of the firms, and therefore does not enable the returns from oil milling itself to be assessed. There have been allegations that in the past the prices paid for cottonseed have been so high, and the prices received for oil so low that it was impossible for any miller to make a profit on oil milling alone. This, it is claimed, was a deliberate design on the part of 'the big four' who effectively control both the prices paid for cottonseed and the price at which the oil is sold in Uganda, to force the smaller firms, who could not continue to operate at a loss, out of business.

If we consider the product of one ton of 'AR' cottonseed; this yields a total of 291.2 lbs of crude oil (a 13 per cent extraction rate is used as it is the plight of the smaller firms which is being considered, and not that of the larger firms who may receive 14 per cent oil from their cottonseed) and of 1120 lbs of cottonseed cake (50 per cent extraction rate).

The total value of the oil, assuming a price of 75 cts per lb for crude oil would be shs 218,and assuming a price of 90 cts per lb for crude oil, shs 262. The total value of the cake is shown in Table 3.7.

Table 3.7

	Average Price of Cottonseed Cake Received by Millers in shs/ton	Total Value of 1120 lbs Cottonseed cake in shs
1960	401	200.50
1961	356	178.00
1962	410	205.00
1963	455	227.50
1964	432	216.00
1965	464	232.00

Source: East African Customs and Excise Annual Trade Reports of Tanganyika, Uganda and Kenya 1960-5 (Commissioner of Customs and Excise, East Africa)
Note: shs 65 per ton has been deducted from the average price for transport to the coast. See East African Railways and Harbours, Tariff Book No.4 Part II (Aread Lithographic Printers, East Africa)

On the basis of these figures, the maximum and minimum returns to the miller in any year can be calculated, see Table 3.8.

Table 3.8

	Minimum Value of Oil and Cake from One Ton of Cottonseed (shs)	Maximum Value of Oil and Cake from One Ton of Cottonseed (shs)
1960	418.50	462.50
1961	396.00	440.00
1962	423.00	467.00
1963	445.50	489.50
1964	434.00	478.00
1965	450.00	494.00

Some idea of the profitability of oil milling in individual years can now be assessed by comparing these figures with the price of cottonseed and crushing costs shown in Table 3.9.

Table 3.9

Season	Prices of 'AR' Cottonseed in shs/ton	Prices plus Crushing Costs of 50 shs	Prices plus Crushing Costs of 60 shs
1959-60	467	517	527
1960-1	468	518	528
1961-2	354	404	414
1962-3	455	505	515
1963-4	403	453	463
1964-5	499	549	559

Source: See Table 2.6 in Chapter II.

With the costs of production of semi-refined oil from one ton of cottonseed being around shs 50, and the price of semi-refined oil having been in almost all years less than 90 cts per lb., the smaller millers who only have semi-refining plant would have operated at a large loss in 1960 and 1961 when the maximum returns from the oil and cake were insufficient even to cover the cost of the seed. In 1963 maximum returns would have been sufficient to cover seed costs, but only a very small margin would have been left for covering crushing costs. Further, prices for oil were extremely low in 1963, being only 90 cts per lb for double-refined oil and it is possible that total returns were in fact below cottonseed prices in that year. In 1964 prices for double-refined oil were still only 1 sh per lb, and thus returns were likely to be near the minimum level of shs 434, which would cover the cost of purchasing the cottonseed, but provide little margin for covering other costs. In 1965, double-refined oil prices rose to shs 1.40 per lb and semi-refined oil prices were possibly as high as 1 sh per lb, in which case maximum returns from one ton of seed would have been 523 shs. As in 1964, while this would cover the cost of purchasing the seed, only a very small margin would remain for other costs. The only year in which returns would appear to have been sufficient to cover all costs, for millers with only semi-refining plant in the 1960's, appears to be 1962 when cottonseed prices fell to the abnormally low level of shs 354 per ton. It should be noted, though, that due to the peculiar circumstances of that year, 'BR' seed prices were on average shs 396 per ton, and it is therefore unlikely that returns from 'BR' seed would have been sufficient to cover costs in that year.

A glance at the figures for the maximum value

of the oil and cake in Table 3.8 shows that a price of around shs 400 per ton for cottonseed over the period considered would have given returns sufficient to cover costs. It is interesting to note here that in the opinion of an official of the Lint and Seed Marketing Board of Tanzania, shs 400 per ton is a fair price to ask the miller to pay for cottonseed given the state of oil and cake prices in 1966.

However, for the millers with double-refining and hydrogenation plant, the position may not have been so critical in the 1960's. The total cost of producing double-refined oil and cake from one ton of cottonseed is about shs 67. This indicates total costs including the seed of the order of magnitude of column 3 of Table 3.9, plus shs 7. The total cost of producing hydrogenated oils and fats from one ton of cottonseed is about Shs 82.

The prices, together with calculations for the amount of revenue obtained from double-refined and hydrogenated oils are shown in Table 3.10. The calculations are based on a 14 per cent extraction rate for oil from the seed (only large millers double-refine and hydrogenate) allowing 6 per cent refining losses for double-refined oil and 7 per cent refining losses for hydrogenated oils and fats.

Table 3.10

	Price of Double-Refined Oil in cts/lb	Minimum Price of Ghee cts/lb	Revenue from One Ton of Seed From Oil (shs)	From Ghee (shs)
1962	112	114	331.35	334.11
1963	91	96	269.22	281.36
1964	100	111	295.85	325.32
1965	140	127	414.19	372.21

Source: Evidence from the millers.

The figures of Table 3.10, together with the value of cake given in Table 3.7, give the following figures in Table 3.11.

Table 3.11

	Returns from Oil and Cake from One Ton of Seed (shs)	Returns from Ghee and Cake from One Ton of Seed (shs)
1962	536	539
1963	497	509
1964	512	541
1965	646	504

A comparison of the figures of Tables 3.9 and 3.11, with the appropriate additions to crushing costs, indicates that the production of double-refined oil would have been highly profitable in every year except 1963. The production of ghee may not have been profitable in 1963 and 1965, although it should be remembered that the price given for ghee was the minimum realised for lowest quality ghee.

Thus there does seem to be some truth in the contention that in Uganda in the 1960's, while the production of semi-refined oil was not profitable, the production of double-refined oil did yield good returns. Thus the millers with double-refining plant could have deliberately bidden cottonseed prices up, so as to make the production of semi-refined oil unprofitable while still being able themselves to obtain a good return from their double-refined oil.

F. Possibilities of Technological Development

The question of technological development in the industry is a difficult one. The life of an expeller is approximately fifty years, and so the problem of the replacement of existing machinery is not likely to arise until the 1990's. With excess capacity as it stands in the industry in 1965, any additional expelling capacity would seem to be redundant.

The problem is to decide whether it is in the interests of the efficiency of the industry for more millers to invest in modern expellers or for some to invest in solvent extraction plant. The problem also must be considered of whether investment in additional double-refining and hydrogenation plant is justified.

1. Extraction Plant. An increase of 1 per cent in the output of oil from the cottonseed increases the revenue from crushing by around shs 20 per ton of seed crushed assuming a price of 90 cts per lb for oil. The cost of a modern expeller crushing around 3,000 tons of seed per year, and leaving $4\frac{1}{2}$ - 7 per cent oil in the cake is quoted as £6,500 f.o.b. U.K. Port.[22] Even if this expeller were to increase the output of oil by only 1 per cent this would lead to an increased potential revenue of £3,000 per year at no greater cost to the miller. Even allowing for high transport costs on such machinery, it would not take many years of operation to cover the initial investment, and with a life-time of over 50 years, such a machine if utilized to capacity would yield a high return on capital.

However, the minimum size of utilized plant for which such an investment would be worthwhile is probably around 9,000 tons, as at least three expellers

are needed to cope with first and second crushings of seed. This means that reinvestment in modern expellers is to be recommended only up to the extent of a firm's utilized capacity, and only for those firms with a utilized capacity in excess of 9,000 tons. A few of the larger "smaller" firms may find it profitable, though, to invest in one such expeller if their utilized capacity exceeds 5,000 tons.

Therefore it is recommended that 'the big four' and the other three millers with utilized capacities of over 5,000 tons should, to the extent that they have not done so already, replace their older expellers by the more modern type. However, care should be taken only to install such machinery to the extent of the firm's utilized capacity.

Only the 'big four' have sufficient utilized capacity for the efficient operation of a solvent extraction plant. However, it is claimed that the market for solvent extracted cake is uncertain, and the price low. Further, the last 1-2 per cent of oil obtained from cottonseed is often of poor quality and can only be used for soap-stock. Under these circumstances the solvent extraction plant may not lead to an increase in revenue. Obviously any firm considering such an investment would need to study these factors carefully. It is believed that groundnuts show greater returns when solvent extracted, but as the quantity of groundnuts crushed in Uganda is so small, this is not relevant in the Ugandan context. It seems unlikely that investment in solvent extraction plant would be worthwhile.

2. Double-refining Plant. In 1965, some of the mills without double-refining plant were showing an interest in investing in such plant. As from 1966, the total capacity of double-refining plant was around 30,000 tons of oil, which is capable of double-refining the oil from over 200,000 tons of cottonseed, assuming an extraction rate of 14 per cent oil from the seed. Thus in 1966 there is sufficient capacity to double-refine all the oil in Uganda. With an estimate of 180,000 tons of cottonseed being available for crushing by 1971 (see Chapter IV section C) no further expansion in double-refining plant is required. Further, most of the smaller firms only have crushing capacities of less than 5,000 tons per year. If a small firm were to own double-refining plant with a capacity of 3,000 tons of oil per year, either the firm would need to buy large quantities of semi- and unrefined oils from other firms, or the plant would operate at very low utilized capacity. Given further that some of the crude oil is utilized by hydrogenation plants, there certainly seems to be no case for any new investment in

double-refining plant.

3. Hydrogenation Plant. Yet other firms, who already own double-refining plant, are interested in installing hydrogenation plant. It is thought that in 1965, the existing hydrogenation plant in Uganda was operating at 80 per cent of capacity. Obviously in part the question of new investment in hydrogenation plant depends on market prospects for ghee and solid fats. In 1964 and 1965 over 400 tons of ghee was imported (see Chapter IV Section A) but it is believed that this is mainly the superior groundnut ghee, and therefore could not be replaced by home-produced ghee. The most important markets for both ghee and solid fats are the Kenyan and home markets, and these markets may be expected to grow with increases in population and the gross domestic product. However, by 1967, a total of around 7,000 tons of hydrogenated oils and fats can be produced by the industry, which is around 3,000 tons above the 1965 level of production. Decisions concerning new investment in such plant should wait for market trends to become more obvious.

In considering these proposals for future investment in the industry, no account has been taken of the opportunity cost of the capital involved. Foreign currency, which would be required for all these investments, is a scarce resource in Uganda, and investment in new plant for the oil milling industry must be considered carefully alongside alternative projects.

A changeover to more modern expellers would give a high return on the capital invested, provided they were fully utilized, and such reinvestment would only at most affect the leading seven firms in the industry. Demands for both refining and hydrogenation plant stem from the desire of certain firms to strengthen their positions in the industry. Although returns would be high if such plant could be fully utilized, it is doubtful if in the 1960's such plants could be fully utilized, and thus the capital involved would in 1967 probably be better spent elsewhere. The question of such investment may be considered again 5-10 years hence when the size of market and the amount of seed available for crushing are known factors.

In conclusion, it is to be recommended that all oil milling firms pay particular attention to the pretreatment of their seed in order to increase their efficiencies. The cost of cleaning equipment is comparatively low (Rose, Downs and Thompson Ltd., of Hull, England, quote the price of cleaning equipment with a capacity of 50 tons per 24 hours, as around £3,000 f.o.b. U.K.) and its use would increase

the efficiency of the industry. Further, adequate, clean storage, and carefully controlled decortication would also increase the yield of oil obtained.

The only reinvestment in the industry that can be justified is the replacement of old expellers with more modern ones by some of the leading firms to the extent only of their utilized capacity.

Footnotes

1. H. Moore and A.S. Moore, Seed Crushing, Compound and Provendor Milling (Northern Publishing Company, Liverpool, 1948).
2. Ibid
3. Private communication.
4. E. Orr and D. Adair, The Production of Protein Products from Oilseeds (Ministry of Overseas Development, Tropical Products Institute, August, 1966).
5. Ibid
6. Information from Mr V.R. Apte, demonstrator in Agricultural Chemistry at Makerere University College, Kampala, Uganda.
7. Information on refining and hydrogenation from a manufacturer of oil milling machinery.
8. Information from Mr V.R. Apte.
9. Information from Mr V.R. Apte.
10. Information from Mr V.R. Apte.
11. Information from an ex-member of the Uganda Oil Millers' Association.
12. Laws of Uganda, 1965 (Government Printer, Entebbe) Statutory Instruments 1965 No. 233.
13. Statistics Division, Ministry of Planning and Community Development, Survey of Industrial Production, 1963 (Government Printer, Entebbe, October, 1965).
14. Statistics Division, Ministry of Planning and Community Development, Survey of Industrial Production, 1964 (Government Printer, Entebbe, December, 1966).
15. Statistics Division, Ministry of Planning and Community Development op.cit.
16. Statistics Division, Ministry of Planning and Community Development op.cit.
17. Statistics Division, Ministry of Planning and Community Development op.cit.
18. Statistics Division, Ministry of Planning and Community Development op.cit.
19. Statistics Division, Ministry of Planning and Community Development op.cit.

20. Department of Agriculture, Entebbe, Monthly Price Bulletins, 1965. (Unpublished)

21. Statistics Division, Ministry of Planning and Community Development, op. cit.

22. Information from Rose, Downs and Thompson Ltd., of Hull, England.

CHAPTER IV

SUPPLY AND DEMAND FOR THE PRODUCTS OF THE UGANDAN INDUSTRY

A. The Supply and Demand for By-Products

1. Linters. The linters are a by-product of the delinting process, and may form as much as 5 per cent by weight of the original cottonseed. As mentioned earlier (see Chapter III Section A) only a small number of firms crushing cottonseed actually delint their seed, and these firms produced a total of around 1.4 million lbs of linters in 1965. Production in other years is unknown.

There is a demand for linters from upholstery manufacturers, but this demand is often fairly localized and limited in size. One firm did report selling its linters to a mattress company in Nairobi but this firm appeared to be the exception rather than the rule. The price received for the linters in 1965 varied from 45 cts per lb in Kampala to 50 - 75 cts per lb in the Eastern Region towns. Almost certainly the limited scope of the market for linters is another factor affecting the millers' decision as to whether or not to delint their cottonseed.

2. Hulls. The husks (or hulls) are a by-product of the decortication process, forming in the case of cottonseed up to 40 per cent by weight of the original seed. Although the husk may be used as a fertilizer, a packing material, or a poor quality cattle-food, these markets are limited and nearly all the Ugandan millers burn their husk in the boilers of their mills. Thus the husk becomes a major source of fuel in the industry, obviating the need for wood or some other fuel to use in the boilers. In a few cases, the husk is also added to the cottonseed cake so as to increase its bulk.

3. Soap-Stock. Soap-stock is a by-product of the refining process, and may account for around 4 - 6 per cent by weight of the crude oil. This residue forms the base for the production of laundry soap, although some millers producing soap also purchase palm and copra oil to improve the quality of the soap. In 1965, a total of five milling firms were producing soap, all except one firm producing only laundry soap. A total of 13,570 tons of soap was produced in 1965 by the millers, the laundry soap being sold at Shs 1,000 - 1,200 per ton, almost all locally. The one firm producing toilet soap, though, did supply a much wider market.

B. The Supply and Demand for Oil Products

The production of oil products by the industry is the most important aspect of the industry, oil being the most valuable product from the crushing of the oilseeds. Various different forms of oil products may be produced, of which in Uganda, liquid oils are the most important. However, hydrogenated oils in the form of vegetable ghee and solid fats are also produced.

Figures for the production, distribution and consumption of these oil products are shown in Tables A.1 to A.5 of Appendix 1 for the period 1963-5, and figures for sales to and purchases from other countries for liquid oils are shown in Table A.6 of Appendix 1 for the period 1955-65.

Overall production of all oil products increased by 14 per cent over the period 1963-5, most of the increase being accounted for by increased production of ghee and solid fats. Over the period 1963-5 the average production of liquid oils was around 13,440 tons, of ghee around 2,640 tons, and of solid fats around 460 tons. Sales of all oil products to Kenya increased over the period, while sales to Tanzania showed a slight decline. Sales of liquid oils on the home market declined, but sales of ghee and solid fats increased, most of this increase accounting for the increased production of these products. The low level of exports for oil products remained unchanged.

Liquid oil was the most important oil product consumed in Uganda over the period 1963-5, amounting to 5,288 tons on average, of which 90 per cent was home produced. There appeared to be a slight decline in its consumption over the period 1963-5. In contrast, the consumption of both ghee and solid fats showed a large increase between 1964-5, mainly supplied from the increased production in the Ugandan industry.

The Liquid Oils Market. The most important markets for liquid oils over the period 1963-5 were Kenya and Uganda,for on average 51 per cent of the liquid oils produced were sold to Kenya and 35 per cent on the home market.

In the past, the Ugandan oil milling industry appears to have dominated in both these markets, but in the 1960's there is reason to believe that the industry in the Lake Area of Tanzania is providing strong competition. There is no fear of strong competition in this field from Kenyan millers, as only around 5,000 tons of cottonseed per year are available for crushing in Kenya, this being augmented by a few thousand tons more purchased from Uganda and Tanzania.

But there were in 1965 a total of seventeen operative oil mills in the Lake Area, three of whom owned double-refining plant. In 1965 these firms produced a total of around 13,000 tons of liquid oils, according to the evidence of the millers, almost the same quantity as that produced by the Ugandan millers, but most of the production was in the form of semi-refined oil, only around 2,800 tons of double-refined oil being produced. However, Lake Area millers only sold in 1965 a total of 2,868 tons of liquid oils to Kenya, compared with Ugandan millers' sales of 7,305 tons to Kenya, and thus it appears that Ugandan millers were in the stronger position in the Kenyan market. Further, Lake Area millers' sales to Uganda were less than Ugandan millers' sales to Tanzania in 1965. But over the period 1960-5, sales by Lake Area millers to Kenya and Uganda have been steadily increasing, and undoubtedly competition in these markets is increasing.

There is verbal evidence from the millers to the effect that the Ugandan millers are influenced in their pricing policy by the prices of liquid oils in Mwanza and vice versa. Prices for liquid oils in Uganda and Mwanza are shown in Table 4.1.

Table 4.1

	1965 Uganda Prices in shs/tin [a]	1966 Uganda Prices in shs/tin [b]	1966 Mwanza Prices in shs/tin [b]
Semi-refined oil	38-39	34.10	29.42
Double-refined oil	48-48.50	41.30	34.10

Sources: a. Ministry of Commerce and Industry, Inquiry on the Prices of Edible Oils, June 1965. (Unpublished)

b. Private Communication.

In 1965 it is believed (based on the evidence of millers) that prices of liquid oils were roughly the same in both Mwanza and Uganda. However, in 1966 prices in Mwanza fell considerably below those in Uganda, and it is interesting to note that it was in this year that the Ugandan millers began to complain that the Mwanzan millers were flooding the Ugandan market with cheap oil.

What are the price differentials which must exist between Mwanza and Uganda in order that Lake Area millers may compete on the Ugandan and Kenyan markets?

The costs of sending liquid oils from Mwanza to

Jinja and Kampala are set out in Table 4.2.

Table 4.2

Transport Costs from Mwanza per Tin of Oil

	To Jinja (shs)	To Kampala (shs)
Large loads	1.15	1.28
Small loads	1.64	1.91

Source: East African Railways and Harbours, Tariff Book No.4 Part II (Aread Lithographic Printers, East Africa)

Therefore if prices for either semi- or double-refined oil in Mwanza should be more than 2 shs below those in Uganda, the Mwanzan millers could effectively compete with the Ugandan millers on the Ugandan market.

The costs of sending liquid oils from Mwanza to Nairobi are compared in Table 4.3 with the costs of sending oil from Jinja and Kampala to Nairobi.

Table 4.3

Transport Costs to Nairobi per Tin of Oil

	From Kampala (shs)	From Jinja (shs)	From Mwanza (shs)
Large loads	1.42	1.33	1.83
Small loads	2.36	2.20	3.28

Source: East African Railways and Harbours, Tariff Book No.4 Part II (Aread Lithographic Printers, East Africa)

The figures show that for large loads, there is only a 50 ct difference between the cost of transport for oils from Jinja and Mwanza to Nairobi, and for small loads a 1.08 sh difference. This means that if Mwanzan prices are more than 1 sh below Ugandan prices, Mwanzan oil can compete favourably with Ugandan oil on the Kenyan market.

One of the most important factors in determining the competitive power of the two groups of millers is the overall cost of production in the two areas. There does not appear to be a wide difference in the crushing costs in the two industries, see Chapter VI, but the price differential for cottonseed purchased in Uganda and Tanzania has in almost all years been in favour of the Mwanzan millers, see Chapter VI, and this gives the Mwanzan millers a considerable cost advantage over their counterparts in Uganda. This cost advantage may enable Lake Area millers to produce lower cost oil, thus increasing their competitive strength in the oil markets.

The interaction of these two competitors in the market is also to some extent affected by the difference of season between the two areas. The Ugandan oil milling season operates from January to September, while that in the Lake Area operates from June to March. This means that either group of millers may find themselves entering the market with the new season's supplies of oil when the market is already flooded with supplies from the other source. Thus prices at the beginning of the season in both the Ugandan and the Mwanzan industries are likely to be determined by prices already ruling in the markets. Further, as both industries may dump surplus supplies of oil towards the end of their season, in order to sell the old season's oil before the new season's oil enters the market, prices may be depressed around March and September.

The fact that the Lake Area millers only produced 2,800 tons of double-refined oil in 1965, compared to Uganda's production of around 11,000 tons, obviously means that at that time the Ugandan millers were in the stronger position in the double-refined oil market. However, with the expansion of double-refining capacity in Mwanza, the strength of the Lake Area millers will increase, and supplies of double-refined oil from Mwanza may take a larger share of the Kenyan and Ugandan markets.

Thus the evidence suggests that the Ugandan millers are not monopolists in the liquid oils market in East Africa, strong competition being provided by the Lake Area millers.

Some millers in Uganda have claimed that the cutting-off of sales of oils to Somalia was the cause of falling prices in 1966. However, from 1963-5, exports only accounted for 8 per cent on average of total sales. Sales to Somalia, though, did on average account[4] for 88 per cent of exports between 1963 and 1965,[5] most of the rest of the oil being exported to other African countries. While the suspension of sales to Somalia may seriously reduce the level of exports of oil, the amount of oil involved is small compared with total sales, and the effect on prices should not be particularly great.

The scope for exporting oil is probably limited to neighbouring African countries because of its price. U.K. prices for oils, quoted c.i.f. U.K. ports, were in 1963 and 1964 only 31 shs per tin of 36 lbs which is at about the same level as semi-refined oil in 1966. Thus there is little hope of selling oil on the European market.

There is evidence to suggest that the pricing policy of the Ugandan industry is determined by 'the big four', presumably after due regard has been paid

to the prices ruling in Mwanza. A number of the smaller millers, when asked as to how they determined the prices of their oil answered that they followed the lead of 'the big four'. Others said that they followed the ruling market price, which amounts to much the same thing. The rationale of this is obvious. If the smaller miller were to try to sell at a higher price than 'the big four', who produce over 70 per cent of the liquid oils, they will find themselves unable to sell. On the other hand, if they offer their oil at a lower price, they may find themselves in financial difficulties, due to the very low margins on oil sales, see Chapter III, section E, and anyway they could not hope by their action either way to have any effect on the future pricing policy of 'the big four'. The position of these small millers is further weakened by the fact that they must often offer their oil for re-refining to the millers with double-refining plant.

Thus it would appear that although 'the big four' dictate pricing policy in the Ugandan industry, they do not hold a monopoly position in the East African liquid oils market. They do, though, appear in 1966 to be in a stronger position than the Lake Area millers, who only produce comparatively small amounts of double-refined oil.

The Ghee and Solid Fats Markets. For vegetable ghee, 72 per cent of production on average over the period 1963-5 was sold to Kenya, nearly all the remainder being sold on the home market. For solid fats, 52 per cent was sold to Kenya on average, again nearly all the remainder being sold on the home market. Thus, as for liquid oils, the Kenyan and Ugandan markets are of supreme importance.

However, production of ghee and solid fats in East Africa was limited to three firms in 1965, two being Ugandan millers and one being a Kenyan miller situated in Nairobi. Unfortunately, as the Kenyan miller was not willing to disclose production figures it is not easy to assess the competitive forces in these markets.

The trade figures show that in 1964 and 1965 Uganda sold around 2,000 tons more of vegetable ghee to Kenya than Kenya to Uganda, [6] but that Kenya exceeded Uganda in its sales to Tanzania, although these latter sales were very small. The Ugandan millers thus appear to be strongly established in the vegetable ghee market, although their position may be challenged when production of ghee begins in Mwanza.

It is difficult to estimate future potential demand for vegetable ghee, as this is strongly influenced by the price of alternative products, such as

the superior quality groundnut ghee imported from Europe (over 2,500 tons of this was imported into East Africa in 1964 and 1965), and animal ghee.

In the field of solid fats, sales by Kenya to Uganda exceeded those by Uganda to Kenya by a few hundred tons in 1964 and 1965. Kenya was also very much the larger supplier of solid fats to Tanzania.[10] This seems to indicate that the Kenyan firm is probably the larger producer, and tends to dominate the market.

To a certain extent, the three firms with hydrogenation plant in Uganda and Kenya do occupy a monopoly position in the market for ghee and solid fats in EastAfrica, although imports do to some extent regulate the level of prices. However, there is no evidence of collusion between the Ugandan and Kenyan firms, and as such it is doubtful whether the potential monopoly position is being exploited to the detriment of the consumer.

C. The Supply and Demand for Oil-Cake

The second most important product of the industry is vegetable oil-cake, which is the residue remaining after as much oil as possible has been removed from the oilseed.

In the case of cottonseed, two types of cake may be produced depending on whether the cottonseed has been decorticated before crushing. Decorticated cottonseed gives the type of cake known as 46 per cent cake, and undecorticated cottonseed gives the 31 per cent cake. It is usual for other oilseeds to be decorticated before crushing.

Total production of cake for the period 1963-5 is estimated in Appendix 2. These figures show that production of all cake increased steadily over the period considered and ranged from 60,000-70,000 tons. Table A.10 in Appendix 2 shows the sales of cake as given in the trade figures. These figures show that on average over the period 1955-65 around 98 per cent of the cottonseed cake has been exported to countries outside of East Africa, nearly all the remainder being sold in Kenya. The exported cake is mainly sold as a cattle-food to European countries. It is believed that only very small quantities of the cake are retained in Uganda, although no data is available on this.

A high percentage of the cake sold for export is registered for sale through the Kampala Produce Exchange. The cake is usually sold forward for delivery 1-3 months hence, with a high and low price being quoted. The maximum of the highs and the minimum of the lows for transactions in any one year for the period 1963-6 are shown in Table A.11 of Appendix 2. The average prices for 31 per cent and

46 per cent cottonseed cake together exported in any one year are also shown in Table A.11. These figures indicate that in 1965 millers were receiving between shs 430 and shs 590 per ton for their 46 per cent cottonseed cake, which is backed up by evidence from the millers that they received from shs 450 - 560 per ton in 1965.

The prices for groundnut cake are shown in Table A.12 of Appendix 2. The prices given by the millers for sales of groundnut cake in 1965 ranged from shs 600 to shs 670 f.o.r. Uganda, which again agree with the figures given in Table A.12.

The price figures of Tables A.11 and A.12 show that there are small yearly variations in prices of cake, probably determined by the situation in the world market and the quality of the cake offered. The highest value is placed on groundnut cake by the cattle-food buyers, and this sells at a premium of more than shs 120 per ton over 46 per cent cottonseed cake. However, in the 1960's the problem of aflatoxin, a mould which grows on damp groundnuts and is contained in groundnut cake extracted from contaminated nuts, has introduced a new difficulty into the groundnut cake market, as this mould is harmful to animals and human beings. A few countries have already introduced legislation banning the import of groundnut cake containing aflatoxin, while it is known that other countries are refusing consignments of cake affected with aflatoxin. If the legislation becomes more severe, this may mean that Ugandan millers will find it difficult to sell any groundnut cake at all on the world market. There may, though, to counteract this difficulty, be an increased demand from livestock owners in Kenya and Uganda for the relatively small amount of groundnut cake produced.

The majority of the cake produced in Uganda, takes the form of 46 per cent cottonseed cake. Some of the 31 per cent cottonseed cake is produced by the industry, but the millers said that they only crushed undecorticated seed when there was a ready customer for the 31 per cent cake. There does not seem to be an established world market for 31 per cent cake.

Little information is available on the world market situation for cottonseed cake, but the trade figures [11] indicate that most of the Ugandan cake is sold to European cattle-food manufacturers. The figures for sales, Table A.10, and prices, Table A.11, do not indicate any deterioration in this market over the period 1955-65.

Although there are prospects of an increase in sales of cake within East Africa, these are only

likely to account for a very small percentage of total sales of cake in the future. The new Ugandan manufacturer of animal foods only expected to use a total of 75 tons of oilseed cake in 1966, and a large Kenyan manufacturer of animal food utilizes less than 1,000 tons of oilseed cake each year. Obviously the millers must therefore continue to depend on outside markets for selling their cake, but oilseed cake is such a valuable protein food that the market is likely to continue to be favourable.

D. The Value of Sales of Oilseed Products Outside Uganda

The value of Uganda's sales of vegetable oils and fats and oilseed cake is considerable. Table 4.4 shows the value of such sales to Kenya, to Tanzania and to countries outside East Africa for the period 1963-5.

Table 4.4

	Oils and fats[a] (£)	Cake (£)	Total (£)
1963			
To Kenya	670,637	38,170	708,807
To Tanzania	95,963	-	95,963
Exports[b]	84,587	1,369,332	1,453,919
Total	851,187	1,407,502	2,258,689
1964			
To Kenya	1,024,144	41,355	1,065,499
To Tanzania	115,787	-	115,787
Exports[b]	158,899	1,351,338	1,510,237
Total	1,298,830	1,392,693	2,691,523
1965			
To Kenya	1,411,106	18,558	1,429,664
To Tanzania	88,980	21	89,001
Exports[b]	116,065	1,595,684	1,711,749
Total	1,616,151	1,614,263	3,230,416

Source: East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya 1963-5 (Commissioner of Customs and Excise, East Africa)

Notes: see overleaf.

Table 4.4

Notes: [a]This includes ghee for 1964 and 1965, but excludes other hydrogenated fats in all years.
[b]From the value of exports has been deducted the cost of transport from Jinja to Mombasa. This amounts to shs 4.10 per cental for oil and ghee, and shs 2.90 per cental for cake. See East African Railways and Harbours, Tariff Book No.4 Part II (Aread Lithographic Printers, East Africa)

The figures of Table 4.4 show that the earnings of the industry from sales outside Uganda reached £2.3 million in 1963, £2.7 million in 1964 and £3.2 million in 1965, an increase of 39 per cent over the period. Of these sales, 62 per cent in 1963, 52 per cent in 1964 and 50 per cent in 1965 were accounted for by the cake. (One reason for the greater relative importance of cake in 1963 as compared with 1964 and 1965 may be the exclusion of ghee from the figures in 1963). In addition, the cake accounted for 92 per cent on average of the exports for the period. It will be noted that while the cake accounted for a high percentage of exports, oil and fat products accounted for 97 per cent of the sales to Kenya and Tanzania, sales to Kenya being particularly important.

The value of sales of the industry outside Uganda is compared with the total value of all exports for the period 1963-5 in Table 4.5.

Table 4.5

	Value of Sales by Oil Milling Industry (£)	Value of All Sales by Uganda (£)	% of Total Formed by Oil Milling Sales[a]
1963	2,258,689	51,475,000	4.4
1964	2,691,523	64,430,000	4.2
1965	3,230,416	62,709,000	5.2

Source: Work for Progress, Uganda's Second Five-Year Plan, 1966-71 (Government Printer, Entebbe)

Note: [a]These percentages are slightly under-estimated due to the value of all exports being f.o.b. Mombasa or Dar es Salaam.

These figures show that although oil milling products were not a major component of the total domestic export revenue of Uganda, they comprised over 4 per cent of that total over the period 1963-5 and are thus a valuable minor component. Obviously therefore the maintenance and expansion of the present markets for oil and cake are of importance to the economy of the country.

The value of oil sales to Kenya are especially important as total Kenyan sales to Uganda have exceeded total Ugandan sales to Kenya by over £3 million over the period 1963-5 and had reached £8 million by 1965.

E. Future Trends in Supply and Demand

Unless there were to be a change in the legislation governing the import of cottonseed into Uganda, all the cottonseed crushed by the Ugandan industry in the future must be supplied from within Uganda. Even if seed could be imported, it is unlikely with the growing oil milling industry in Tanzania and with insufficient cottonseed available for existing millers in Kenya, that much seed would find its way on to the Ugandan market.

The aim of Uganda's Second Five Year Plan[12] is that production of cotton lint should increase to 575,000 bales by 1970-1. Such a figure for cotton lint indicates a production of cottonseed in 1970-1 of around 180,000 tons, see Appendix 3 Table A.13, when planting requirements have been met.

There are also plans in the Five Year Plan[13] for an expansion in the production of groundnuts by around 7.8 per cent per year over the five year period 1966-71. However, these plans are mainly geared towards the expansion of the production of high grade groundnuts for export. With the expansion of this market and that for local consumption as the population increases, it seems unlikely that large supplies of groundnuts will be available for crushing in the future unless prices for groundnuts both locally and on the world market were to fall considerably.

The availability of other oilseeds for crushing by the industry is also uncertain, but it seems unlikely that over the period 1966-71 these will be of any great importance to the industry.

Assuming, therefore, that the millers will crush around 180,000 tons of seed in 1971, this indicates a production of approximately 24,500 tons of crude oil (assuming that 10 per cent of the seed is 'BR', 90 per cent 'AR' and that extraction rates are 14 per cent from 'AR' seed and 10 per cent from 'BR' seed.) Allowing for a 5 per cent refining loss, production of refined oils would be around 23,300 tons.

In Appendix 3, projections have been made of the demand for oils and fats in 1971 and 1981. These projections are based on the projected levels of monetary gross domestic product per capita and of population given in the Five Year Plan.[14] They are made using an assumed model as described in the Appendix, and are only approximations which give an idea of the order of magnitude of total demand at

some future point in time. No estimate of the extent of the error of projections is given.

Projections for 1971 with 1965 as base, show that the total demand for oils and fats will be expected to rise to between 11,000 and 12,500 tons by 1971. As noted above, if the production of 575,000 bales of cotton lint is achieved by 1970-1, production of oils and fats by Uganda in 1971 is likely to amount to over 23,000 tons. This leaves a gap of between 10,800 and 12,300 tons of oils and fats to be traded with other countries. In the 1960's, total sales to other countries have ranged between 5,174 and 9,345 tons, sales to Kenya forming much the most important part of these sales, see Table A.6 in Appendix 1. It seems feasible, provided that Uganda's position in the Kenyan market is maintained and increased as total demand in Kenya rises, that Uganda can sell all the oil that she produces up until 1971. However, the Ugandan industry may find itself in a surplus position if the rise in total demand in Kenya is insufficient to take the surpluses from both Uganda and Tanzania, and other markets cannot be developed for the oils and fats outside East Africa. In fact, projections for Tanzania, see Chapter VI, suggest that Tanzania will not have a surplus of oil in 1971, and thus Uganda should be able to sell most of her surplus oil to Kenya.

Projections for 1981 with 1965 as base, show that total demand for oils and fats will be expected to rise to between 17,500 and 22,000 tons. Unfortunately no estimates are available for cottonseed production in 1981, but production is expected to be higher than that in 1971. This will again give Uganda a surplus of oils and fats. Uganda's ability to sell these oils and fats will depend on developments in both Tanzania and Kenya.

1. East African Customs and Excise, Annual Trade Report of Tanganyika, Uganda and Kenya, 1965. (Commissioner of Customs and Excise, East Africa)

2. Ibid

3. East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya, 1960-5.

4. Ibid

5. Commonwealth Economic Committee, Tropical Products Quarterly (H.M. Stationery Office, London.)

6. East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya, 1960-5.

7. Ibid

8. Ibid

9. Ibid

10. Ibid

11. East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya, 1955-65.

12. Work for Progress, Uganda's Second Five Year Plan, 1966-71. (Government Printer, Entebbe)

13. Ibid

14. Ibid

CHAPTER V

THE LOCATION OF THE OIL MILLING INDUSTRY IN UGANDA

The location of the eighteen firms operative in the industry in 1965 is shown in Table 5.1. The place (town) given, refers to the postal address of the mill and not its actual location. Some mills are known to be situated in rural areas.

Table 5.1

Place	No. of Mills
Jinja	8
Tororo	1
Mbale	3
Soroti	1
Kampala	5

Source: Evidence from the millers.

These figures show that in 1965 the industry was located in only two regions, the Eastern Region and Buganda, the majority of the mills being in the Eastern Region. At one time there had been other operative mills in other places, including one in Gulu, one in Hoima and two in Masaka, but these all ceased to operate prior to 1960.

Not only are a high percentage of the oil mills located in the Eastern Region, but an even higher percentage of total capacity is in that region, see Table 5.2.

Table 5.2

Region	No.of Mills 1965	% of All Mills	Capacity 1965	% of Total Capacity
Buganda	5	27.8	30,500	14.6
Western	-	-	-	-
Eastern	13	72.2	179,000	85.4
Northern	-	-	-	-
Total	18	100.0	209,500	100.0

Source: Evidence from the millers.

Sales of 'AR' cottonseed by the Lint Marketing Board to the millers, Table 5.3, indicate an even stronger orientation of the industry to the Eastern Region.

Table 5.3

Season	% to Eastern Region Millers	% to Bugandan Millers	% to Millers Outside Uganda
1957-8	99.7	0.3	-
1958-9	100.0	-	-
1959-60	82.1	17.9	-
1960-1	87.7	12.3	-
1961-2	81.6	17.7	0.7
1962-3	94.4	5.2	0.4
1963-4	94.4	4.4	1.2
1964-5	91.6	6.3	2.1
1965-6	93.0	5.0	2.0

Source: Private communication with the Lint Marketing Board.

These figures show that over the nine seasons 1957-8 to 1965-6 over 90 per cent on average of the 'AR' cottonseed was sold to Eastern Region millers, the residual being mainly sold to the Bugandan millers.

The figures of Tables 5.1, 5.2 and 5.3 show that, although the industry is centred on both Jinja and Kampala, the Kampala millers only account for a small percentage of the seed crushed.

The development of the industry in the two areas of Buganda and the Eastern Region was undoubtedly the result of the zoning arrangements which were not relaxed until 1959, see Chapter II, section A.

Kampala and Jinja were the obvious centres for a market orientated oil milling industry in Uganda, as they provided easy access to the coast by rail for the cake, nearly all of which was exported, and for the oil, possibly around 50 per cent of which was sold in Kenya. Further, Jinja and Kampala had the largest urban populations and thus provided a good market for oil locally. However, the location of the industry in the past need not necessarily be the correct location for the industry in the 1960's.

Table 5.4 shows the amount of cottonseed available for allocation to millers by Region for the seasons 1960-1, 1962-3 and 1963-4. The 1961-2 season has been excluded, as flooding in that season caused an abnormally small cotton crop in certain zones.

Table 5.4

Region	1960-1 Amount of Cottonseed (tons)	% by Region	1962-3 Amount of Cottonseed (tons)	% by Region
Buganda	16,803	14.2	19,617	17.4
Western	4,098	3.5	4,543	4.0
Eastern	62,571	53.0	54,805	48.6
Northern	34,520	29.3	33,694	29.9
Total	117,992	100.0	112,659	99.9
	1963-4			
Buganda	9,342	7.9		
Western	5,164	4.4		
Eastern	64,539	54.6		
Northern	39,220	33.2		
Total	118,265	100.1		

Source: Lint Marketing Board, Annual Reports, 1961, 1963 and 1964. (Uganda Argus, Ltd. Kampala)

If we take the mean of the percentage figures given in Table 5.4. by Region, this would give the following results.

Region	Percentage on Average of Total Cottonseed Available
Buganda	13.1
Western	4.0
Eastern	52.3
Northern	30.6
Total	100.0

In attempting to draw conclusions from these results, it is interesting to look at the trends in the acreage of cotton planted in the different Regions. These are shown in Table 5.5.

Table 5.5

Region	% of Total Acreage Planted 1961-2	1962-3	1963-4
Buganda	22.1	15.4	13.0
Western	4.2	3.9	4.0
Eastern	50.7	57.6	58.9
Northern	23.0	23.1	24.2
Total	100.0	100.0	100.0

Source: Lint Marketing Board, Annual Reports, 1962, 1963 and 1964. (Uganda Argus Ltd., Kampala)

The figures show that the percentage of the total acreage planted in Buganda declined over the period 1961-2 to 1963-4, while that in the Eastern and Northern Regions increased. This trend is associated with the movement away from cotton in Buganda with the expansion of other attractive cash enterprises, and the steady increase in cotton acreage in the East and North as a result of the development of group farming. With the continued growth in group farms anticipated in the Second Five Year Plan, this trend may be expected to continue.

We would therefore expect that in future less than 13 per cent of the cottonseed available to millers will come from Buganda, around 4 per cent will come from the Western Region and more than 50 per cent and 30 per cent respectively will come from the Eastern and Northern Regions.

It therefore appears that in the 1960's over 90 per cent of the cottonseed is crushed in the Eastern Region, the source of only 50 per cent of the seed available, while none is crushed in the Northern Region, the source of 30 per cent of the seed. Do we conclude that the location of the industry is optimum, or that in the light of these circumstances some re-organization is called for?

Probably the strongest argument for a source rather than market orientated milling industry rests on the cost advantage to be obtained from crushing seed at source rather than at some market centre.

As mentioned elsewhere, the Lint Marketing Board has the sole responsibility for the allocation of seed to the millers, according to the amounts bought by the millers at the auctions.

The particular allocation of seed from ginneries to millers for the 1963-4 season cost the Lint Marketing Board £251,212 in transport costs. The pattern of the allocation is set out in Table 5.6.

Table 5.6

Region	Amount of Seed Available	Percentage Sold to:- Soroti	Mbale	Tororo	Jinja	Kampala
Buganda	9,008	-	-	-	41.7	58.3
Western	5,164	-	1.9	4.8	59.2	34.1
Eastern	62,786	0.3	18.0	6.8	73.3	1.6
Northern	39,687	0.5	4.9	3.3	89.9	1.3

Source: Private communication with the Lint Marketing Board.

This data suggests that, given the 1965 location of the mills, the allocations were fairly rational. For the Bugandan cottonseed 58 per cent was crushed in Kampala and 42 per cent in Jinja. For the Eastern Region seed over 98 per cent was crushed in the Eastern Region, while for the Northern Region seed over 98 per cent also was crushed in the Eastern Region, which represents the nearest oil milling area. It would seem unnecessary for Western Region seed to have been transported to the Eastern Region for crushing, although as such a high percentage of the seed had been purchased by Eastern Region millers, this was probably inevitable. Given the location of the mills and the high percentage of purchases by Eastern Region millers, it is doubtful whether the transport costs could have been reduced below £250,000.

Transport costs incurred by the Lint Marketing Board have been of much the same order of magnitude in other years, Table 5.7.

Table 5.7

Season	Transport Cost (£)	Amount of Cottonseed (tons)	Cost/Ton (£)
1954-5	130,933	87,651	1.49
1955-6	217,116	110,500	1,96
1956-7	225,526	114,595	1.97
1957-8	247,609	107,381	2.31
1958-9	285,780	125,410	2.28
1959-60	209,723	118,512	1.77
1960-1	271,440	117,992	2.30
1961-2	99,861	44,301	2.25
1962-3	302,119	112,659	2.68
1963-4	251,212	118,265	2.12
1964-5	267,848	130,625	2.05

Source: Lint Marketing Board, Annual Reports, 1955-65
Note: 'BR' cottonseed is not included prior to 1959.

Assuming that transport costs remain unchanged, with the steady increase in the amount of cottonseed available to millers, the costs of transport for seed from the ginneries to the oil mills cannot be expected in the future to fall below £250,000 per year. Further, as the Northern Region crop increases, we would expect the cost per ton to increase.

Considering the Northern Region crop, the total amounts of cottonseed available in that Region are set out in Table 5.8.

Table 5.8

Season	Amount of Cottonseed to Nearest '000 Tons
1960-1	35,000
1961-2	10,000
1962-3	34,000
1963-4	39,000

Source: Lint Marketing Board, Annual Reports, 1961-4. (Uganda Argus Ltd., Kampala.)

Taking the figure of 90 per cent as that percentage of the Northern crop crushed in Jinja, and considering Gulu as the central collecting point for seed in the Northern Region, we would expect at least 35,000 tons of cottonseed for 1963-4 and following seasons to be transported from Gulu to Jinja.

The cost of transporting cottonseed from Gulu to Jinja by rail is shs 2.50 per cental, or shs 56 per ton.[2]

Now, in order to obtain a figure for the cost advantage of crushing cottonseed in Gulu rather than Jinja, we must offset against the transport charges the extra costs of transport of the final products of oil milling.

The main products are oil and cake, oil forming approximately 13 per cent by weight of the seed, and cake forming approximately 46 per cent by weight. A large part of the remaining weight consists of hulls which are generally burnt in the boilers at the mill. 1-2 per cent by weight consists of soapstock, which is generally used for the manufacture of laundry soap.

If we consider the output from one ton of cottonseed, this would give:

291.2 lbs of oil
and 1,030.4 lbs of cake.

Firstly, consider the case of all the oil and cake being exported. Now, if the seed is crushed in Gulu as opposed to Jinja, the extra cost of railage of the oil and cake to the coast would be 75 cts per

cental of oil and 50 cts per cental of cake.[3] This would imply an extra cost to the Gulu miller of shs 7.35 per ton crushed. On the other hand, the cost of transporting the raw seed from Gulu to Jinja was shs 56 per ton, and thus, if the miller had to meet the cost of transporting his own seed, the Gulu miller would have a cost advantage of shs 48.65 per ton crushed over the Jinja miller for cottonseed from the Northern Region.

Secondly, consider the case of all the cake being exported, but 50 per cent of the oil being sent to Nairobi, the remaining 50 per cent to Kampala. The extra railage would be 50 cts per cental of cake, 1.10 shs per cental of oil sent to Nairobi and 2.90 shs per cental of oil sent to Kampala.[4] This would imply an extra cost to the Gulu miller of shs 11 per ton of seed crushed. This gives a cost advantage of shs 45 per ton to the Gulu miller for cottonseed from the Northern Region.

The worst possible situation for the Gulu miller with respect to his cost advantage over the Jinja miller, is one in which all the oil is sold in Jinja. The cost of transport for oil from Gulu to Jinja is shs 3.70 per cental.[5] Assuming that all the cake is exported, the extra cost to the Gulu miller would be shs 15.90 per ton of seed crushed. This still gives a cost advantage to the Gulu miller of shs 40.10 for seed from the Northern Region.

Of the three cases considered above, the second is the most realistic, although we would not necessarily expect all the oil to be sold in Kampala and Nairobi. Further, as a Northern based mill would be able to serve a local demand for oil, the cost advantage to the Gulu miller would probably be even greater.

Table 5.9

	Case 1	Case 2	Case 3
Extra Cost for Cake per cental in shs	.50	.50	.50
Extra Cost for Oil per cental in shs	.75	1.10 and 2.90	3.70
Extra Cost to Gulu Miller shs/ton Crushed	7.35	11.00	15.90
Cost of Transport to Jinja Miller shs/ton	56.00	56.00	56.00
Net Gain from Crushing Northern Seed in North shs/ton	48.65	45.00	40.10

Table 5.9 sets out the three cases mentioned above. Now, if we assume that around 35,000 tons of seed will be sent from the Northern Region to Jinja for crushing each year, the total extra costs of

crushing in Jinja rather than the North are as follows:-

	Extra Cost for 35,000 tons
Case 1	shs 1,702,750 or £85,138
Case 2	shs 1,575,000 or £78,750
Case 3	shs 1,403,500 or £70,175

Thus, in terms of costs alone, the system of sending most of the Northern cottonseed for crushing to Jinja leads to a yearly loss of around £80,000.

The reason for the continued existence of this system despite the apparent gains from a relocation of the industry lies with the willingness of the Lint Marketing Board to continue meeting the costs of transport from the ginneries to the oil mills.

It is difficult to forecast exactly what would be the effect of the Lint Marketing Board handing over the responsibility for transport costs to the millers. If the cottonseed were to be sold ex-ginnery, a complicated price and auction system would undoubtedly result. Further, if the millers could agree not to outbid one another, it is possible that as a group they could force the price of cottonseed down to a level at which they are compensated for the transport costs, and nothing would be gained.

However, if at least one miller could be attracted to open a mill in the Northern Region, and some limit were placed on the amount of cottonseed from the North which could be transported elsewhere for crushing, then some gain could be expected to arise in that prices for Northern seed going to Northern mills would not fall as much as those for Northern seed going elsewhere if millers were asked to pay for transport costs. In fact, the Northern miller might find himself at a cost advantage compared with other millers, the extent of the advantage depending on the price he was required to pay for his seed.

The most important factors are whether the millers can command a monopsonist position in the market for seed and whether a miller is prepared to operate in the Northern Region. It is unlikely that with 18 operative mills in the industry, the millers can come to a complete agreement. Further, it is likely that, provided some incentive were given, a miller would begin to operate in the Northern Region.

In the past the successful millers in the industry have been characterized by having other large scale interests, the profits from which have been used to offset any losses in oil milling, and all millers have some other activity outside oil milling, such as maize milling, soap manufacture, etc. .

Further, if cottonseed prices were to continue at the same high levels as in the early 1960's, undoubtedly profit margins would be small, even though the Northern mill might have some cost advantage.

This suggests that the establishment of a new mill in the North, operated by a firm completely new to the oil milling industry could prove disastrous. Such a firm would need a large and continual subsidy payment in terms of relatively cheaper seed in order to remain in business.

We need not assume, though, that this precludes the establishment of a Northern mill. With prospects of a crop of over 40,000 tons being available for crushing in future years, there is certainly sufficient seed available to support at least one Northern mill of an economic size. In order to support a double-refining plant of 3,000 tons of oil per year, the mill would need a throughput of 25,000 tons of seed, and as a double-refining plant is necessary in order to make satisfactory returns from oil milling. This represents the minimum recommended size of a Northern mill. Some Co-operative Unions have suggested that they should be allowed to crush their own cottonseed. However, as the maximum amount of cottonseed produced by any Co-operative ginnery in the 1964-5 season was around 4,000 tons,[6] this idea is rejected on the grounds that insufficient seed is available at any ginnery to support a plant for producing double-refined oil efficiently.

Two non-cost benefits of a Northern mill would also result. Firstly, milling of the Northern seed in the North would lead to an easing of the congestion on the railway. Despite the fact that the East African Railways and Harbours would lose a revenue of approximately £80,000 per year, this loss is more apparent than real. For the cottonseed must travel southwards at the same time as the cotton lint, leading to congestion on the railway. If, though, the seed were to be crushed in the North, movements of oil and cake southwards would tend to follow rather than be concurrent with movements of cotton lint. Secondly, there would be some benefit in the Northern Region from the increase in employment in the new mill, although only 100-200 people would be employed.

Thus there are considerable direct and indirect benefits from the establishment of an oil mill in the North, a part of the cost benefits probably going as an incentive to the miller and a part to the Lint Marketing Board. Such a benefit to the Lint Marketing Board is particularly important in the light of the losses incurred by the Board, see Table 2.7. Obviously, some of these gains can only

be made at the expense of someone else. The chief losers will be the Jinja millers who at present crush 98 per cent of the Northern crop.

The most satisfactory relocation of the industry would result from providing an incentive to an existing miller to open up operations in the North. This would give all the benefits mentioned above, while removing the problems of the establishment of a completely new firm in the industry. If an existing miller were to operate in the North, probably some of the existing redundant plant in the industry could be transferred to this mill, thus reducing the costs of the investment. A completely new mill would cost at least £500,000, but costs would be much lower if second-hand equipment were used. The smaller the investment required, the smaller need be the incentive given, and the larger the gains to the Lint Marketing Board.

In view of the high opportunity cost of capital and the problems of competing in the industry, a Northern mill operated by an existing miller would seem to be the better investment. If a new firm were to try to enter the industry, the difficulties of such entry should not be forgotten. Such a firm is likely to meet with antagonism from the existing milling group who, although probably not able to deprive the miller of his seed, could flood the market with cheap oil, causing the new firm to operate at a loss.

The problem of whether a mill should be established in the Western Region is more easy to deal with. The quantity of cottonseed produced in that area only amounts to around 5,000 tons, see Table 5.4, which is insufficient to support a mill of an economic size. There is therefore, in 1966, no case for an oil mill in the Western Region.

Evidence on the location of the oil milling industry was given by the writer to the Committee of Inquiry into the Cotton Industry, 1966. On the basis of this and other evidence, the Committee recommended that "the Government should pursue the possibility of establishing a mill in the North either by a para-statal organization or through private or Co-operative enterprise".[7] The Committee also recommended[8] that cottonseed should in future be sold ex-ginnery. In reply to the demands of Co-operative Unions "that they should be allowed to retain their seed and mill it themselves", it was stated - "If a Co-operative Union or a combination of Unions can provide the necessary capital and management then naturally no bar must be put in their way. But we are firmly of the opinion that no concessions or ease of entry should be given to the

Co-operatives as to do so would lower the price of seed and hence the price to the growers."

It is known that in 1967 at least one of the larger oil mills in Uganda is considering operating in the North. One Co-operative Union, advised by another large miller, is also investigating the possibility of erecting a new mill in the North. In the opinion of the writer the movement of the existing miller to operate in the North is to be particularly encouraged in the light of the evidence above, but care should be taken on the part of the Co-operative Union lest it should severely burn its fingers in this highly competitive industry.

Footnotes

1. Work for Progress, Uganda's Second Five Year Plan, 1966-71. (Government Printer, Entebbe.)
2. East African Railways and Harbours, Tariff Book No. 4 Part II. (Aread Lithographic Printers, East Africa)
3. Ibid
4. Ibid
5. Ibid
6. Private communication with the Lint Marketing Board.
7. Report of the Committee of Inquiry into the Cotton Industry, 1966. (Government Printer, Entebbe) Paragraph 128.
8. Ibid, Paragraph 129.
9. Ibid, Paragraph 130.

CHAPTER VI

OIL MILLING IN THE LAKE AREA OF TANZANIA

A. Background Information to Lake Area Milling

1. History. The Tanzanian oil milling industry centred on Mwanza represents the only other large producing area of liquid edible oils in East Africa. Although there are other mills situated in Tanga and Dar es Salaam, these mills are mainly concerned with the crushing of copra and with grain milling, and only crush very small quantities of sesame, groundnuts and cottonseed.

The continued increase in the amount of cottonseed available for crushing in the 1950's and 1960's in the Lake Area of Tanzania has led to the continuous expansion of the oil milling industry in and around Mwanza, where most of the Tanzanian cotton crop is grown. As in Uganda, small amounts of groundnuts and sesame are being crushed by the millers, but these oilseeds are of minor importance compared with cottonseed.

The earliest recorded mill in the Lake Area was founded in Mwanza in 1912 and at that time was mainly crushing groundnuts. This mill was an exception, though, and most of the oil mills were built in 1950-60 period. Evidence from six millers in 1965 showed that 77 per cent of their expellers had been purchased in the 1960's.

Seven of the seventeen oil mills in the Lake Area in 1966 were owned by the Victoria Federation of Co-operative Unions. The policy of the Federation has been, since 1953, to purchase all the cotton ginneries in the Lake Area, and also leading rice mills and sisal factories. Where oil mills were on the same site as any of these enterprises, they also have been bought. One further mill, in which the Federation had an ownership share, was being constructed in Mwanza in 1966. This mill was to concentrate on the production of hydrogenated oils and fats.

It is interesting to compare the development of this industry with that in Uganda. Plentiful supplies of cottonseed for crushing were available in Uganda at a much earlier period and the Ugandan industry most rapidly expanded in the early 1950's when the Lake Area industry was still in its infancy. When the greatest expansion was under way in the Lake Area industry in the early 1960's, the Ugandan industry was under severe excess capacity, and firms were going into voluntary and forced liquidation.

2. Location. In Tanzania in contrast to the position in Uganda, the oil mills are situated

within the area in which the cottonseed is grown. About half the oil mills in the Lake Area are attached directly to ginneries, and the seed for crushing is provided in many cases, by an arrangement amongst the millers and the Lint and Seed Marketing Board, from the ginnery attached to the mill. The mills which are not attached to ginneries are all situated in the towns of Mwanza and Shinyanga. The industry is therefore almost completely supply orientated. Further, in contrast to Uganda, cottonseed is sold ex-ginnery by the Lint and Seed Marketing Board of Tanzania, rather than sales at mill or nearest mill station as in Uganda. The Tanzanian system is likely to lead to a much more optimum location of the industry than the Ugandan one, as it encourages supply orientation, which for an oilseed with such high losses in crushing as cottonseed, is almost certainly advantageous.

3. Supplies of Seed. (a) Cottonseed. As in Uganda, all the cottonseed is by law the property of the Lint and Seed Marketing Board of Tanzania, and is sold to the millers either by auction or private treaty.

The total amount of cottonseed available for crushing in the Lake Area is shown in Table 6.1, together with figures for cottonseed produced in the Coast Area of Tanzania.

Table 6.1

	'AR' Cottonseed		'BR' Cottonseed		
	Lake Area	Coast Area	Lake Area	Coast Area	Total Cottonseed
1955-6	30,802	1,746	1,532	1,013	35,093
1956-7	32,257	2,502	2,792	513	38,064
1957-8	42,343	3,375	3,972	1,108	50,798
1958-9	40,771	4,657	4,537	1,166	51,131
1959-60	50,365	4,212	5,331	1,449	61,357
1960-1	40,384	5,182	5,701	1,821	53,088
1961-2	41,184	-	4,207	656	46,047
1962-3	46,393	1,824	8,167	292	56,676
1963-4	55,853	4,326	10,720	1,069	71,968
1964-5	66,169	5,027	10,094	896	82,196
1965-6	85,019	---	8,653	---	94,019[a]

(tons)

Source: Private communication with the Lint and Seed Marketing Board.
Note: a - rough estimate only.

These figures show that, apart from a minor recession in the early 1960's, the Tanzanian cottonseed crop has been steadily increasing. Supplies of cottonseed have more than doubled over the ten-year period 1955-6 to 1964-5, but still fall considerably

short of cottonseed sold through the Lint Marketing Board in Uganda, where in 1964-5 a total of over 131,000 tons of cottonseed was sold to the millers, compared with only 76,000 tons in the Lake Area of Tanzania. In the 1966-7 season the Lake Area cottonseed crop is expected to increase to 110,000 tons, and it now appears that the gap between production in Tanzania and Uganda is closing.

Some of the cottonseed sold through the Lint and Seed Marketing Board is sold to Kenya, while some is also exported, most of the exported cottonseed coming from the Coast Area of Tanzania. Figures for these sales, and estimates for the balance of cottonseed available to the oil millers for crushing are shown in Table 6.2. Although small purchases of cottonseed from outside Tanzania are shown in Table 6.2 for the 1960-1 and 1962-3 seasons, it is known that imports of cottonseed are effectively banned, so as to prevent the spread of disease and the mixing of varieties, and can only take place on the authority of the Agricultural Department of Tanzania. The small purchases shown may have been experimental seed for planting.

Table 6.2

(tons)

	Total 'AR' and 'BR' Cottonseed[a]	Total Exports[b]	Total Sales to Kenya[b]	Total Purchases[b]	Balance[b]
1955-6	35,093	3,826	616	-	30,651
1956-7	38,064	4,020	756	-	33,289
1957-8	50,798	8,386	3,509	-	38,903
1958-9	51,131	7,520	3,434	-	40,177
1959-60	61,357	5,011	7,024	-	49,322
1960-1	53,088	5,460	3,857	59	43,830
1961-2	46,047	2,188	2,434	-	41,425
1962-3	56,676	3	1,626	1	55,048
1963-4	71,968	10	5,498	-	66,460
1964-5	82,196	1,375	3,871	-	76,950
1965-6	94,019*	2	1,829	-	92,188*

Sources: a - See Table 6.1
b - East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya, 1955-65. (Commissioner of Customs and Excise, East Africa).

Notes: For the 1955-6 season, exports for 1955 have been taken, as it is believed that most of the season's crop would be sold in that year, and so on for all the other seasons. * Excluding 'BR' seed.

The figures of Table 6.2 show that over 90 per cent of the cottonseed produced in Tanzania since 1961, excluding that set aside for planting, has been crushed by the millers.

Exports of cottonseed have been worthwhile from

Tanzania because of the lower prices fetched for cottonseed in Tanzania, as compared with prices in Uganda. Prices received are shown in Table 6.3.

Table 6.3

	Price of 'AR' Cottonseed in shs/ton[c]		Price of 'BR' Cottonseed in shs/ton[c]		Average Price of exported Cottonseed[d] in shs/ton
	Lake	Coast	Lake	Coast	
1955-6	335	358	118	166	402
1956-7	378	342	308	280	459
1957-8	327	231	142	145	483
1958-9	235	274	190	144	370
1959-60	369	430	297	206	411
1960-1	380	440	161	194	476
1961-2	422	-	224	200	456
1962-3	383	396	190	170	280[e]
1963-4	329	320	212	179	336[e]
1964-5	375	344	205	231	410
1965-6	547	---	317	---	300[e]
1966-7	400[f]	500[f]	---	---	---

Sources: c - Private communication with the Lint and Seed Marketing Board.

d - East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya, 1955-65. (Commissioner of Customs and Excise, East Africa). Prices f.o.b. Dar es Salaam.

Notes: e - Less than 10 tons exported in these years.

f - Rough estimates.

A comparison of 'AR' cottonseed prices between Uganda and the Lake Area of Tanzania shows that in the period 1959-60 to 1965-6, prices in the Lake Area of Tanzania only exceeded those in Uganda in the 1961-2 and 1965-6 seasons. In all other seasons Ugandan cottonseed prices were more than Shs 70 in excess of those in the Lake Area. The explanation for the 1961-2 season is that prices were abnormally low in Uganda in that season because of the pooling agreement, see Chapter II, while prices were slightly higher in the Lake Area for that season as a result of a short crop. The high Lake Area prices in the 1965-6 season (the price of Shs 547 received for 'AR' cottonseed in that season was an all-time high) resulted from heavy competition for cottonseed

amongst the millers in the Lake Area. These high prices led to large losses being incurred by the millers, as a result of which the millers came to a gentleman's agreement not to outbid each other at the auctions in the following season. This agreement was effective, and in the 1966-7 season prices in the Lake Area fell to around shs 400, which price the Lint and Seed Marketing Board felt to be fair in relation to current cottonseed oil and cake prices. It therefore seems likely that Lake Area prices will continue to be lower than Ugandan prices.

It should be noted here that the prices given by the Lint and Seed Marketing Board are prices ex-ginnery, compared with prices in Uganda, which refer to cottonseed delivered at mill or nearest mill station. However, as about half the mills crush the seed from their own ginneries, and as distances from the ginneries to the mills are in most cases fairly short, most of the oil mills in the Lake Area were receiving seed at a considerably lower cost than their counterparts in Uganda.

Although given the structure of prices in the two areas, and transport costs of shs 64 per ton of cottonseed from Mwanza to Jinja,[1] the Ugandan millers could have obtained lower cost seed from Tanzania than from the Ugandan Lint Marketing Board, such purchases were prohibited by the ban on imports of cottonseed into Uganda. However, Kenyan millers could obtain this lower cost seed, and purchases by Kenyan millers from Tanzania have greatly exceeded their purchases from Uganda in the 1960's.

A comparison of the prices received for cottonseed in the Lake and Coast Regions of Tanzania shows that the difference in prices between the two regions fluctuates widely from year to year. This, as we would have expected from the distance between the two sources of seed, reflects the separate demand situations for seed from the two regions. Demand for Coast seed is almost completely for seed for export, while that for Lake Area seed predominantly comes from the oil millers and to a much lesser extent from the exporters. In this respect there is a close similarity between sales of Lake Area cottonseed and sales of Ugandan cottonseed. Naturally, Coast Area cottonseed is in a more advantageous position than either Lake Area or Ugandan cottonseed for export, as the charge of transport to the coast (of around shs 75 per ton[2]) does not have to be met for Coast Area seed. A comparison of Coast Area and exported seed prices, indicates that in almost all years exports would have been fairly profitable.

In the Mwanza area the Victoria Federation of Co-operative Unions (which operated a total of five

mills in 1965) dominated the purchases of seed from the Lint and Seed Marketing Board, purchasing a total of 28 per cent of the cottonseed in the 1965-6 season. In that same season, there were two other firms who bought between 10-14 per cent of the seed, five who bought between 5-9 per cent of the seed and six who bought less than 5 per cent of the seed. In the 1966-7 season , with the addition of two further oil mills, the Federation is expected to account for an even greater percentage of purchases of cotton-seed, although it is interesting to note that they are still not crushing all the cottonseed which is produced in the Federation ginneries.

However, the Federation does not dominate the purchases of seed in the Lake Area to nearly the same extent as 'the big four' in Uganda, and is certainly not in a monopsony position.

(b) Other Oilseeds. The crushing of other oilseeds in the Lake Area seemed to be rather less common than in Uganda. In 1965 none of the millers interviewed in Mwanza were crushing other oilseeds, although some had done so in the past. Apparently supplies of other oilseeds are not readily available for crushing in the Mwanza region, and this probably explains the lack of interest of Lake Area millers in these seeds.

It is believed that at one time there were separate mills for the crushing of groundnuts in Tanzania, but that most of these have now closed because of the relative attractiveness of selling groundnuts for export and for direct consumption. This belief is backed up by evidence from the Census of Industrial Production, 1961, [3] which states that while copra and cottonseed are crushed for oil and cake, other oil bearing seeds are exported in their raw state.

Figures given by the Ministry of Industries, Mineral Resources and Power [4] show that around 700 tons of groundnut oil was produced in Tanzania over the period 1961-3. This indicates, assuming a 36 per cent extraction rate for oil from groundnuts, crushings of around 2,000 tons of groundnuts. Total sales of groundnut oil by Tanzania to other countries have not exceeded 50 tons in the 1960's, [5] and sales of groundnut cake only amounted to 442 tons and 88 tons in 1964 and 1965 [6] respectively, indicating crushings of around 800 tons of groundnuts in 1964 and 160 tons in 1965.

Certainly, in 1961 some groundnuts were being crushed by the industry. The Census of Industrial Production in 1961 [3] shows that some of the thirty-two establishments classified in the 'oil milling and soap' section were crushing groundnuts, producing oil and cake to a value of £154,000. In

addition, seven of the firms listed under the 'Grain Mill Products' section in the Census were said to be producing groundnut and sim sim oil. It is thought, though, that the crushing of groundnuts has gradually decreased in the 1960's.

Little information is available on the crushing of sesame seed, but it is known, as mentioned above, that some firms listed under 'Grain Mill Products' were crushing sesame seed in 1961. Total sales of sesame oil by Tanzania to other countries[8] have not exceeded 10 tons in the 1960's, and have in most years been negligible. It is thought that in the mid-1960's total crushings of sesame seed have been very small.

The only other oil produced in Tanzania is copra oil, which is produced at the Coast. This oil is used mainly for the production of soap, and as there are no crushings of copra in Uganda, this oil has been excluded from the study.

B. The Operation of Lake Area Mills

1. Techniques of Production. The techniques of production used in Tanzania are similar in almost all respects to those in use in Uganda.

(a) Pretreatment. As far as the delinting is concerned, about half the firms appeared to be removing the fluff making use of gins in their ginneries but only one firm actually owned a delinting machine. This differs considerably from the practice in Uganda where a number of delinters are owned, but very few are in use. The difference possibly arises from the different variety of seed in the two areas, the Tanzanian seed having more fluff on it, thus increasing the need for delinting prior to crushing.

The position with regard to decortication appeared to be roughly similar to that in Uganda. Most millers had one decorticator, a few were still using grinding mills, but only one mill owned two decorticators. Most of the decorticators contained a magnet for removing tramp iron, but as in Uganda, there seemed to be an absence of proper cleaning equipment for removing dirt and stones.

There is no information available on the amount of oil left in the hulls after decortication, and thus there is no measure of the efficiency of the decortication process.

Although the millers gave evidence in 1965 to the effect that they owned adequate storage accommodation for the seed, other evidence shows that this is often not true. Many of the millers only have a total storage capacity of 400-500 tons, which is hardly adequate for the seed and the cake (which may have to be stored for 1-2 months due to the difficulties of railage to the Coast).

(b) Extraction. The method of extraction, as in Uganda, is by means of expellers, a total of 98 expellers being owned by the industry in 1965 and 105 in 1966. Many of these expellers have been purchased during the 1960's and it was found that for seven firms, who owned a total of forty-three expellers, thirteen of their expellers had been purchased second-hand from Uganda and Kenya. The majority of expellers owned by the seven firms mentioned above were of the British Rose-Down model.

This is backed up by the evidence from the East African Customs and Excise Annual Trade Reports for 1951-65, where 54 per cent of the purchases of vegetable oil crushing machinery were found to be from the United Kingdom. A further 37 per cent were from India, and 6 per cent from Germany. Again, as in Uganda, the Indian machinery was the cheapest and the German the most expensive machinery from these three countries.

All except one of the millers asked claimed to leave, after extraction, only 6-7 per cent of oil in the cake. Some firms even claimed to only leave 6-6.5 per cent oil in the cake. The weighted average of the extraction rates for oil from cottonseed of the Lake Area millers came to nearly 14 per cent in 1965 and is therefore almost exactly identical with that received on average by the Ugandan millers.

Thus in terms of efficiency of extraction of cottonseed oil, there seems to be little to choose between the Lake Area and Ugandan industries. Both would gain in efficiency if more of the modern-type expellers were used.

(c) Refining. A total of three firms, with a total capacity of 9,000 tons of oil, were producing double-refined oil in 1965, and a plant to produce 7-8,000 tons of double-refined and hydrogenated oils and fats was planned. All the other fourteen firms were only producing semi-refined oil. No data is available on the efficiency of the refining process in Tanzania.

2. Activities of Lake Area Millers. (a) Refining. There were seventeen mills operating in the 1965-6 season, fourteen of whom were producing semi-refined oil, and three of whom were producing double-refined oil. None of these mills had hydrogenation plant, but a new mill for producing double-refined and hydrogenated oils and fats was being constructed in 1966 and was expected to be operational in 1967.

(b) Grain Milling. A total of eight mills in 1965 were found to be rice milling, and this appeared to be an important alternative activity of the town millers. Two of these mills were also producing maize flour and two cassava flour.

(c) Other Activities. The most important other activity of the millers was cotton ginning, a total of nine out of the seventeen mills having an associated ginnery, usually on the same site as the oil mill. Four of the mills with associated ginneries now belong to the Victoria Federation of Co-operative Unions.

It is particularly interesting to note that soap manufacture is not closely associated with oil milling in the Lake Area of Tanzania. Only one of the millers in the Lake Area was producing soap and the millers claimed that soap manufacture was not a profitable enterprise on a small scale. In fact, most of the soap-stock is apparently thrown away, as according to the millers it is not worthwhile in terms of the returns to barrel the soap-stock and sell it to the soap factories.

The reason for this difference of attitude towards soap-stock as between the Ugandan and the Lake Area millers probably arises from two factors. Firstly, the Ugandan millers have found it much more difficult to make profits on their oil milling enterprises than the Mwanzan millers due to the very high prices for cottonseed in Uganda and therefore wish to utilize all the by-products. Secondly, large amounts of copra oil are produced in Tanzania, and this provides a better base for soap manufacture than the soap-stock from cottonseed oil. This will reduce the value of the soap-stock in Mwanza considerably, and probably explains why it was not worth barrelling and selling.

The fact that only one of the Lake Area millers was found to be manufacturing soap in 1965 is interesting in the light of the following evidence from the Census of Industrial Production in Tanganyika in 1961 - "The classification problem posed by multi-purpose mills which produced both vegetable oils and soap proved insoluble as the mills were unable to distinguish between their separate cost of production so that oil milling and soap manufacturing are considered to constitute one industry." Under the classification 'Oil Milling and Soap' in the Census, were included thirty-two establishments, almost double the number of oil mills found in the Lake Area in 1965. It seems probable that around fifteen of these establishments were at the Coast, and that it is there that copra extraction and soap manufacture are inseparable activities, and not in the Lake Area.

3. Size and Structure of Firms. The general impression of the oil milling industry in the Lake Area is that it consists of a number of mills of more or less equal size. However, the slow amalgam-

ation of mills by the Federation has led to the emergence of one large milling group, which in 1966 owned a total of seven out of the seventeen existing oil mills. Further, the new mill being constructed in 1966, with a total of fifteen expellers, should also be somewhat larger in terms of its crushing capacity than the existing mills.

In Table 6.4, the eleven separate firms are classified according to the number of expellers owned in 1966. Crushing capacity is not used as this could not be obtained sufficiently accurately.

Table 6.4

No. of Expellers	No. of Mills in That Class
2	1
3	2
6	1
7	2
8	2
10	2
45	1
	11

Total number of expellers - 109
Source: Evidence from the millers.

The two mills with ten expellers, and one of the mills with seven expellers have double-refining plant, and in a sense may be considered as the larger firms in the industry. The firm with 45 expellers is of course the Federation, which really consists of a number of firms working under the same management, and not of a large integrated mill as is found amongst 'the big four' in Uganda.

The total capacity of the industry was estimated as 147,000 tons of seed in 1965 and as 156,000 tons in 1966. When the new firm is fully operational in 1967, total capacity may be expected to rise to 183,000 tons. In 1965, the millers crushed a total of 86,000 tons of 'AR' and 'BR' cottonseed, and in 1966 they were expected to crush around 110,000 tons. This indicates utilized capacities of 59 per cent in 1965 and 71 per cent in 1966. With the operation of the new mill in 1967, utilized capacity will undoubtedly fall again in 1967.

It is interesting to note, that despite claims by the millers that they had a high utilized capacity, the Mwanzan industry is operating overall at no greater utilized capacity than the Ugandan industry. However, the plight of the individual firms in the Mwanza Area is definitely better than in Uganda, where a high percentage of utilized capacity is accounted for by 'the big four'.

The capacity of the three firms with double-

refining plant was around 9,000 tons of oil in 1965, but only 2,800 tons of double-refined oil was actually produced in 1965, indicating a utilized capacity of 31 per cent. The capacity of this plant was in 1965 considerably less than that of the Ugandan millers (16,000 tons increasing to 30,000 tons in 1967) and was operating at a much lower capacity. The new mill in Mwanza will have capacity for producing 7-8,000 tons of hydrogenated and double-refined oils, bringing the total capacity for producing double-refined and hydrogenated oils in Mwanza to 16-17,000 tons in 1967. (For Uganda this will amount to 35,000 tons in 1967).

Unlike the Ugandan industry, there does not seem to be a sharp division in the industry amongst the firms as to future plans. Most firms in the Lake Area did not appear to have clearly defined plans, and the plans of the Federation were geared to the acquisition of ginneries rather than oil mills. However, the Federation plans do affect the other millers, in that existing millers owning ginneries are uncertain as to their future, and will not invest money lest they should be bought out.

Only three firms hoped to expand their expelling capacity, and one of the larger millers with double-refining plant mentioned the possibility of investing in hydrogenation plant.

Certainly, the Mwanzan industry was not in 1965 dominated by the Federation in the same way as the Ugandan industry is dominated by 'the big four'. 'The big four' have major interests in oil milling, and considerable ability to affect cottonseed and oil prices. The Federation was in 1965 only just emerging as a large oil milling group, its major interest being in cotton ginning. There is no indication that it has ever outbid other millers at cottonseed auctions, although a few Mwanzan millers did complain that on occasions the Federation had flooded the local market with oil. Again, unlike 'the big four', none of the mills owned by the Federation in 1965 had double-refining plant, although the Federation was to have a share in the new mill being constructed.

In 1966, the Lake and Western Regions Oilmillers' Association was formed in Mwanza to provide a bargaining power for the millers with the Lint and Seed Marketing Board over the price of cottonseed, and with East African Railways and Harbours to deal with the problem of railage of cake to the Coast. The formation of this Association, which includes nearly all the millers in the Lake Area, indicates a measure of co-operation amongst the millers in the Lake Area, which does not exist in Uganda.

4. Labour Employed. Most of the mills were employing both permanent and casual labour, unlike the position in Uganda, where the bigger firms employed only permanent labour. Only around 45 per cent of the total labour force was permanent, compared with 74 per cent in Uganda. The large casual labour element will cause considerable variation in the total amount of labour employed at different times of the year.

Of the eight firms who gave information on labour employed, the four firms crushing more than 5,000 tons of seed per year had average throughputs of 152 tons per unit of labour employed, while the remaining four, with utilized capacities of less than 5,000 tons per year, only had average throughputs of 72 tons per unit of labour employed. These figures are well above those found to apply in Uganda and give support to the claim by the millers that the handling of the seed is more highly mechanized in the Lake Area than in Uganda.

All except one of the millers were operating three shifts of eight hours each day, and most of the millers claimed to operate for an 8-month year, coinciding with the ginning season beginning in June -July and ending in February-March. This is in contrast to the situation in Uganda where the larger mills operate for about 10 months of the year, while the smaller mills only operate for a few months depending on seed supplies. The difference undoubtedly results from the close relationship between milling and ginning in the Lake Area, and the more equitable distribution of seed amongst millers in the Lake Area.

Payments to labour were roughly similar in form to those in Uganda, most millers paying the minimum wage of shs 125 per month in 1965. It should be noted that this wage-level is shs 25 below the minimum wage applicable in Jinja and Kampala in 1965. Some firms in the Lake Area were paying bonuses for seniority, while the Federation was paying a basic wage of shs 130 per month. A few firms were providing housing and other facilities for their employees.

The data which is available on labour indicates that total labour costs per ton of seed crushed should be less in the Lake Area than in town mills in Uganda.

5. Costs of Production and Profitability. Some evidence on costs of production was given by seven of the millers in the Lake Area, but there is no evidence from other sources, as the Census of Industrial Production in Tanganyika in 1961 classifies oil milling and soap manufacture together.

Figures given by the seven millers for fuel

costs varied from 5 - 22 Shs per ton of seed crushed. One reason for this variation is probably that only four out of the seven mills were linked to the main electricity supplies. The other three mills, all situated outside the towns, either had their own generators or used some alternative fuel and the costs of such fuels were difficult to estimate. Many millers were also using their husk as fuel for the boilers.

As is the case in Uganda, the main cost of materials takes the form of cottonseed, for which the millers paid over Shs 500 per ton in 1965, but this price was abnormally high.

Other purchases of materials included chemicals and packaging costs. Expenditure on chemicals varied from 5 - 38 Shs per ton of crude oil refined, and that on packaging materials (tins for the oil and sacks for the cake) amounted to Shs 47 per ton of seed crushed or Shs 5.70 per ton of refined oil produced.

The cost of spare parts mainly for the expellers, was given as 3 - 9 Shs per ton of seed crushed.

While costs of chemicals and expenditure on spare parts appears to be rather lower in the Lake Area than in Uganda, expenditure on packing materials appears to be higher in the Lake Area, although from the data available it is difficult to make precise judgements.

When estimates were made as to the overall crushing costs (including fuels, chemicals, spare parts and labour costs) per ton of seed crushed, the resulting figures per ton crushed varied considerably, but for those firms whose costs appeared to be consistent, a figure of between 45 - 55 Shs for crushing costs per ton of seed crushed was obtained. However, as overhead costs have not been included, these costs per ton are likely to be under-estimated. These estimates coincide roughly with similar estimates made for Uganda in Chapter III, section E.

Actual figures for total costs of crushing one ton of seed as quoted by the millers are shown in Table 6.5.

Table 6.5

Overall Crushing Costs in Shs/ton	No. of Firms
45 - 50	1
50 - 55	1
55 - 60	2
60 - 65	2
65	1

Source: Evidence from the millers.

These figures show that overall crushing costs per ton of seed crushed in the Lake Area lie between 45 - 65 shs. As in some cases the firms have not adequately accounted for overhead costs, the true cost probably lies towards the upper end of this range.

The question of the profitability of the industry in the Lake Area is a difficult one. In the 1965-6 season when cottonseed prices were abnormally high in the Lake Area, many millers complained of making heavy losses. The Lint and Seed Marketing Board of Tanzania considered carefully the question of what constituted a reasonable price for cottonseed for the following season and concluded that a price of shs 400 per ton for cottonseed was fair, taking into account ruling prices for oil and cake and allowing for crushing costs of shs 40 per ton of cottonseed crushed.[11]

If the product of one ton of cottonseed is considered, this would yield 299 lbs of oil (14 per cent extraction rate and allowing 5 per cent for refining losses) and 1120 lbs of cake (50 per cent extraction rate). Valuing the oil at 75 cts per lb, and the cake at ruling export prices less shs 68 for the cost of transport to the Coast,[12] this gives the following figures shown in Table 6.6.

Table 6.6

	Value of Cake From One Ton of Cottonseed	Value of Oil From One Ton of Cottonseed	Total Value	
1960	201	224	425	in shs.
1961	188	224	412	
1962	214	224	438	
1963	259	224	483	
1964	232	224	456	
1965	241	224	465	

Source: East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya, 1960-5. (Commissioner of Customs and Excise, East Africa).

The figures for prices of 'AR' cottonseed, and estimates of overall crushing costs are shown in Table 6.7.

Table 6.7

Season	Price of 'AR' Cottonseed (shs) in Lake Area	Price + 50 shs Crushing Costs	Price + 60 shs Crushing Costs
1960-1	380	430	440
1961-2	422	472	482
1962-3	383	433	443
1963-4	329	379	389
1964-5	375	425	435
1965-6	547	597	607

Source: Private communication with the Lint and Seed Marketing Board.

A comparison of the figures of Tables 6.6 and 6.7 shows that in the two seasons 1961-2 and 1965-6, in which prices for 'AR' seed in the Lake Area exceeded shs 400 per ton, the millers may well have found it difficult to cover their costs, although it should be remembered that the value shown for oil in Table 6.6 is undoubtedly a very low value which would be exceeded in most years. However, if a price of 90 cts per lb is assumed for oil, an extra revenue of shs 45 would be received by the millers, which would still give a negative balance in 1961 and 1965. In other years there would appear to have been a comfortable return from the production of semi-refined oil in the Lake Area. One factor which should be remembered is that the prices given for cottonseed in the Lake Area are ex-ginnery prices, and therefore that a few millers in the Lake Area, who have to buy seed from a considerable distance, may not have been in such a favourable position.

The position in the Lake Area contrasts sharply with that in Uganda, where it was found, see Chapter III, section E, that the production of semi-refined oil alone was not a profitable enterprise, due to the high prices of cottonseed. As for Uganda, the production of double-refined oil would certainly have provided a good return for the miller.

6. Possibilities of Technological Development. Much the same arguments apply to the Tanzanian situation as applied to that in Uganda.

As in Uganda, a 1 per cent or more rise in the amount of oil extracted from the cottonseed would lead to a considerable increase in revenue, and this could be achieved by the use of more modern extraction plant, and in particular more modern expellers.

However, as in Uganda, such a recommendation is only applicable to firms with sufficient crushing capacity to fully utilize these expellers. Only two mills had utilized capacities of over 9,000 tons in 1965, and thus could with advantage, to the extent

which they have not done so already, replace their expellers with more modern ones. At least another five firms had utilized capacities of more than 5,000 tons in 1965, and could benefit from the purchase of one such machine.

Again as in Uganda, the installation of solvent extraction plant is not to be recommended.

In 1967, the total capacity of the double-refining and hydrogenation plants in the Lake Area is expected to be 16 - 17,000 tons. This capacity is sufficient to double-refine or hydrogenate the oil from around 120,000 tons of cottonseed. The total amount of cottonseed available for crushing is only expected to reach around 140,000 tons by 1970 (see page 97) and thus in the near future, assuming that a small market for semi-refined oil will continue, there would seem to be no need for further plant of this form.

However, looking ahead to 1980, when the amount of cottonseed available for crushing is estimated as around 300,000 tons, considerable expansion will probably be required in double-refining and hydrogenation plant in order to produce a saleable commodity, as demand for semi-refined oil is likely to diminish over time, while that for other oil products increases.

As in Uganda, little investment in the industry is justified in the mid-1960's, particularly when such investment is seen in the light of the opportunity cost of the foreign exchange which could be used on other projects. Some increased efficiency can be achieved in the industry at very low cost by the millers taking more care over the pretreatment of their seed. A high capital outlay in the industry is neither required or justified, although some replacement of old expellers by modern ones, where these can be fully utilized, may be advantageous.

C. Supply and Demand for the Products of the Lake Area Industry

1. The Supply and Demand for By-Products. As in Uganda, the husk (or hulls) from the decorticators are used as a fuel in the boilers, and are not generally sold. They may also be added in a few cases to the cake, in order to increase the bulk of the cake before it is sold.

The actual amount of linters produced in 1965 in the Lake Area is unknown, but it is believed to amount to over 90,000 lbs. Prices quoted by millers as being received for their linters varied between 80 cts and 1 sh, which is considerably higher than the price received by Ugandan millers. As in Uganda, the linters were sold to upholstery manufacturers.

The soap-stock produced by the Lake Area

millers was almost all thrown away as was mentioned earlier.

2. The Supply and Demand for Oil Products. Cottonseed oil is the most important oil available in Tanzania, and is mainly converted into liquid oil products. Figures for the production, distribution and consumption of liquid oils from cottonseed are shown in Appendix 4 for the period 1963-5.

The exact production of groundnut and sesame oils in Tanzania is unknown, and Tanzania's purchases and sales of these oils as shown in the trade figures indicate an almost negligible amount of trade in the oils. It is assumed in what follows that these other oils are of only minor importance.

No hydrogenated oils and fats were being produced by the Lake Area millers in 1965, although small sales of both vegetable ghee and solid fats are shown in the trade figures, see Appendix 4, Table A.16. These sales are probably resales of purchases from elsewhere. Total consumption of ghee and solid fats for 1964-5 is shown in Table A.17.

Total production of liquid oils increased by 45 per cent over the period 1963-5 from 8,250 to 11,944 tons, in contrast to the situation in Uganda where production of liquid oils remained almost static at around 13,000 tons and where the increase in crude oil production was used to produce ghee and solid fats. Sales of liquid oils to Kenya increased four-fold over the period 1963-5, but sales of 2,868 tons by Tanzania in 1965 are small when compared with Uganda's sales to Kenya of 7,305 tons. Sales to Uganda and for export declined over the period. Over 67 per cent of production was consumed within Tanzania itself.

As in Uganda, liquid oil was the most important oil product consumed in Tanzania over the period 1963-5, amounting to 8,183 tons on average, of which 82 per cent was home produced. However, in Tanzania consumption of liquid oils was still increasing while that in Uganda was declining. Consumption of liquid oils was also at a higher level in Tanzania. This is possibly due to the greater preference for ghee and solid fats in Uganda where per capita incomes are higher.

For the Tanzanian millers, the most important markets for their liquid oils are the home market which absorbs 67 per cent on average of their sales, and the Kenyan market absorbing 18 per cent on average of their sales. It is obvious from these figures that the Kenyan market is not nearly as important to the Tanzanian as to the Ugandan millers. The greatest threat to the Lake Area millers would be from any stiff competition in their home market.

As discussed in Chapter IV, it seems far more likely that the Tanzanian millers will begin to take an increasing share of the Kenyan and Ugandan markets, than that they should lose their competitive power in these or their home markets. For the industry in the Lake Area is a rapidly expanding one, and one which should be able to produce lower cost oil due to the lower price of cottonseed. In these circumstances, it is likely, that, while prices in Uganda for cottonseed continue to be high, the Lake Area millers can control the liquid oils market.

There is no evidence that one or a group of firms in the Lake Area have the power to affect oil prices in the same way as 'the big four' in Uganda, although some millers did complain that the Federation had at one stage flooded the market with cheap oil. In fact, the Federation only accounted for 25 per cent of the liquid oils produced in 1965, compared with 'the big four's' 70 per cent.

The scope for exporting liquid oils is limited for the same reasons as for Uganda. Exports accounted for 11 per cent on average of total sales, a slightly higher percentage than for Uganda, and as for Uganda, a high proportion of these sales were to Somalia.

However, Tanzania would seem to be in a more advantageous position in the 1960's for marketing her liquid oils than either Uganda or Kenya. Uganda suffers from high cost seed, while Kenya suffers from limited supplies, and thus Tanzania should be able to maintain her share of the market, and possibly increase it at the expense of Uganda.

The Lake Area millers said that prices for oil depended on the price which they had to pay for cottonseed in any particular season. They pointed out that the high prices for oil in 1965 resulted from the very high prices for cottonseed in the 1965-6 season, and that the fall in prices in 1966 resulted from the large fall in cottonseed prices in that year. Unfortunately, there is no price data for other years to put this claim to the test. It was also said that the prospects of a large increase in the amount of cottonseed available for crushing in the Lake Area in the 1966-7 season, and therefore of more plentiful supplies of oil being put on the market, had caused the fall in price in 1966.

It is interesting to note that if the former claims are true, the Lake Area millers are able to raise their prices and still market their produce, indicating that Ugandan millers are not providing strong competition on the East African market. Further, the fact that oil prices fall as cottonseed prices fall, indicates a fair degree of competition

amongst the Lake Area millers themselves.

The total consumption of ghee and solid fats in 1965 was 2,468 and 1,241 tons respectively, all of this being purchased from outside Tanzania. When the new mill becomes operative in 1967, there seems no reason why its ghee and solid fats should not find a ready market in Tanzania. As is the case for liquid oils, the Lake Area millers should be able to produce these products at lower cost due to the lower cost of cottonseed, and thus the new products should be able to compete on the home market effectively with those from Uganda and Kenya. The firm might also, when it has established a brand name, be able to take a share of the Kenyan and Ugandan markets.

3. The Supply and Demand for Oil-Cake. Total production of cottonseed cake, almost all of which was the 46 per cent type cake, increased from 29,000 to 42,500 tons between 1963 and 1965, see Appendix 5.

Around 99.7 per cent of the cottonseed cake produced, see Table A.18 of Appendix 5, was sold for export, all the remainder being sold to Kenya. There were no sales of cottonseed cake to Uganda over the period 1955-65. As in Uganda, it is thought that only a very small fraction of the cottonseed cake produced is used in Tanzania itself.

The average prices received for the exported cake are shown also in Table A.18. In 1965, the millers claimed to be receiving from 520 to 570 shs for their cottonseed cake free on wharf at Dar es Salaam, which is supported by the figure given for 1965 in Table A.18. A comparison of Table A.18 with Table A.11 in Appendix 2, shows that prices f.o.b. Dar es Salaam were rather higher than those f.o.b. Mombasa over the period 1958-65. However, the cost of transport from Jinja to Mombasa of shs 65 per ton for cake is slightly lower than that from Mwanza to Dar es Salaam of shs 68 per ton.[14] Even so, it does appear that over the period 1958-65, the Mwanzan millers have been receiving rather more for their cake than their Ugandan counterparts.

As for Uganda, Tanzanian millers must accept the ruling market prices for their cake, but again there appears at present to be no deterioration in these markets.

Within Tanzania itself, though, difficulties have arisen with respect to the transporting of the cake to Dar es Salaam. These difficulties which began in 1965 have arisen because of the congestion on the Tanzanian railway, and congestion at Dar es Salaam Port. An agreement was made by the millers with the East African Railways and Harbours, that E.A.R. & H. would rail 4,000-5,000 tons of cottonseed

cake to the Coast each month. However, in the 1966-7 season, production of cake per month was in excess of this figure, and the cake was piling up in Mwanza. Often the cake, when it was transported, was taken in open trucks with consequent losses and deterioration en route. Further, with the railage difficulties the old system of payment has broken down. Under the old system, the banks forwarded the money to the millers when it was railed, collecting the money from the exporters when the cake reached Dar es Salaam. Now this system has broken down, the miller does not receive payment until his cake reaches Dar es Salaam, and if the cake is unduly delayed because of the congestion, the miller may not have the necessary finance to purchase further supplies of cottonseed. Most of the contracts made between the millers and exporters for cake have been for cake delivered free on wharf at Dar es Salaam. This again has created yet more difficulties, in that responsibility for off-loading from the railway and storage at the port becomes the responsibility of the miller. With the congestion in the port this has proved a major responsibility, and makes the millers responsible for any losses.

Under these circumstances it is not surprising that the millers have complained bitterly. It has been suggested that Kilindini Port should be used as an alternative outlet for the Lake Area cake, but the Lake Area millers are anxious that any extra cost of sending their cake to Mombasa should be met by E.A.R. & H. and not by themselves. Even if the Lake Area millers did have to meet the extra costs themselves of sending their cake to Mombasa (the cost of transport from Mwanza to Mombasa would be around shs 74 per ton [15]) they would still probably be in a more favourable cost position than the Ugandan millers due to their lower price of cottonseed.

4. The Value of Sales of Oilseed Products Outside Tanzania. The value of Tanzania's sales of cottonseed oil and cake to countries outside Tanzania is shown in Table 6.8 for the period 1963-5. Sales of other oils and cake are excluded as these were very small in amount over that period.

Table 6.8

	Oils (£)	Cake (£)	Total (£)
1963			
To Kenya	56,809	435	57,244
To Uganda	44,174	-	44,174
Exports [a]	89,270	741,838	831,108
Total	190,253	742,273	932,526
1964			
To Kenya	184,547	-	184,547
To Uganda	13,800	-	13,800
Exports [a]	144,441	773,295	917,736
Total	342,788	773,295	1,116,083
1965			
To Kenya	361,751	2,000	363,751
To Uganda	45,999	-	45,999
Exports [a]	75,715	1,008,397	1,084,112
Total	483,465	1,010,397	1,493,862

Source: East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya, 1963-5 (Commissioner of Customs and Excise, East Africa)

Note: a - The cost of transport from Mwanza to Dar es Salaam has been subtracted from export values at the rate of shs 3.05 per cental for cake and shs 4.30 per cental for oil.

The figures of Table 6.8 show that the earnings of the Lake Area milling industry amounted to around £0.9 million in 1963, £1.1 million in 1964 and £1.5 million in 1965, showing an increase of 67 per cent over the period. These figures are considerably less than the earnings of the Ugandan industry which increased from £2.3 million to £3.2 million over the same period.

Exports accounted for 79 per cent on average of these sales over the period, and 89 per cent of exports were accounted for by the cake. Sales of oils to Uganda and Kenya accounted for most of the sales to these countries. Thus, sales of cake were of great importance in the case of Tanzania.

In Table 6.9, the value of the sales of the Lake Area millers is compared with the total value of all sales for Tanzania for the period 1963-5.

Table 6.9

	Value of Lake Area Millers' Sales (£)	Value of all Tanzanian Sales (£)	Percentage of Total Formed by Millers' Sales [a]
1963	932,526	63,553,374	1.5
1964	1,116,083	70,111,861	1.6
1965	1,493,862	62,777,634	2.4

Source: East African Customs and Excise, Annual Trade Report of Tanganyika, Uganda and Kenya, 1965. (Commissioner of Customs and Excise, East Africa)

Note: a - The percentages are under-estimated as all exports are valued f.o.b. Mombasa or Dar es Salaam.

Although the sales by the Lake Area millers do not account for as great a percentage of total sales as was the case in Uganda, they have been accounting for an increasing percentage, and particularly sales of cake have a minor but significant part to play in the country's earnings from other countries.

5. Future Trends in Supply and Demand. While the ban on imports of cottonseed into Tanzania continues, the Tanzanian millers must rely on cottonseed produced within Tanzania for their crushings of seed.

In the Tanganyika Five-Year Plan, the output target for cotton lint is given as 81,000 tons by 1970 and 190,000 tons by 1980.[1] Assuming that the cottonseed available for crushing forms 175 per cent by weight of the cotton lint, this indicates a production of 142,000 tons of cottonseed by 1970, and of 333,000 tons by 1980.

Within the Tanganyika Five-Year Plan, details for the expansion of the groundnut crop are also set out,[2] but as in Uganda, it is expected that most of the increased production of groundnuts will be absorbed by the local population and by exports of high quality nuts.

It is not expected that any large quantities of other oilseeds will be available to the millers for crushing in the future, and thus total crushings will be limited to the amounts of cottonseed given above.

Assuming that the millers crush 142,000 tons of cottonseed in 1970, and 333,000 tons in 1980, this indicates a production of 19,312 tons of crude oil in 1970 and 45,288 tons in 1980. (Assuming that 10 per cent of the seed is 'BR', 90 per cent 'AR', and that extraction rates are 14 per cent from 'AR' seed and 10 per cent from 'BR' seed.) Allowing for a 5 per cent refining loss, production of refined oils

would be around 18,400 tons in 1970 and 43,100 tons in 1980.

In Appendix 6. projections have been made of the demand for oils and fats in Tanzania in 1971 and 1981, these projections being based on the same model as was used for Uganda.

The projections show that in 1971, total demand for oils and fats in Tanzania should be between 17,500 and 20,000 tons. A comparison of these figures with those for production above, indicates that by 1971, Tanzania could be producing just sufficient oils and fats to satisfy her home demand, but that there will be little or no surplus remaining for sales to other countries.

By 1981, total demand in Tanzania will have increased to between 27,000 and 34,000 tons, and supply will have increased to over 43,000 tons, giving a surplus of over 9,000 tons to be sold to other countries.

It will be remembered that Uganda was found to have an exportable surplus of oil by 1971 of over 10,000 tons, but it was considered that this would be absorbed by the Kenyan market.

However, the position would appear to be more critical by 1981. Although no supply estimates for oils and fats in Uganda by 1981 are available, demand by 1981 in Uganda is only expected to increase to between 17,500 and 22,000 tons, and even in 1971, supply of oils and fats was expected to amount to 23,000 tons. Thus we may still expect Uganda to be in a surplus position by 1981. Further, it has been shown above that Tanzania will also be expected to have a large surplus of oils by 1981.

The question of whether these oils and fats can be absorbed within East Africa obviously depends on the trends in oils and fats consumption in Kenya. Otherwise the continued prosperity of the oil milling industry in East Africa will depend on the development of exports to other neighbouring African countries.

Footnotes

1. East African Railways and Harbours, Tariff Book No.4 Part II (Aread Lithograph Printers, East Africa).
2. Ibid
3. Directorate of Development and Planning, Census of Industrial Production in Tanganyika, 1961. (Central Statistical Bureau, Dar es Salaam, August, 1964.)
4. Private communication with the Ministry of Industries, Mineral Resources and Power, Tanzania.
5. East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya, 1960-5. (Commissioner of Customs and Excise, East Africa).
6. Ibid
7. Directorate of Development and Planning, op.cit.
8. East African Customs and Excise, op.cit.
9. Directorate of Development and Planning, op.cit.
10. Private communication with the Lint and Seed Marketing Board of Tanzania.
11. Private communication with the Lint and Seed Marketing Board of Tanzania.
12. East African Railways and Harbours, op.cit.
13. East African Customs and Excise, op.cit.
14. East African Railways and Harbours, op.cit.
15. East African Railways and Harbours, op.cit.
16. The United Republic of Tanganyika and Zanzibar, Tanganyika Five-Year Plan for Economic and Social Development, 1st July, 1964 - 30th June, 1969. Volume I. General Analysis. (Government Printer, Dar es Salaam, Tanzania, 1964).
17. Ibid

CHAPTER VII

THE OIL MILLING INDUSTRY IN KENYA

A. Background to the Oil Milling Industry in Kenya

The oil milling industry in Kenya consists of a number of small firms, most of whom are not very active in the production of edible vegetable oils. A total of thirty-two firms in 1966 held licences to purchase cottonseed from the Cotton Lint and Seed Marketing Board of Kenya, but it was found that most of these firms were traders, who held licences in order to buy up cottonseed for export, should this become profitable.

As in Tanzania, the cotton production areas are split, the largest quantity of seed coming from Nyanza and Western Provinces, and most of the rest coming from the Coast Province, although a few tons in the 1960's have been coming from the Eastern Province.

The quantities of seed sold to millers and exporters in these three areas over the period 1955-6 to 1965-6 are shown in Table 7.1. This cottonseed, as in Uganda and Tanzania, is all sold through the Cotton Lint and Seed Marketing Board.

Table 7.1 (in tons)

	Nyanza & Western Provinces		Coast Province		Eastern Province		Total
	AR	BR	AR	BR	AR	BR	
1955-6	3,950	557	1,254	347.5	-	-	6,109
1956-7	2,775	245	102	129	-	-	3,251
1957-8	3,112	409	716	158	-	-	4,395
1958-9	4,400	461	1,398	271	-	-	6,530
1959-60	4,016	416	2,290	462	-	-	7,184
1960-1	4,393	309	770	261	-	-	5,733
1961-2	2,025	620	479	248	23	18	3,413
1962-3	3,706	559	833	334	165	177	5,774
1963-4	3,180	470	2,013	297	414	155	6,529
1964-5	5,003	720	1,274	421	456	494	8,368
1965-6	773	910	600	262	---	---	2,545*

Source: Private communication with the Cotton Lint and Seed Marketing Board, Kenya.
Note: * Incomplete.

These figures show how small the cottonseed crop has been in Kenya compared with that in Uganda and Tanzania. The maximum amount of cottonseed sold by the Cotton Lint and Seed Marketing Board was 8,400 tons in the 1964-5 season, when sales in Uganda and Tanzania amounted to around 130,000 and 80,000 tons respectively.

Total sales of cottonseed by Kenya for export or to Uganda and Tanzania have been very small. Purchases appeared to have been made by Uganda and Tanzania in only two years between 1955-65, and these were only of around half a ton.

As imports of cottonseed into Uganda and Tanzania are banned, it is assumed these purchases represented small purchases for experimental or planting purposes. It has been suggested that seed cotton and cottonseed is being smuggled from the Western Province of Kenya into Uganda, where a higher price can be obtained, but there is no firm evidence that such illegal transactions are taking place. However, if, as was suggested in the Kenya Development Plan[1], prices for raw cotton in Kenya were not to be kept in line with Ugandan prices, and further if farmers were to be charged for seed for planting, irregularities across the Kenya-Uganda border could increase.

As in Tanzania, almost all the seed exported probably comes from the Coast Province, and this is shown in Table 7.2, together with the balance sold to non-exporting firms in Kenya.

Table 7.2

(to nearest ton)

	Total Amount of Seed Sold (AR + BR)[a]	Exports of seed[b]	Balance
1956	6,109	1,873	4,236
1957	3,251	-	3,251
1958	4,395	-	4,395
1959	6,530	806	5,724
1960	7,184	1,596	5,588
1961	5,733	-	5,733
1962	3,413	-	3,413
1963	5,774	-	5,774
1964	6,529	980	5,549
1965	8,368	1	8,367

Sources: a - See Table 7.1.
b - East African Customs and Excise, Annual Trade Reports for Tanganyika, Uganda and Kenya, 1956-65. (Commissioner of Customs and Excise, East Africa).

However, the supplies of seed available in Kenya are augmented by purchases from both Uganda and Tanzania. These purchases, as recorded in the trade figures, are shown in Table 7.3, together with figures for purchases from the Lint and Seed Marketing Board of Tanzania, and the Lint Marketing Board of Uganda.

Table 7.2 (to nearest ton)

	Sales by L.M.B. of Uganda to Kenyan Firms[a]	Sales by L & SMB of Tanzania to Kenyan Firms[b]	Purchases in Trade Figures From Uganda[c]	Purchases in Trade Figures From Tanzania[c]
1955	---	---	-	605
1956	---	---	-	756
1957	---	---	-	3,509
1958	-	---	298	3,434
1959	-	---	-	7,024
1960	-	---	-	3,857
1961	-	1,300	-	2,434
1962	200	5,294	132	1,626
1963	419	2,870	229	5,498
1964	1,241	1,982	-	3,870
1965	1,950	1,986	-	1,829

Sources: a - Private communication with the Lint Marketing Board, Uganda (AR seed only).
b - Private communication with the Lint and Seed Marketing Board, Tanzania.
c - East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya, 1955-65 (Commissioner of Customs and Excise, East Africa).

The explanation of the different figures arrived at from the different sources is explained by two factors. Firstly, there may be some lag in cottonseed sales and the seed for the 1961-2 season, for example, in Tanzania may be recorded in the 1962 trade figures, when in fact the contract for the seed would have actually been made in 1961. Secondly, in the case of Ugandan sales, there is one firm which has offices in Uganda, but whose mill is situated at Malakisi, just over the border in Kenya. It is likely that purchases by this firm, which account for most of the Ugandan seed sold to Kenya, have been omitted from the trade figures. A further discrepancy that may have arisen with respect to the Tanzanian figures is that seed may have been bought by non-milling Kenyan firms whom it was not possible to identify from the Lint and Seed Marketing Board figures.

However, the figures of Tables 7.2 and 7.3 indicate that the total amount of cottonseed sold to Kenyan firms, mainly millers, over the period 1961-5 did not exceed 12,000 tons per year.

It is interesting to note the preference of the Kenyan millers for the Tanzanian, as opposed to the Ugandan cottonseed. As is noted below, prices for cottonseed in Tanzania have, with the exception of

two years, been much lower than those in Uganda, and with the cost of transport for cottonseed from Mwanza to Nakuru being little in excess of that from Tororo to Nakuru, while that from Mwanza to Kisumu was less than that from Tororo to Kisumu, the preference for Tanzanian cottonseed is obvious.

The prices for the Kenyan cottonseed itself are shown in Table 7.4.

Table 7.4 (in shs/ton)

	Western Provinces		Coast	
	AR	BR	AR	BR
1958-9	297	223	301	172
1959-60	388	285	416	221
1960-1	425	186	388	199
1961-2	300	205	338	190
1962-3	423	246	388	223
1963-4	339	221	340	201
1964-5	422	292	392	205

Source: Private Communication with the Cotton Lint and Seed Marketing Board.

An interesting feature of these figures is that prices for 'AR' cottonseed at the coast were, in four years out of seven, higher than prices in the Western Provinces. It is possible that in some years this is explained by demand for seed for export.

Throughout the period 1958-9 to 1964-5, the Kenyan prices have been less than the prices paid by millers in Uganda, the price differential being on average shs 59 over the period for Western Provinces and Ugandan 'AR' cottonseed. However, in every year except 1961-2 over the period 1958-9 to 1964-5, prices of cottonseed in the Lake Area of Tanzania were rather less for 'AR' cottonseed than those in the Western Provinces, the price differential being shs 37 on average over the period excluding 1961-2. With costs of transport of shs 64 per ton from Mwanza to Nakuru, and of shs 44 per ton from Mwanza to Kisumu, the cheapest source of seed to the Western Provinces millers would have been Western Provinces seed, although in 1958-9, 1960-1, and 1964-5, purchases from Tanzania may have been cheaper. A comparison of the prices for cottonseed in the Coast areas of Kenya and Tanzania show that on average these have been more or less equal over the period.

A total of fifteen different firms were listed as buying Western Provinces cottonseed from the Cotton Lint and Seed Marketing Board over the period 1958-65. However, it was found that only six of

these firms were regular purchasers of seed, the other purchasers being either exporters or traders who resold their seed, probably to one of the other six. Of these six firms, all of which were located in the Western Provinces, one had sold his oil mill in the early 1960's, and seemed now to be concerned with supplying cattle-food. This leaves a total of only five oil mills in the Western Provinces.

In 1965, only three of these mills purchased more than 100 tons of cottonseed from Kenya, Uganda or Tanzania, the largest purchaser having bought a total of 5,520 tons from all three sources, and the other two having bought 1,566 tons and 748 tons from all three sources.

Information was only available for one year on the purchasers of coast province cottonseed. In 1965-6, there were eight different purchasers of Coast cottonseed, three of whom were the Western Provinces millers mentioned above, the other five consisting of a ginnery, a soap factory, a dairy farmer, and two associated firms who operated an oil mill in Mombasa. This last was found to be the only mill producing edible oil products in the Coast Province from cottonseed although it is believed that, as in Tanzania, there are a number of mills crushing copra.

Thus the oil mills extracting oil from cottonseed and other edible oil seeds are mainly located in the Western Provinces. Two are located in Nakuru, two near Kisumu, and one near the Uganda border at Tororo. In addition there is one mill at Mombasa. The small number of mills in Kenya and the small amount of their activity is undoubtedly due to the small size of the cotton crop in Kenya.

In addition to the six mills mentioned above, there is one firm in Nairobi, a subsidiary of a large international company, which produces vegetable ghee and solid fats amongst a range of other products. This firm does not buy raw cottonseed or other oilseeds, but purchases the supplies of liquid oils it requires from oil mills in Kenya, Uganda and Tanzania. The reason given by the firm for not crushing the oilseeds for itself, is that only very small amounts of oil-bearing seeds are available in the Nairobi area, and the high cost of bringing cottonseed from the cotton-growing areas of Kenya would put the firm at a disadvantage compared with other millers located in the cotton areas. The firm only has a small extraction plant in Nairobi which has been used for crushing small amounts of sunflower seed.

Apart from the crushing of cottonseed, no other oilseed seems to have been crushed in any quantity

by the industry in Kenya. It is thought that the high prices for exported groundnuts, and also in the local markets, have prevented the crushing of groundnuts by the millers, as in Tanzania and Uganda. Small amounts of other seeds for specific purposes have been crushed, and these will be mentioned later.

B. The Operation of the Kenyan Oil Mills

The methods used by the Kenyan millers for the extraction of oil from their oilseeds were similar to those in use in Uganda and Tanzania.

All of the four firms asked owned delinting equipment, which was being used. All four also had decorticators, which contained a magnet for removing tramp iron. But three of the firms in the Western Provinces were in fact crushing mainly undecorticated cottonseed, there being a market for the 31 per cent type cake amongst the farmers in Kenya itself. The four firms claimed to have adequate storage capacity for the seed which they crushed.

A total of 20 expellers, mainly of the old type, were owned by five of the six millers in 1965. At least four of these expellers were second-hand ones purchased from millers in Uganda and Tanzania. Most were of the British Rose-Down model. Figures given for the amount of oil left in the cake after extraction varied from 7-10 per cent. These figures are considerably higher than those given by the millers in either Uganda or Tanzania, and probably refelct a lower standard of efficiency amongst the Kenyan millers.

None of the six mills had plant for producing double-refined or hydrogenated oils and fats, although, as mentioned above, there is one firm in Nairobi producing hydrogenated oils and fats.

Thus the six mills were producing only semi-refined oil, some of which was then sold to the Nairobi firm for hydrogenation.

Another important activity of the millers, apart from oil milling, was grain milling, two of the mills producing maize meal and two polished rice. In the case of one of the rice millers, the rice mill appeared to be the major enterprise of the firm, the oil mill only being operated when seed could be obtained. Two of the mills were also producing laundry soap, while another was also engaged in cotton ginning.

The two Nakuru mills were produce dealers in all forms of food products, and were also concerned with the provision of cattle-food to the local farmers. In addition to cottonseed, these two firms crushed small amounts of mustard seed, linseed, kapok seed, soya beans, and sunflower seed which has been rejected for export, but the total of all these

seeds crushed in any one year only amounted to a few hundred tons. Some of these seeds are crushed to provide high quality cake for cattle-food. Cattle-food seems to be the major enterprise of these two firms.

The activity of these Kenyan millers is in some ways similar to that of the smaller Ugandan millers, who have a variety of other enterprises, apart from milling, in order to maintain the mill premises functional throughout the year.

The total amount of cottonseed crushed by the six mills from 1961-5 is estimated in Table 7.5. This includes all purchases by the six millers from the Kenyan, Ugandan and Tanzanian Marketing Boards.

Table 7.5

(in tons)

	Purchases from LMB of Uganda[a]	Purchases from L & SMB of Tanzania[b]	Purchases from CL & SMB of Kenya[c]	Total Purchases
1961	-	1,050	6,568	7,618
1962	200	4,326	2,162	6,688
1963	419	2,670	1,154	4,243
1964	1,241	1,782	1,117	4,140
1965	2,739	1,536	4,551	8,826

Sources: a - Private communication with the Lint Marketing Board of Uganda.
b - Private communication with the Lint and Seed Marketing Board of Tanzania.
c - Private communication with the Cotton Lint and Seed Marketing Board of Kenya. (Excluding purchases of Coast Province seed except in 1965).

These figures are rather lower than those shown in Table 7.3, as amounts sold to other firms in Kenya have been excluded. A maximum of 12,000 tons of seed (see earlier) is the likely amount of seed which has been crushed in Kenya over this period. But the maximum may be as low as 9,000 tons as indicated in Table 7.5, as some cottonseed may have been used directly as a cattle-food.

The total capacity of five of the firms in 1965 was around 30,000 tons of seed per year, assuming that each expeller crushes approximately 1,500 tons of seed per year. This indicates a utilized capacity in 1965 of less than 40 per cent. One firm was, however, operating at 90 per cent of capacity in 1965. This level of overall utilized capacity is considerably less than that experienced overall by the industries in either Uganda or Tanzania, although some of the smaller firms in Uganda probably as individuals had utilized capacities of this order of magnitude.

There is no question of one firm dominating the others in Kenya, although as mentioned above one was apparently operating at a much higher utilized capacity in 1965 than the other five. This firm has purchased much larger supplies of seed from Uganda and Tanzania than the others, and oil milling seems to be a more important enterprise of the firm than in the other cases. It seems that it is by this firm's efforts that it is able to secure such large supplies of seed compared with the small quantities which the other Kenyan firms obtain. However, this firm only crushed 5,500 tons of seed in 1965, and is therefore, by Ugandan and Tanzanian standards, only a small miller. The other five mills are small when considered in terms of the amount of seed crushed by Ugandan and Tanzanian standards, and are of negligible importance.

When four of the six firms were questioned about their future plans, one appeared to have none at all, one was planning to install one further expeller in 1967, and two hoped to expand if the cotton crop in Kenya expanded. None of the six millers were considering the possibility of setting up double-refining or hydrogenation plant, which is probably a reflection of the small size of the industry in Kenya and the inability of any of these small firms to compete with the large Nairobi producer of hydrogenated oils and fats.

The four firms questioned employed a predominantly permanent labour force, which was believed to be used for other activities of the firms when the expellers were not operative. The number of shifts operated by the firms varied from one to three, and like the smaller firms in Uganda, the length of time for which the extraction machinery was operated depended on the amount of seed available.

The wages paid to the labour force appeared to be rather higher than Ugandan and Tanzanian wages, although there was considerable variation between the individual firms. In addition, housing and posho was provided by some firms.

The lower level of extraction for oil in Kenya, which was quoted as 12-13 per cent by the millers, together with the higher labour costs may make oil milling less profitable than elsewhere. Even if labour costs increase crushing costs by only a small amount, the 1-2 per cent lower output of oil may decrease returns by as much as 16-32 shs per ton of seed crushed, compared with Uganda and Tanzania.

Although the prices paid by the Kenyan millers for Western Provinces cottonseed were on average shs 59 less than prices in Uganda over the period 1958-9 to 1964-5, only 49 per cent (see Table 7.5)

of the cottonseed over that period was purchased from the Cotton Lint and Seed Marketing Board of Kenya. Of the remainder, 36 per cent was purchased from Tanzania and 15 per cent from Uganda. As was mentioned earlier, although Tanzanian seed was cheaper on average over the period, the price differential was not sufficient to cover the cost of transport from Mwanza to the Western Provinces mills and thus the overall cost of Tanzanian seed would have been greater than that of Western Provinces seed. The cost of the Ugandan seed purchased would have been considerably above that of the Kenyan and Tanzanian seed.

If the price of the cottonseed from the different sources is weighted by the amount purchased, with allowance also being made for transport costs, an average figure for any year for the price of cottonseed to the Kenyan millers can be obtained. These figures are shown in Table 7.6, together with estimates of total costs.

Table 7.6

	(shs/ton) Average Price for Cottonseed in Kenya	Price + 50 shs Crushing Costs	Price + 60 shs Crushing Costs
1961	426	476	486
1962	397	447	457
1963	440	490	500
1964	384	434	444
1965	466	516	526

The minimum returns for the oil from one ton of cottonseed would be Shs 192 (allowing a 12 per cent extraction rate, a 5 per cent refining loss and a price of 75 cts per lb). The maximum returns for the oil from one ton of cottonseed would be Shs 250 (allowing a 13 per cent extraction rate, a 5 per cent refining loss and a price of 90 cts per lb).

The returns for cake, allowing for a 50 per cent extraction rate are based on figures in the trade figures, with an allowance of Shs 60 per ton for transport to the coast.[4] These returns, together with the overall returns from one ton of cottonseed are shown in Table 7.7.

Table 7.7 (in shs)

	Returns From 1120 lbs of Cake	Maximum Returns From Oil & Cake From One Ton of Cottonseed	Minimum Returns From Oil & Cake From One Ton of Cottonseed
1961	188	438	380
1962	217	467	409
1963	241	491	433
1964	210	460	402
1965	244	494	436

A comparison of Tables 7.6 and 7.7 shows that although returns were probably sufficient in most years to cover the cost of the cottonseed, it is unlikely that there would have been sufficient returns from the production of semi-refined oil over the period 1961-5 to cover crushing costs. In this respect the Kenyan millers are in a similar position to the smaller millers in Uganda, although in Uganda the position was found to be slightly more critical as seed costs could not be covered in some years.

The possibilities of technological development in the industry are naturally limited by its small size. The amount of seed available for crushing in Kenya is only expected to increase to 30,000 tons by 1970, see page 116, and thus the existing capacity in Kenya is almost sufficient to deal with this seed. With pressure for cottonseed coming from millers in both Mwanza and Uganda, it is doubtful if Kenya can increase her supplies of seed from other sources.

With only one mill crushing more than 5,000 tons of seed in 1965, it is doubtful whether the replacement of old expellers by more modern ones would be worthwhile. Further, the small size of the firms makes any investment in double-refining or hydrogenation plant impractical. Thus little or no investment is at present justified amongst the Kenyan millers.

However, as demand for ghee and solid fats is likely to increase over time, it may be worthwhile for a firm such as the one in Nairobi to expand its hydrogenation plant. As this firm was unwilling to give any information, it is not possible to estimate present or future demand for these products, nor to judge whether the existing plant in Nairobi is sufficient to fulfil future demands for vegetable ghee and solid fats.

C. Supply and Demand for Products of the Oil Milling Industry in Kenya

It is not possible to give any precise figures for production of by-products, oil products or cake in Kenya, as information was not obtained from all

millers. However, rough estimates based on the amount of cottonseed crushed can be made.

If a 13 per cent extraction rate is taken for oil from cottonseed, and allowing for a 5 per cent refining loss, figures can be obtained for the production of refined oil in Kenya. These are shown in Table 7.8.

Table 7.8

(in tons)

	Amount of Cottonseed Crushed	Production of Refined Oil
1963	11,501	1,395
1964	10,399	1,287
1965	10,197	1,262

Source: See Table 7.2 and Table 7.3. (Amount equals total seed sold, less exports, plus purchases from Uganda and Tanzania).

These figures show that the production of liquid oils in Kenya only amounted to just over 1,000 tons between 1963-5, compared with around 13,000 tons in Uganda and Tanzania. Evidence from the millers shows that when prices are high, most of this oil is sold locally in the Western Provinces as semi-refined oil. However, when prices locally are low, the millers make contracts with the firm in Nairobi with hydrogenation plant. The prices received by the millers for their oil in the Western Provinces of Kenya are undoubtedly strongly influenced by prices in Mwanza and Uganda. Like the smaller firms in Uganda, the Kenya millers must accept the ruling market price, or the price quoted by the Nairobi firm.

It is interesting to note here the dependence of this large Nairobi firm on the millers producing semi-refined oil in Kenya, Uganda and Tanzania. Almost certainly, the amount of oil produced in Kenya itself is quite insufficient to satisfy this firm's requirements of cottonseed oil, and oil must generally be bought from either Tanzania or Uganda. The actual quantities required by this firm annually are unknown.

The amount of liquid oils produced by Kenya is far below that required for consumption purposes and also for conversion into hydrogenated oils and fats. Thus Kenya is a large purchaser of liquid oils from Uganda and Tanzania. Quantities of cottonseed oil purchased are shown in Table 7.9. Some groundnut and sesame oils were also purchased, but the amounts involved were generally less than 100 tons per year.

Table 7.9 (to nearest ton)

	Purchases From Uganda	Purchases From Tanzania	Imports	Total
1955	3,126	259	-	3,385
1956	2,205	522	-	2,727
1957	3,313	251	-	3,564
1958	5,364	181	-	5,545
1959	7,025	461	-	7,486
1960	6,686	268	-	6,954
1961	5,751	423	-	6,174
1962	3,916	268	98	4,282
1963	6,168	704	-	6,872
1964	6,805	1,954	-	8,759
1965	7,260	2,868	-	10,128

Source: East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya, 1955-65 (Commissioner of Customs and Excise, East Africa).

These figures show that the quantity of cottonseed oil purchased by Kenya has been steadily increasing. Although the amount of cottonseed oil sold by Kenya has also been increasing, the amounts involved are relatively small. Total sales by Kenya to all other countries are shown in Table 7.10, together with the net purchases.

Table 7.10 (in tons)

	Total Sales of Cottonseed Oil by Kenya	Total Purchases Less Total Sales
1955	54	3,331
1956	59	2,668
1957	87	3,477
1958	436	5,109
1959	999	6,487
1960	1,478	5,476
1961	1,420	4,754
1962	677	3,605
1963	740	6,132
1964	568	8,191
1965	1,089	9.039

Source: East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya, 1955-65 (Commissioner of Customs and Excise, East Africa).

These figures, together with those of Table 7.8, indicate that the total amount of liquid oils either consumed or converted into hydrogenated oils and fats in Kenya from 1963-5 amounted to 7,500-10,300 tons. Unfortunately, the amount converted into

hydrogenated oils and fats is unknown, and therefore no estimate can be made of the consumption of liquid oils in Kenya. Similarly, it is not possible to make estimates of the production or consumption of vegetable ghee or solid fats in Kenya. The Nairobi firm is believed to be the largest producer of these products in East Africa, but no figures for production are available. Figures for sales and purchases of vegetable ghee and solid fats by Kenya are shown in Table 7.11.

Table 7.11

Vegetable Ghee (to nearest ton)

	Purchases From Uganda	Purchases From Tanzania	Imports	Sales To Uganda	Sales To Tanzania	Exports
1964	1,978	56	27	152	497	3
1965	2,231	172	1	165	165	11

Solid Fats[a]

	Purchases From Uganda	Purchases From Tanzania	Imports	Sales To Uganda	Sales To Tanzania	Exports
1964	225	1	47	388	771	14
1965	294	4	61	521	1,152	10

Source: East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya, 1964-5 (Commissioner of Customs and Excise, East Africa).

Note: a - These fats include other liquid oils, apart from cottonseed oil.

As was discussed in Chapter IV, the Nairobi firm holds a monopoly with two Ugandan firms in the hydrogenated oils and fats market, and it appears from the trade figures that the Nairobi firm is the larger producer of solid fats, while the Ugandan firms together are the larger producers of vegetable ghee.

Undoubtedly, the Nairobi firm suffers from the disadvantage of having to purchase supplies of liquid oils from other millers, while the Ugandan millers can utilize their own supplies, but on the other hand the cost of transport from Jinja to Nairobi is such that the Nairobi firm can overcome this disadvantage to some extent on the Kenyan market. As palm oil and other oils are used in the production of solid fats, and these oils must be bought from the Coast area, the Nairobi firm can probably produce lower cost solid fats than its

Ugandan counterparts, but it is doubtful whether the Nairobi firm can compete so effectively in the ghee market.

With the new production of hydrogenated oils and fats in Mwanza, competition in the hydrogenated oils and fats market may increase. As for Ugandan firms, the Mwanzan firm should certainly be able to produce lower cost ghee than the Nairobi firm.

The total consumption of all oils and fats in Kenya appears to have been between 10,000-11,000 tons in 1964 and 1965, see Tables 7.8, 7.10 and 7.11.

Again, as for oil products, only estimates can be given of the total amount of cottonseed cake produced in Kenya. Assuming a 50 per cent extraction rate for cake from cottonseed, figures can be obtained for the total production of cake. These figures, together with the total amount of cottonseed cake sold by Kenya are shown in Table 7.12.

Table 7.12

(in tons)

	Estimated Production of Cake[a]	Exports of Cottonseed Cake[b]	Sales of Cake to Uganda and Tanzania[b]	Total Sales
1955	---	1,269	17	1,286
1956	2,496	2,924	171	3,095
1957	3,380	477	1	478
1958	4,064	4,072	16	4,088
1959	6,374	4,330	175	4,505
1960	4,723	2,069	110	2,179
1961	4,084	1,430	72	1,502
1962	2,586	1,209	30	1,239
1963	5,751	706	117	823
1964	5,200	1,104	35	1,139
1965	5,099	1,151	52	1,203

Sources: a - See Table 7.2 and 7.3.
b - East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya, 1955-65 (Commissioner of Customs and Excise, East Africa).

These figures show that the production of cottonseed cake in Kenya is very small compared with production in both Uganda and Tanzania.

A comparison of the figures in the last column of Table 7.12 with those in the first column shows that in the 1960's possibly around 70 per cent of the cake produced in Kenya was consumed as a cattle-food within Kenya itself. However, not too much accuracy should be attached to the figures in the first column, as it is known that some millers produce the 31 per cent type cottonseed cake, giving an extraction rate of around 80 per cent. The amount

of such cake produced is unknown. But this factor implies that the figures in Table 7.12 are probably under-estimates.

In addition to the home produced cake sold for cattle-food on the Kenyan market, some cake is purchased from Uganda and Tanzania. Figures for purchases of this cottonseed cake are shown in Table 7.13, together with minimum estimates of the total amount of cottonseed cake consumed within Kenya.

Table 7.13 (in tons)

	Total Purchases of Cottonseed Cake	Minimum Estimate of Home Consumption of Cake
1960	58	2,602
1961	72	2,654
1962	30	1,377
1963	72	5,000
1964	35	4,096
1965	53	3,949

Source: East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya, 1960-5 (Commissioner of Customs and Excise, East Africa).

These figures indicate a minimum amount of 4,000-5,000 tons of cake sold on the Kenyan market. Most of this cake will have been sold to the cattle-food manufacturers in Kenya, at a similar price to that ruling for cake on the world market. Some would have been sold direct to the Kenyan farmers.

It is interesting to note that most of the cottonseed cake used in Kenya for cattle-food appears to come from the Kenyan millers, while large quantities of the finished animal food are sold to Uganda and Tanzania.

As for Uganda and Tanzania, prices received for exported cottonseed cake which was mainly sold to European cattle-food manufacturers, ranged between shs 480-550 f.o.b. Mombasa, which prices are in line with those received by Uganda and Tanzanian millers. Obviously the Kenyan millers have no power to affect the prices or conditions in the world market for cake.

No sales of groundnut cake are recorded for 1964 and 1965 in the trade figures, but in 1965 Kenya purchased a total of 114 tons of groundnut cake from Uganda and Tanzania.[6] It is presumed that this cake was used by the cattle-food manufacturers in Kenya. The production of groundnut cake or any other oilseed cake within Kenya itself is unknown.

The total value of Kenya's sales of oil products

and cake to other countries is shown in Table 7.14.

Table 7.14

(in £)

	Oil Products[a]	Cottonseed Cake	Total
1963			
Sales to:			
Uganda	3,055	640	3,695
Tanzania	77,880	1,200	79,080
Exports[b]	1,358	17,025	18,383
Total	82,293	18,865	101,158
1964			
Sales to:			
Uganda	106,193	-	106,193
Tanzania	306,862	536	307,398
Exports[b]	5,824	23,255	29,079
Total	418,879	23,791	442,670
1965			
Sales to:			
Uganda	205,499	-	205,499
Tanzania	385,887	851	386,738
Exports[b]	10,196	28,109	38,305
Total	601,582	28,960	630,542

Source: East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya, 1963-5 (Commissioner of Customs and Excise, East Africa).

Notes: a - This includes liquid cottonseed oil, and for 1964 and 1965 vegetable ghee and solid fats.

b - A deduction of shs 2.50 per cental for oil products and shs 2.65 per cental for cake has been made for the cost of transport to the Coast.

The year 1963 is not directly comparable with 1964 and 1965 in Table 7.14, as figures for sales of ghee and solid fats are not available for 1963. It is interesting to note from this table the relative importance of sales of oil products within East Africa as compared with exports of oil products. Exports only accounted for 7 per cent of the total value of all sales of oil products over the period 1963-5. Sales of oils and fats to Tanzania, most of which consisted of hydrogenated oils and fats, formed the greatest percentage of these sales.

Total sales by Kenya in 1964 and 1965 amounted to only around £0.5 million, compared with sales to a value of over £1 million and £2 million by Tanzania and Uganda.

The Kenyan sales formed only 0.9 per cent of the total domestic exports of Kenya in 1964, and 1.3 per cent in 1965. However, most of these sales

consisted of hydrogenated oils and fats produced by the Nairobi firm, for which large supplies of liquid oils will have had to have been purchased from Tanzania and Uganda. The oil milling industry in Kenya is of rather less importance to the economy than its counterparts in Uganda and Tanzania.

Future trends in the supply of oils and fats by the Kenyan industry will depend on the amount of seed which the industry can obtain for crushing. It has been implicitly assumed in making projections for Uganda and Tanzania that these two countries would crush in future years all available seed in their own countries, and therefore we must assume in making these projections that Kenya will also be limited to her own supplies of cottonseed, despite the fact that Kenyan millers are permitted to import cottonseed from other countries.

The target production given in the Kenya Development Plan for the production of cotton lint, is[8] for a production of 95,000 bales (17,000 tons) by 1970, which, taking cottonseed as being 175 per cent by weight of the lint, would give around 30,000 tons of cottonseed.

The total production of crude oil from this seed would be around 4,080 tons, (assuming that 10 per cent of the seed is 'BR', 90 per cent 'AR' and that there is a 14 per cent extraction rate for 'AR' seed and a 10 per cent extraction rate for 'BR' seed). Allowing 5 per cent for refining losses, this gives a production of only around 3,900 tons of refined oil.

Total demand for oils and fats in 1971 was estimated in Appendix 7 as between 14,000 and 15,000 tons, and thus it is to be expected that Kenya will purchase in 1971 between 10,000-11,000 tons of oils and fats.

The projections for Uganda and Tanzania for 1971 show that Uganda will have a surplus production of 11,000-12,000 tons of oils and fats in 1971, and Tanzania will have just sufficient to cover her own demand. Thus for East Africa as a whole, supply and demand should be more or less equal in 1971, much of the demand in Kenya being supplied by the Ugandan industry.

Unfortunately, no predictions are made in the Kenya Development Plan as to cotton production, or the levels of gross domestic product and population by 1980. Thus the estimates of supply and demand in 1980 as calculated for Uganda and Tanzania cannot be made. However, total demand in Uganda and Tanzania increased by around 10,000 tons in each country. Assuming a similar increase in demand for oils and fats in Kenya, and assuming that the best Kenya

could do would be to double her supply of oils and fats, this would imply that Kenya would need to purchase around 16,000 tons of oils and fats in 1980. This will obviously be mainly supplied by Uganda and Tanzania, but it is uncertain whether this demand will be sufficient to take up all the surplus production of oils and fats in Uganda and Tanzania.

Footnotes

1. Republic of Kenya, Development Plan, 1966-1970.
2. East African Railways and Harbours, Tariff Book No.4 Part II (Aread Lithographic Printers, East Africa).
3. Ibid
4. Ibid
5. East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya, 1964-5. (Commissioner of Customs and Excise, East Africa).
6. Ibid
7. Ibid
8. Republic of Kenya, Op.cit.

CHAPTER VIII

THE USE OF OILSEED CAKE AS A HIGH PROTEIN HUMAN FOOD[1]

Most of the oilseed cake produced within East Africa is sold to European countries, and is used for the production of high protein feedingstuffs for domestic animals. However, as well as providing a high quality feedingstuff for domestic animals, suitably prepared oilseed cake may be used as an ingredient for a high protein food for human consumption.

In parts of Uganda, and undoubtedly also in parts of Kenya and Tanzania, there is a serious lack of protein in the diet of the people, particularly in the diets fed to young children, pregnant and nursing mothers, and invalids. In the 1960's, the clinics have relied on the use of dried skimmed milk to treat and prevent malnutrition, but in future years the skimmed milk may prove both difficult and costly to buy. Until 1966, no food product has been produced commercially within East Africa to meet this need, although high protein foods making use of oilseed cakes are produced commercially in other parts of the world.

Although flour produced from oilseed cakes does not have such a high protein content as animal products such as eggs, milk, meat and fish, it has been found that such flours have a high nutritive value, and further it has been found that oilseed flours are cheaper per lb of protein than the animal products. Thus the oilseed flours may be a means of providing a low cost, high protein food for those in need.

The most common and simplest protein food which can be formed from oilseeds is a flour produced from the cake. This may have certain vitamins and minerals added, and may be supplemented with any essential amino acids, mainly lysine and methionince, in which the particular flour is deficient. In practice, most of the protein foods used in other parts of the world consist of a mixture of products, often containing both oilseed flours and cereals. The advantage of such mixtures is that an amino acid lacking in one constituent of the mixture may be supplemented by the presence of that amino acid in another constituent, and thus the nutritive value of the mixture may be greater than that of any of its constituents.

Cottonseed flour, marketed as "Proflo" has been produced in the U.S.A. for around 25 years, and is

mainly sold to the bakery industry. The first developments in the production of cottonseed flour by the developing countries were sponsored by the Institute of Nutrition of Central America and Panama, who developed formulae for "Incaparina". "Incaparina" was mainly based on whole corn, cottonseed flour and/or soya flour, with small quantities of yeast, calcium carbonate and vitamin A added. This product has been sold commercially in several countries in Central and South America, and has been used as a beverage or for incorporation in soups, puddings, baby food, or for use in non-bread recipes as a part substitute for wheat flour. It was found that obtaining cottonseed flour of the required standards was a problem in some countries, and it was also found that the degree of acceptability of the product by the people varied considerably from country to country.

Groundnut flour has also been used in high protein foods in different parts of the world. In India two plants for producing human-grade groundnut meal were provided by UNICEF, and groundnut flour has been used in manufacturing the biscuits "Nutro", and a compound consisting also of dried skimmed milk known as "Arlac", which has been used in the treatment of cases of kwashiorkor. Groundnut flour was also a constituent of "Amama", which it is believed was at one time sold in East Africa as a medicine.

Many other high protein foods rely on the use of full-fatted or defatted soya flours.

The Production of Human-Grade Cottonseed Meal in East Africa

The production of cottonseed cake in the 1960's in East Africa amounted to over 100,000 tons annually, and thus plentiful supplies of this cake are available for use as a basis for a low cost high protein food.

Certain adjustments must be made to the standard procedures for the extraction of oil and cake from the cottonseed if the cake is to be used as a human and not an animal food. This will mean careful selection of seed prior to crushing and adequate cleaning to remove all dirt, stones and tramp iron, so that the resultant meal is sanitary and free from bacteriological infections. Throughout the crushing process, standards of hygiene and cleanliness must conform with those acceptable in other food manufacturing industries. It is necessary to ensure that in the decortication process the hulls and meats are almost completely separated by the use of aspirators, so that the fibre content of the meal is reduced to a minimum, and for the same reason delinting of the seed is necessary. Care must be taken in the

heating of the meats prior to pressing, to ensure that essential amino acids are neither destroyed nor become less available. Finally, it is necessary in the case of cottonseed to ensure that the toxic element gossypol is only present in very small quantities in the meal.

The standards given by the Protein Advisory Group of WHO/FAO/UNICEF for the production of cottonseed meal for human consumption are shown in Table 8.1.

Table 8.1

Moisture percentage (maximum)	10.0
Crude fat percentage (maximum)	6.0
Protein percentage (Nx6.25, minimum)	50.0
Crude fibre (maximum)	5.0
Total gossypol (maximum)	1.2
Free gossypol (maximum)	0.06
Free fatty acids (as percentage of oil, maximum)	1.8
Available lysine (g/16.N, maximum)	3.8

Free of E. Coli, Salmonella and pathogens.
Total bacterial plate count less than 20,000 per gm.
Acid insoluble ash less than 0.1 per cent.
Insect and rodent contamination - essentially free.

These conditions make the production of meal for human consumption considerably more expensive than the production of cake for cattle-food. As mentioned above, the pretreatment of the seed, selection, cleaning, delinting and decortication, needs to be particularly thorough, and apart from the capital outlay involved, the overall costs of production will undoubtedly be raised. Further, carefully controlled production making use of laboratory facilities will also be required if meal of the specified standards is to be produced. It is difficult to estimate the exact extra costs of production for producing human-grade meal, but experience of producing human-grade soya flour in the U.S.A. suggests that production costs may be 150 per cent more for producing a human-grade product.

Much the most pressing problem in the production of human-grade cottonseed meal in conformity with the standards, is to reduce the toxic element gossypol in the meal to a level of 0.06 per cent. Most of the cottonseed meal available in world, including that produced in East Africa, exceeds this gossypol limit, and cottonseed flour fulfilling the standards of Table 8.1 has so far only been produced in El Salvador, Colombia and the U.S.A.

There are two approaches to the removal of gossypol from the meal, the first relying on reducing the level in the meal itself by careful process-

ing, and the second of reducing the level of gossypol in the original cottonseed.

The level of gossypol in the meal may be reduced by binding the gossypol with some of the lysine in the meal. The gossypol and lysine react to form a substance which is then non-available. The extent of the binding which takes place depends on the conditions under which the seed was crushed, higher temperatures, higher moisture and longer cooking leading to greater rupturing of the glands in the seed, and thus to increased binding. Lyman and co-workers recommend that cottonseed meats be brought to a moisture content of at least 14-15 per cent before cooking, that the cooking be for at least 90 minutes, and that the final temperature be not less than 115°C.

This approach to the elimination of gossypol leads to a fall in the level of available lysine in the meal. The amount of available lysine is one of the most important factors in determining the product's nutritive value, and this factor is the more important when the meal is to be used in conjunction with cereals which are deficient in lysine. Martinez and Frampton have shown that the quantity of lysine destroyed in the processing of cottonseed meal depends on the severity of the processing, and it is quite probable that the amount of heating etc. required to reduce gossypol to the desired level will also cause the amount of available lysine to fall below the minimum of 3.8 per cent given in the standards, see Table 8.1.

The gossypol may also be removed from the meal by a solvent extraction method, using a mixture of hexane, acetone and water as the solvent. The gossypol is then removed with the oil. This method should not lead to the same loss of lysine as in the case of expeller processing, but toxicity may arise from the use of organic solvents on the cottonseed.

The second approach, of removing the gossypol from the seed itself, depends on the use of a glandless variety of cottonseed, which is then free of gossypol. The absence of glands is independent of other genetic characteristics, and therefore may be transferred to various types of cottonseed without modifying other characteristics. There appears to be no ill effects from glandless seed, and there is in fact evidence to show that glandless seed has an improved protein content and produces cleaner oil. Glandless plants, though, are not as resistant to rodents and insects as conventional varieties. Certainly if this approach were adopted to overcome the problem of gossypol, time and money would need to be spent on research and on the production of

suitable seed varieties. The most appropriate method of removing gossypol in East Africa would seem to be by extraction with expellers under carefully controlled conditions.

One further problem with regard to cottonseed meal is the presence of cyclopropenoid fatty acids in the meal. These acids are part of the fat content of the meal, and thus the lower the level of the fat content of the meal the less the problem. Some of these acids are in fact destroyed by the heat generated in the expelling process.

Most of the cottonseed cake being produced within East Africa has a profat (protein and fat) content of 46 per cent. As in general the cake was found to contain 6-7 per cent oil, this indicates a protein content of 39-40 per cent, which is considerably below the protein content given in the standards, see Table 8.1. Further, the level of gossypol in East African cake is almost certainly above the minimum set in the standards.

These factors indicate that human-grade cottonseed meal could only be produced in East Africa if there were some change in the techniques of production in the oil mills. This would undoubtedly mean capital expenditure on cleaning equipment and modern separators for removing the hulls from the meats prior to extraction. It would also mean using delinting equipment where this is not already used, and carefully controlling the extraction process.

Laboratory facilities would be necessary in order to select the seed carefully, and to ensure the required standards were met throughout the production process.

The minimum size of plant which could be operated would consist of either one expeller or one solvent extractor together with the necessary cleaning, delinting and decortication equipment. However, there are some problems concerned with the extraction of cottonseed oil and cake by the solvent extraction process, and as no miller has any experience of solvent extraction in East Africa, the expeller process would seem to be the better choice. One advantage of the expeller process is that its capacity is fairly low, and initially small quantities of the human-grade meal could be produced, other expellers being added as the demand increased. However, the problem of beginning production on only a small scale is that the cost of the ancillary equipment is high, and it may not prove economic to use this equipment for small amounts of seed. Therefore it has been suggested that costs could be reduced by initially producing the human-grade meal at an existing mill in conjunction with the product-

ion of cake for cattle-food. This system would have the additional advantage in that there would be no difficulty in selling the oil from an established mill, whereas a completely new mill might find the marketing of its oil a problem. This is important because the revenue from the oil will decrease the cost of producing human-grade cottonseed flour.

Within East Africa there is probably only one firm in the 1960's, this being the leading miller in Uganda, which has the technical ability to operate such a mill. This miller already uses laboratory facilities, and carefully controls his production. All other millers operate in a rather haphazard fashion with regard to quality. Thus if it were decided that cottonseed meal for a high protein food should be produced in East Africa, the most economic way of beginning production would be through this firm. Alternatively, at rather higher cost, one of the other existing mills could be re-organised or a completely new mill constructed.

An examination of the amino acids in cottonseed flour indicates that methionine is the limiting amino acid, and that to provide the essential amino acids in their required amounts for human consumption, 1.4 times more cottonseed flour in terms of bulk would need to be given than dried skimmed milk.

The exact cost of production for human-grade cottonseed meal is uncertain. However, assuming a 50 per cent extraction rate for cake, a 14 per cent extraction rate for oil, allowing for a 5 per cent refining loss, a price of 90 cts per lb received for oil, a price of shs 500 per ton paid for cottonseed, and crushing costs of shs 150 per ton crushed, this indicates that a price of 34 cts per lb must be charged for the cottonseed cake if the miller is to break even. It should be noted here, though, that no allowance has been made for the capital costs of setting up the additional plant required for producing human-grade cottonseed meal.

With a milling charge of 2-3 cts per lb, this gives the overall cost of producing the cottonseed flour as 36-37 cts per lb. Although no allowance has been made in these calculations for packaging and marketing costs, the price of the cottonseed flour compares very favourably with that of dried skimmed milk, which is around 1.50 shs per lb.

It should be remembered that for every 1.4 lbs of cottonseed flour produced in Uganda, 1 lb less of dried skimmed milk needs to be imported, and 1.4 lbs less of cottonseed cake can be exported. This would mean that around 30 cts would be lost in foreign exchange from the cake, but that this would be more than offset by the 1.50 shs of foreign exchange

saved from not importing the skimmed milk. Thus there would be a net saving in foreign exchange if cottonseed flour were substituted for dried skimmed milk.

Even though the advantages of making use of cottonseed cake as a low cost high protein food may seem to be clear-cut, care must be taken in the early stages of production, and it is recommended that only small amounts of the human-grade meal be produced initially. This would enable tests to be carried out on both the feasibility of producing such cake economically, and of the acceptability of the product to the people. Untreated cottonseed flour has a yellowish colour which may not prove acceptable, and further treatment may be required to produce a lighter coloured product.

Other Oilseed Meals

Apart from cottonseed cake, groundnut, sesame and sunflower cake is also produced in East Africa, and may be used for high protein foods. However, in the 1960's, only small quantities of these cakes were produced by the East African oil milling industry.

The chief problem of groundnut meal is the presence in the meal of aflatoxin, resulting from the mould Aspergillus flavus, developing on the nuts prior to crushing. The critical period for the development of aflatoxin is the storage period, when the moisture in the groundnut must be held below a certain level. Groundnuts of low aflatoxin content can be produced if the nuts are harvested at the correct time, if they are rapidly dried and stored in a place where humidity is low, and if efforts are made to avoid damaging the nuts. Fluorescence techniques can be used to test for the presence of aflatoxin in the meal, and the safety of the meal as a human food can be tested by feeding the meal to one-day old ducklings.

Probably over 1,000 tons of groundnut cake are produced annually in East Africa, but it is known that in the past this cake has been found to contain aflatoxin. If groundnut meal is to be used as a human food in East Africa, there will need to be much greater control and selection of those nuts to be used for this purpose, so that nuts unaffected by aflatoxin are obtained.

As in the case of cottonseed, the techniques of production used for producing cake would need to be adapted in order to produce a human-grade product. The problem of aflatoxin in groundnut meal is much more serious than that of gossypol in cottonseed, as once present it is almost impossible to remove.

This provides a severe limitation on the use of groundnut cake as a high protein food in East Africa unless carefully selected nuts free of aflatoxin can be obtained.

Sesame seed meal is another potential source of high protein food which does not suffer from the same draw-backs as groundnuts. However, the price of sesame seed is such in East Africa that crushing for oil has become uneconomic, and the human-grade product produced from this seed would undoubtedly be more expensive than cottonseed flour. As for cotton-seed, the extraction process would need to be carefully controlled if human-grade sesame flour was to be produced.

Only very small quantities of sunflower seed were being crushed by the millers in East Africa, this being the seed rejected for export. If human-grade sunflower meal were to be produced, this would mean crushing the higher quality seed which is normally exported, and as in the case of sesame seed, the final product would undoubtedly be fairly expensive.

Although soya beans have not been of importance to the oil milling industry in East Africa, these may also be crushed, using similar techniques as for other oilseeds, so as to produce human-grade soya meal. Only the two Kenyan firms who concentrated on producing cattle-food for the local market appeared ever to have crushed soya beans, but it is believed that at least 1,000 tons annually are produced in East Africa. Thus the crushing of soya beans may also be considered as a possible source of low cost high protein foods.

However, in order to produce human-grade soya meal not only must the extraction be under similar conditions to those described for cottonseed meal, but special heat treatment must be used to destroy the trypsin inhibitors, reduce the bacterial count, and give the meal a nutty flavour.

A Low Cost High Protein Food for East Africa?

Cottonseed flour probably has the greatest potential of the oilseed flours available in East Africa for use as or incorporation in a high protein food. Obviously other foods such as soya beans, and the cereals could also be useful for such a product.

If a low cost high protein food is to be produced in East Africa, trials with various mixes of products must be carried out and carefully tested. Considerable experience could be drawn from countries already producing these high protein foods.

Footnote

1. This Chapter is based on information obtained from:

(a) the News Bulletins (No.3-5) of the WHO/FAO/UNICEF Protein Advisory Group.
(b) Elizabeth Orr and David Adair, The Production of Protein Products from Oilseeds (Ministry of Overseas Development, Tropical Products Institute, August, 1966).

CHAPTER IX

CONCLUSIONS

The study has shown that there have been significant developments in the seed crushing industry in East Africa over the past twenty-five years, most of the expansion being in the 1950's and 1960's. While in the 1940's there had only been a handful of oil mills operating in the three East African countries, by 1965 there were forty-one such mills, and in the late 1950's the total probably approached sixty.

Cottonseed has been the only oilseed yielding soft edible oil which has been available in quantity for crushing by the millers. Other oilseeds grown within East Africa were both exported and consumed directly locally, but only very small quantities were crushed by the millers. Only small quantities of cottonseed were found to have been exported from East Africa, most of this exported seed coming from the Coast Areas of Tanzania and Kenya.

The main cottonseed areas in East Africa are Uganda and the Lake Area of Tanzania, and this has led to the concentration of the oil milling industry in these two areas. Uganda is the largest producer of cottonseed, but production of cottonseed in the Lake Area of Tanzania has nearly doubled in the 1960's. A few oil mills are also located in the Western Provinces of Kenya but the amount of cottonseed here is small.

Bans on the import of cottonseed into both Uganda and Tanzania have led to the development of separate markets for the cottonseed in the two countries, and to widely different prices being paid for the cottonseed. The cheapest seed supplies have come from the Lake Area of Tanzania, and the most expensive from Uganda, with the price for the small amount of Kenyan seed being somewhere between the two. The high prices for cottonseed in Uganda have mainly been the result of extreme competition amongst the Ugandan millers for cottonseed, and have resulted in many smaller millers going into voluntary or forced liquidation. The import of cottonseed into Kenya is not banned, and the Western Provinces millers purchased supplies from both Uganda and Tanzania. The largest amount was bought from Tanzania which was the cheaper source.

Throughout East Africa it was found that oil milling was closely associated with other enterprises. Activities such as cotton ginning, soap manufacture, grain milling and groundnut shelling were particularly important in different areas.

Most of the East African millers produced only the semi-refined type of oil which was saleable locally. Six Ugandan millers and three Tanzanian millers had plant for producing the double- or fully-refined oil and two Ugandan millers plant for producing hydrogenated oils and fats. In addition, a large Nairobi firm was buying in liquid oils to produce hydrogenated oils and fats.

The operation of the Ugandan industry contrasts sharply with that of the Lake Area industry in two respects. Firstly, the milling industry in Uganda is not located close to the source of seed as it is in the Lake Area. Over 90 per cent of the cottonseed was found to be crushed in the Eastern Region of Uganda, the source of only 50 per cent of the cottonseed, while there was no crushing capacity in the Northern Region which was the source of 30 per cent of the cottonseed. It was shown that the existing location of the industry has led to losses of around £80,000 per year, and it was suggested that this mislocation of the industry should be corrected by the establishment of an oil mill in the Northern Region, preferably under the management of an existing miller.

A second difference between the Lake Area and Ugandan industries lies in the structure of the firms in the industries. The Lake Area industry consisted of a total of seventeen oil mills in 1965 of more or less equal size. Although seven of these firms in 1966 were found to be under the ownership of the Victoria Federation of Co-operative Unions, this group of firms could not be said to be dominating the industry. However, the industry in Uganda, consisting of eighteen firms in 1965, was definitely dominated by 'the big four'. These four firms have purchased a high percentage of the cottonseed available in Uganda in the 1960's, and accounted for 70 per cent of the total utilized capacity of the Ugandan industry. The remaining fourteen firms were mainly very small in size and operating with low utilized capacities. There is some evidence to support the view that 'the big four' have deliberately outbid the smaller millers at the cottonseed auctions, causing cottonseed prices to rise to such a level that an economic return could not be obtained from the production of semi-refined oil alone. However, it was found that an economic return would in most years have been obtained from the production of double-refined oil, which could only be produced in Uganda by 'the big four' and two other firms. Thus the smaller firms in Uganda, most of whom only have semi-refining plant, are at the mercy of the four largest millers.

There are, though, many points of similarity between the industries in the Lake Area and Uganda. Both industries are using similar techniques of production,and in both cases no technological developments would seem to be warranted except for possibly in a few cases the replacement of old expellers by their more modern counterparts.

Overall costs of production in the two industries appeared to be at about the same level, but a major factor affecting the profitability in the industries was the price of the cottonseed itself. The much lower prices for cottonseed in the Lake Area as compared with those in Uganda, made it possible for adequate returns to be obtained from semi-refined oil in the Lake Area, while such returns could not be obtained by the smaller Ugandan millers.

The six mills in Kenya were operating at rather lower utilized capacity than the mills in either Uganda or Tanzania, and it was found that as in Uganda, it was doubtful whether the production of semi-refined oil provided an adequate return.

Large quantities of Ugandan liquid oils as well as some ghee and solid fats were sold on the Kenyan market, nearly all the remainder being sold within Uganda. Tanzanian millers relied mainly on their home market for selling their liquid oils, most of the residual being sold to Kenya. Kenya was only a small producer of liquid oils, but the Nairobi firm was selling large quantities of ghee and solid fats to both Uganda and Tanzania. Exports of oil products have been relatively unimportant.

The prices for liquid oils in East Africa were found to be determined by the interaction of the two competing groups of millers centred on Mwanza and Jinja. Due to the cost advantage of the Lake Area millers in terms of their seed purchases, it seemed probable that the prices at least for semi-refined oil have been dictated by the Lake Area millers in the 1960's. Within Uganda itself, there is evidence to show that the smaller firms follow the pricing policy of 'the big four'.

It is interesting to note the dependence of Uganda on Kenya for marketing its surplus production of oil, and of Kenya on both Uganda and Tanzania for purchasing sufficient supplies of liquid oils both for direct consumption and for conversion to hydrogenated oils and fats. If in future years tariff barriers or bans on imports should interfere with this trade, Uganda could be seriously embarrassed by surplus supplies of oil, and Kenya may find herself in short supply of liquid oil.

Most of the cottonseed cake produced in East Africa was sold to European countries for the prod-

uction of cattle-food, and particularly for Uganda and Tanzania the cake was an important source of export revenue. Some cottonseed cake was sold to cattle-food manufacturers or directly to farmers in Kenya, but the amounts involved were small compared with the total production of cake. Prices received by millers for their cake f.o.b. Mombasa or Dar es Salaam depended on world market conditions, which have in the past been good.

For both Uganda and Tanzania, the returns from sales of oil products and cake to other East African countries or exported have been considerable. In the case of Uganda, the sales consisted mainly of exported cake and oil products sold to Kenya. These latter were of considerable importance because of the trade deficit of Uganda with Kenya. In the case of Tanzania cake sales were particularly important, sales of oil products being rather low in value. Kenya obtained considerable revenue from her sales of ghee and solid fats to both Uganda and Tanzania.

Projections of the total supply and total demand for oils and fats to 1971 showed that Uganda would still have a large surplus of oils, which should be absorbed by the Kenyan market. Tanzania will only be producing sufficient oils to meet her home demand. However, by 1981, it is possible that East Africa as a whole may be producing a surplus of oil products, which must be market elsewhere in Africa.

The use of cottonseed and groundnut cake as a low cost high protein food was finally put forward as a suggestion for a means of providing protein mixes suitable for the undernourished. The use of cake for this purpose could be an important welfare project in East Africa in future years.

APPENDIX 1

PRODUCTION, SALES AND CONSUMPTION OF OIL PRODUCTS: UGANDA

Production of Oils and Fats, 1963.

A total of 99,581 tons of 'AR' cottonseed and probably around 11,600 tons of 'BR' cottonseed was sold to the Ugandan millers in the 1962-3 season.[1] In addition, around 2,700 tons of groundnuts, see Chapter II, Section C.2, and a few tons of other oilseeds, see Chapter II, Section C.3, were also crushed by the millers in 1963.

The 1963 Survey of Industrial Production,[2] claims that a total of 107,180 tons of cottonseed was bought by the millers in 1963. The slight difference between this figure and that given by the Lint Marketing Board is probably due to the different period covered by the two figures, the Lint Marketing Board's season operating from October 1962 to September 1963, while the survey figures apply to the calendar year 1963.

Using a 14 per cent extraction rate for oil from 'AR' cottonseed (an average yield received by millers) a 10 per cent extraction rate for oil from 'BR' seed, and a 36 per cent extraction rate for oil from groundnuts, (also based on evidence of millers) production of crude oil in 1963 would have been 16,073 tons.

Assuming that a total of 2,132 tons of this crude oil are hydrogenated, (based on production figures for ghee and solid fats from millers and allowing a 6.4 per cent refining loss) this leaves a total of 13,941 tons of crude oil for producing liquid oil products. Allowing 5 per cent refining losses, this gives a production of around 13,277 tons of semi- and double-refined oil.

Production figures for all oils and fats for 1963 are shown in Table A.1.

Table A.1

	(tons)
Production of semi- and double-refined oil	13,277
Production of ghee	1,854
Production of solid fats[a]	284
Total	15,415

Note: a - This includes fats made from palm and copra oil as well as cottonseed and groundnut oil.

Production of Oils and Fats, 1964.

A total of 106,259 tons of 'AR' cottonseed and 13,235 tons of 'BR' cottonseed was sold to the Ugandan millers in the 1963-4 season.[1] In addition, a total of around 2,900 tons of groundnuts, see

Chapter II, section C.2, and a few tons of other oilseeds, see Chapter II, section C.3, were crushed in 1964.

Using the same extraction rates for oil from seed as for 1963, this gives an overall production of 17,244 tons of crude oil. Assuming that a total of 2,833 tons of this crude oil is hydrogenated, on the same basis as for 1963, this leaves a total of 14,411 tons of crude oil for producing liquid oil products. Allowing a 5 per cent refining loss, this implies that around 13,725 tons of semi- and double-refined oil were produced in Uganda in 1964.

Production figures for all oils and fats for 1964 are shown in Table A.2.

Table A.2

	(tons)
Production of semi- and double-refined oil	13,725
Production of ghee	2,450
Production of solid fats[b]	404
Total	16,579

Note: b - This includes fats made from palm and copra oil as well as cottonseed and groundnut oil.

Production of oils and fats, 1965.

The following estimates of production shown in Table A.3, are based on the evidence of the millers.

Table A.3

	(tons)
Production of semi-refined oil[c]	3,911
Production of double-refined oil	11,330
Production of ghee	3,624
Production of solid fats[d]	696
Total	19,561

Notes: c - Excluding 580 tons resold to mills for re-refining.

d - This includes fats made from palm and copra oil as well as cottonseed and groundnut oil.

The total amount of crude cottonseed and groundnut oil required to produce this output of oils and fats, when allowance has been made for refining losses and for palm and copra oil used, would be around 20,290 tons.

The millers purchased a total of 116,714 tons of 'AR'$_4$ cottonseed and 12,082 tons of 'BR' seed in 1965. In addition around 2,000 tons of groundnuts were crushed in 1965, see Chapter II, section C.2.

Assuming the same extraction rates as for 1963 and 1964, this implies an overall production of 18,268 tons of crude oil. The difference between this total, and that estimated as being required to give the production figures quoted by the millers, may indicate one of three things. Either the amount

of seed crushed by the millers in 1965 has been under-estimated, or the extraction rates used are pessimistic, or production has been exaggerated. The millers themselves claimed to crush around 135,000 tons of cottonseed in 1965, rather than the 129,000 tons quoted, but this difference only accounts for around 800 tons of crude oil. It is unlikely that the extraction rate is too high, and therefore it seems most likely that the error is in the production figures. One possible source of exaggeration in these figures is that some oil sold for refining has been double-counted.

Bearing these factors in mind, and taking the production figures for ghee and solid fats as being reliable, it is probably that the total production of semi- and double-refined oil in 1965 only amounted to around 13,000 tons, and not the 15,000 tons given by the millers. A figure for production of liquid oils of 13,315 tons in 1965 would correspond to the crude oil thought to be produced, and this figure will be used in later calculations.

Sales of Oils and Fats, 1963-5.

Table A.4 (to nearest ton)

	1963	1964	1965
Semi- and double-refined oil			
Production	13,277	13,725	13,315
Sales to Kenya	6,292	6,912	7,305
Sales to Tanzania	923	859	461
Sales for export	864	1,574	871
Home consumed[a]	5,198	4,380	4,678
Ghee			
Production	1,854[b]	2,450	3,624
Sales to Kenya	1,483[b]	1,978	2,231
Sales to Tanzania	93[b]	116	82
Sales for export	-[b]	-	1
Home consumed[a]	278[b]	356	1,310
Solid fats			
Production	284[b]	404	696
Sales to Kenya	199[b]	225	294
Sales to Tanzania	28[b]	43	32
Sales for export	-[b]	-	12
Home consumed[a]	57[b]	136	358

Source: East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya, 1963-5, (Commissioner of Customs and Excise, East Africa).

Notes: a - This is a residual figure.

b - Data not available in Trade Reports for 1963, and therefore figures based on evidence from millers.

Consumption of Oils and Fats, 1963-5.

Table A.5 (to nearest ton)

	1963	1964	1965
Semi- and double-refined oil			
Produced in Uganda	5,198	4,380	4,678
Purchased from Kenya	32	18	464
Purchased from Tanzania	557	188	349
Imported	-	-	-
Total	5,787	4,586	5,491
Ghee			
Produced in Uganda	278	356	1,310
Purchased from Kenya	---	152	165
Purchased from Tanzania	---	-	6
Imported	---	413	423
Total	---	921	1,904
Solid fats			
Produced in Uganda	57	136	358
Purchased from Kenya[a]	---	388	521
Purchased from Tanzania[a]	---	1	1
Imported[a]	---	6	18
Total	---	531	898

Source: East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya, 1963-5. (Commissioner of Customs and Excise, East Africa).
Note: a - Some animal fats may be included.

Table A.6 (to nearest ton)

	Purchases from:			Sales to:		
	Kenya	Tanzania	Other[a]	Kenya	Tanzania	Other[a]
1955	1	-	-	3,223	1,188	263
1956	1	-	-	2,275	905	2,523
1957	1	-	-	3,333	1,763	4,244
1958	24	-	-	5,376	1,796	2,131
1959	64	-	-	7,081	1,678	2,878
1960	51	79	-	6,750	1,334	95
1961	49	9	-	5,900	1,416	280
1962	8	203	-	4,280	801	93
1963	32	557	-	6,292	923	864
1964	18	188	-	6,912	859	1,574
1965	464	349	-	7,305	461	871

Source: East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya, 1955-65. (Commissioner of Customs and Excise, East Africa).
Note: a - "Other" includes any country outside East Africa.

APPENDIX 2

PRODUCTION AND SALES OF OIL-CAKE: UGANDA

Production of Cake, 1963.

The total amount of cottonseed crushed in 1963 was around 111,000 tons, and of groundnuts 2,700 tons, see Appendix 1. The Kampala Produce Exchange shows sales of 1,355 tons of 31 per cent cake,[5] and thus assuming a 50 per cent extraction rate for 46 per cent cake, an 80 per cent extraction rate for 31 per cent cake, and a 55 per cent extraction rate for groundnut cake, this gives the figures for production of cake shown in Table A.7.

Table A.7

	(tons)
Production of 31 per cent cottonseed cake	1,355
Production of 46 per cent cottonseed cake	56,138
Production of groundnut cake	1,485
Total	58,978

The 1963 Survey of Industrial Production[6] gave a figure of 54,550 tons of cake sold in 1963, whereas the East African Customs and Excise Annual Trade Report for 1963[7] shows total sales of cottonseed cake alone of 59,791 tons. (This figure should account for nearly all the cake produced, as it is all either exported or sold to Kenya). The total sales of all cake registered in the Kampala Produce Exchange only amounted to 49,827 tons,[8] but a few of the millers are not members of the Exchange, and even if they are, all their sales of cake need not necessarily be registered in the Exchange. In the light of this evidence, it seems reasonable to accept a figure of around 60,000 tons as the total production of cake in 1963.

Production of Cake, 1964.

The total amount of cottonseed crushed in 1964 was around 119,500 tons, and of groundnuts 2,900 tons, see Appendix 1. The Kampala Produce Exchange shows sales of 2,775 tons of 31 per cent cake,[9] and therefore assuming the same extraction rates for cake from seed as in 1963, this gives the figures for production of cake shown in Table A.8.

Table A.8

	(tons)
Production of 31 per cent cottonseed cake	2,775
Production of 46 per cent cottonseed cake	58,015
Production of groundnut cake	1,595
Total	62,385

The total sales of cottonseed and groundnut cake recorded in the trade figures for 1964 amounted

to 63,326 tons,[10] and sales registered with the Kampala Produce Exchange to 58,840 tons.[11]

It seems probable that around 63,000 tons of cake was produced in 1964.

Production of cake, 1965.

Evidence from the millers in 1965 gave the following figures in Table A.9, for the production of cake.

Table A.9

	(tons)
Production of 31 per cent cottonseed cake	11,600
Production of 46 per cent cottonseed cake	55,850
Production of groundnut cake	2,650
Total	70,100

The total sales of cottonseed cake registered with the Kampala Produce Exchange in 1965[12] amounted to 53,760 tons, of which only 1,400 tons was 31 per cent cake. This rather low figure though results from not all sales being recorded in the Exchange. Total sales of cottonseed cake recorded in the trade figures[13] amounted to 68,725 tons.

The Lint Marketing Board's figures show that a total of 129,000 tons of cottonseed was crushed by the millers in 1965, which using the same extraction rates as for 1964 and assuming that 11,600 tons was crushed as whole seed, would indicate a production of around 69,000 tons of cottonseed cake.

Only 1,050 tons of groundnut cake were registered for sale through the Kampala Produce Exchange in 1965,[14] and 801 tons were recorded in the trade figures.[15] It therefore seems unlikely that as much as 2,650 tons of groundnut cake was produced in 1965 as there is little market for the cake in Uganda. Assuming the figure given by the Kampala Produce Exchange for sales of groundnut cake is the correct one, this gives an overall figure of around 70,000 tons for the production of all cake in 1965.

Table A.10

Sales of Cottonseed Cake to: (to nearest ton)

	Kenya	Tanzania	Export	Total
1955	922	-	47,770	48,692
1956	990	-	58,635	59,625
1957	2,303	40	52,293	54,636
1958	852	-	65,154	66,006
1959	1,653	-	71,731	73,384
1960	2,494	-	71,643	74,137
1961	2,218	-	62,166	64,384
1962	1,131	-	28,622	29,753
1963	1,379	-	58,412	59,791
1964	902	-	61,834	62,736
1965	699	1	68,025	68,725

Sales of Groundnut Cake to: (to nearest ton)

	Kenya	Tanzania	Export	Total
1964	-	-	590	590
1965	101	-	700	801

Source: East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya, 1955-65. (Commissioner for Customs and Excise, East Africa).

Table A.11

Prices in shs/ton f.o.b. Mombasa

	Maximum of highs 46 % cake	Minimum of lows[a] 46 % cake	Maximum of highs 31 % cake	Minimum of lows[a] 31 % cake	Average for all cake exported[b]
1955	-	-	-	-	569
1956	-	-	-	-	524
1957	-	-	-	-	470
1958	-	-	-	-	327
1959	-	-	-	-	452
1960	-	-	-	-	466
1961	-	-	-	-	421
1962	-	-	-	-	475
1963	590	417.50	365	300	520
1964	570	457.50	342.50	330	497
1965	590	430	400	395	529
1966	615	440	480	405	-

Sources: a - Kampala Produce Exchange, Monthly Reports, 1963-6 (excluding January-June, 1964)(unpublished.)

b - East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya, 1955-65. (Commissioner for Customs and Excise, E.A.)

Table A.12

Groundnut Cake, Prices in shs/ton f.o.r. Uganda

	Maximum of Highs[c]	Minimum of Lows[c]	Average for Exported Cake[d]
1963	600	520	-
1964	650	530	558
1965	681/25	620	616
1966	662/50	560	-

Sources: c - Kampala Produce Exchange, Monthly Reports 1963-6 (excluding January-June, 1964) (unpublished).
d - East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya, 1964-5. (Commissioner of Customs and Excise, East Africa).

Note: d - shs 65 has been deducted for the cost of transport from Jinja to Mombasa. East African Railways and Harbours, Tariff Book No.4, Part II (Aread Lithographic Printers, East Africa).

APPENDIX 3

PROJECTIONS FOR SUPPLY AND DEMAND: UGANDA

Table A.13

	Production of Cotton Lint in Bales '000[a]	in Tons	Total Cottonseed Available	% of Lint Formed by Cottonseed[b]
1959-60	360	59,016	118,512	201
1960-1	370	66,071	117,992	179
1961-2	181	32,321	44,301	137
1962-3	359	64,107	112,659	176
1963-4	379	67,679	118,265	175
1964-5	438	78,214	131,830	169
'	'	'	'	'
'	'	'	'	'
'	'	'	'	'
'	'	'	'	'
1970-1	575[c]	102,679	177,635[d]	173

Sources: a - Private communication with the Ministry of Agriculture, Forestry and Co-operatives, Entebbe.
b - Lint Marketing Board, Annual Reports, 1955-65. (Uganda Argus, Kampala).

Notes: c - Estimated production in 1971. Work for Progress, Uganda's Second Five Year Plan, 1966-71. (Government Printer, Entebbe, Uganda).
d - Based on the estimate for the period 1959-60 to 1964-5 that on average cottonseed forms 173 per cent by weight of the cotton lint.

Projections for demand to 1971 and 1981.

This attempt to estimate the trend in the level of consumption for some years in the future is based on a semi-logarithmic demand equation of the form:

$$y = a + b \log_e x$$

where y is the level of per caput demand
x is the level of per caput income.

The exact demand equation used by the F.A.O.[16] to project per caput demand for oils and fats takes the form:

$$y^1/y - 1 = 2.3026 \eta \log_{10} x^1/x$$

where y, y^1 are the levels of per caput demand in the base and projected years.
x, x^1 are the levels of per caput income in the base and projected years.
η is the elasticity of demand for oils and fats in the base year.

Total demand may then be estimated by assuming that a 10 per cent increase in population, say, will lead to a 10 per cent increase in total demand. The

effect of all other factors on the level of demand has been excluded.

The information required, therefore, in order to make these projections is (i) the increase in per capita gross domestic product between the base and projected years, x^1/x (ii) the elasticity of demand in the base year, η, (iii) the level of per caput demand for oils and fats in the base year, y, and (iv) the increase in population between the base and projected years. This data is set out below for making projections of total demand for oils and fats for Uganda for the period 1965-71 and 1965-81.

Monetary Gross Domestic Product per capita at 1964 prices.[17]

1966 £25.7
1971 £31.8
1981 £52.6

Average annual rate of growth 1966-71 4.3 per cent.
Average annual rate of growth 1966-81 4.9 per cent.

These figures indicate, assuming a 4.3 per cent rate of growth between 1965 and 1966, a total increase of 29.3 per cent for 1965-71, and of 113.8 per cent for 1965-81.

The income elasticity of demand for oils and fats.

In his work on expenditure patterns in Kenya, B.F. Massell has found an average income elasticity net of household size for oils and fats of .87 for three districts in the Central Province.[18] In further work, Mr Massell has found an income elasticity for oils and fats in Central Province as a whole (based on a sample of 800 rural households) of .945.[19] Further, Mr Massell has found an income elasticity for middle income African households in Nairobi (based on a sample of 300) of .525 for oils and fats.[20]

With this information in mind, it has been decided in the calculations that follow that projections should be made for a range of elasticities for oils and fats from 0.5 to 0.95, and thus a projected range for total demand estimated. The idea of using a weighted elasticity based on the number of persons with any specific elasticity is rejected on the grounds of insufficient information on both elasticity levels, and the number of persons at any such level.

Level of demand for oils and fats in 1965.

The total consumption of all oils and fats in 1965 amounted to 8,293 tons, see Table A.5 of Appendix 1.

Population Growth

	Total Population[21]
1959	6.5 million
1966	7.5 million
1971	8.8 million
1981	11.4 million

These figures indicate an average annual rate of growth of 2.2 per cent between 1959 and 1966. Thus the level of population in 1965 was 7.3 million and the increases in population between 1965 and 1971 and 1965 and 1981, 19.9 per cent and 55.3 per cent respectively.

Projection 1965-1971

$$y^1/y = 1 + 2.3026\ \eta \log_{10} (1.293)$$
$$= 1 + \eta\ 0.25697$$

η	0.25697 η	y^1/y 100 Index of per caput demand 1971*	Index of Total demand 1971*	Total Demand 1971 (tons)
0.5	0.128	112.8	135.2	11,212
0.55	0.141	114.1	136.8	11,345
0.6	0.154	115.4	138.4	11,478
0.65	0.167	116.7	139.9	11,602
0.7	0.180	118.0	141.5	11,735
0.75	0.193	119.3	143.0	11,859
0.8	0.206	120.6	144.6	11,992
0.85	0.218	121.8	146.0	12,108
0.9	0.231	123.1	147.6	12,240
0.95	0.244	124.4	149.2	12,373

* 1965 = 100

Projection 1965-1981

$$y^1/y = 1 + 2.3026\, \mathcal{D} \log_{10} (2.138)$$

$$= 1 + \mathcal{D}\, 0.759858$$

$\mathcal{D}$	$0.759858\, \mathcal{D}$	y^1/y 100 Index of per caput demand 1981*	Index of Total demand 1981*	Total Demand 1981 (tons)
0.5	0.380	138.0	214.3	17,772
0.55	0.418	141.8	220.2	18,261
0.6	0.456	145.6	226.1	18,750
0.65	0.494	149.4	232.0	19,240
0.7	0.532	153.2	237.9	19,729
0.75	0.570	157.0	243.8	20,218
0.8	0.608	160.8	249.7	20,708
0.85	0.646	164.6	255.6	21,197
0.9	0.684	168.4	261.5	21,686
0.95	0.722	172.2	267.4	22,175

* 1965 = 100

These estimates for projected demand in 1971 and 1981 were based on a given model, and not one which had been found to fit the consumption data in the past. This was done because the data available did not allow for the construction of a demand model for oils and fats in Uganda.

However, to show that the model used is relevant to the data, it is now planned to use the model to project demand from 1960 to 1965. Again a range of elasticities will be used.

The total amount of cottonseed sold to the millers in 1960 amounted to 105,190 tons of 'AR' seed and 13,322 tons of 'BR' seed.[22] Using a 14 per cent extraction rate for oil from 'AR' seed and a 10 per cent extraction rate for oil from 'BR' seed, this gives an overall production of 16,059 tons of crude oil, or 15,294 tons of refined oil, allowing 5 per cent for refining losses. Unfortunately, data for sales and purchases of ghee and solid fats are not available for 1960, but total sales of liquid oils amounted to 8,179 tons, and total purchases of liquid oils amounted to 130 tons.[23] These figures indicate a total consumption of oil in 1960 of around 6,985 tons.

The level of population in 1960 was 6.7 million and in 1965 7.6 million.[24] This indicates an increase in population of 13.1 per cent between 1960 and 1965.

The gross domestic product per capita was £16.6 in 1960 at 1960 prices, and £18.0 in 1965 at 1960 prices.[25] This gives an increase in gross domestic

product per capita of 8.5 per cent between 1960 and 1965.

Projections 1960-5

Using the foregoing data to make projections of the 1965 level of demand, given 1960 demand.

$$y^1/y = 1 + 2.3026\, \mathcal{D}\, \log_{10}(1.085)$$

$$= 1 + \mathcal{D}\, 0.0817428$$

$\mathcal{D}$	0.0817428 $\mathcal{D}$	y^1/y 100 Index of per caput Demand 1965*	Index of Total demand 1965*	Total Demand 1965 (tons)
0.5	0.0409	104.1	117.7	8,221
0.55	0.0450	104.5	118.2	8,256
0.6	0.0490	104.9	118.6	8,284
0.65	0.0531	105.3	119.1	8,319
0.7	0.0572	105.7	119.5	8,347
0.75	0.0613	106.1	120.0	8,382
0.8	0.0654	106.5	120.5	8,417
0.85	0.0695	107.0	121.0	8,452
0.9	0.0736	107.4	121.5	8,487
0.95	0.0777	107.8	121.9	8,515

* 1960 = 100

On the basis of this model, and given levels of gross domestic product per capita and population for 1960 and 1965, total demand for oils would have been estimated as 8,200-8,500 tons in 1965. In fact, total demand was estimated in Appendix 1 as 8,293 tons. Thus, given the limitations of such a model, it is believed that it gives reasonable projections for consumption of oils and fats.

APPENDIX 4

PRODUCTION, SALES AND CONSUMPTION OF OIL PRODUCTS: TANZANIA

Production of cottonseed oil, 1963.

The total amount of cottonseed crushed by the Lake Area millers in 1963 was 52,920 tons of 'AR' seed and 12,538 tons of 'BR' seed.[26] Taking a 14 per cent extraction rate for oil from 'AR' seed and a 10 per cent extraction rate for oil from 'BR' seed, the total production of crude cottonseed oil would be around 8,663 tons, and of refined oil 8,250 tons, allowing for 5 per cent refining losses.

Production of cottonseed oil, 1964.

The total amount of cottonseed crushed by the Lake Area millers in 1964 was 65,117 tons of 'AR' seed and 10,466 tons of 'BR' seed.[27] Using the same extraction rates as for 1963, the total production of crude cottonseed oil would be around 10,163 tons, and of refined oil 9,679 tons.

Production of cottonseed oil, 1965.

The total amount of cottonseed crushed by the Lake Area millers in 1965 was 84,319 tons of 'AR' seed and 7,367 tons of 'BR' seed.[28] Using the same extraction rates as for 1963, the total production of crude cottonseed oil would be around 12,541 tons, and of refined oil 11,944 tons.

The millers themselves claimed to have produced a total of 648,169 tins (of 36 lbs) of semi-refined oil and 176,159 tins of double-refined oil. This gives a total production of 13,248 tons of refined oil. The difference between this and the earlier figure is probably due to some exaggeration on the part of the millers, and in the calculations that follow, the first figure will be taken.

Table A.14

Sales of Cottonseed Oil (to nearest ton)

	1963	1964	1965
Production	8,250	9,679	11,944
Sales to:			
Kenya	704	1,954	2,868
Uganda	557	188	349
Export	1,052	1,491	643
Home consumed	5,937	6,046	8,084

Source: East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya, 1963-5. (Commissioner of Customs and Excise, E.A.).

Table A.15

(to nearest ton)

Consumption of Cottonseed Oil

	1963	1964	1965
Home Produced	5,937	6,046	8,084
Purchased from:			
Kenya	694	531	589
Uganda	908	832	446
Imported	-	88	393
Total	7,539	7,497	9,512

Source: East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya 1963-5 (Commissioner of Customs and Excise, E.A.).

Table A.16

(to nearest ton)

Vegetable Ghee

	Purchases from:			Sales to:		
	Kenya	Uganda	Imports	Kenya	Uganda	Exports
1964	497	116	2,178	56	-	-
1965	165	82	2,403	172	6	4

Solid Fats[a]

	Purchases from:			Sales to:		
	Kenya	Uganda	Imports	Kenya	Uganda	Exports
1964	771	43	40	1	1	-
1965	1,152	32	62	4	1	-

Source: East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya, 1964-5. (Commissioner of Customs and Excise, East Africa).
Note: a - These figures may include purchases and sales of animal fats.

Table A.17

(to nearest ton)

	1964	1965
Consumption[b] of ghee	2,735	2,468
Consumption[b] of solid fats[c]	852	1,241

Notes: b - Consumption equals total purchases less total sales
c - May include some animal fats.

APPENDIX 5

PRODUCTION AND SALES OF OIL-CAKE: TANZANIA

Production of cake, 1963.

The total amount of cottonseed crushed in 1963 by Lake Area millers was 65,458 tons, see Appendix 4, which, using a 46 per cent extraction rate for cake from cottonseed gives a production of 29,456 tons of cottonseed cake. The trade figures show sales of cottonseed cake amounting to 28,740 tons for 1963. It therefore seems probable that around 29,000 tons of cottonseed cake were produced in 1963.

Production of cake, 1964.

The total amount of cottonseed crushed in 1964 by Lake Area millers was 75,583 tons, see Appendix 4, indicating a production of 34,012 tons of cottonseed cake. Sales recorded in the trade figures in 1964 amounted to 33,134 tons. Production was probably around 33,500 tons in 1964.

Production of cake, 1965.

The total amount of cottonseed crushed in 1965 by Lake Area millers was 91,686 tons, see Appendix 4, indicating a production of 41,259 tons of cottonseed cake. Sales recorded in the trade figures amounted to 41,801 tons, while the millers themselves claimed to produce a total of 43,543 tons. Production was probably around 42,500 tons.

Table A.18

Sales of Cottonseed Cake

	Sales to Kenya (tons)	Sales for Export (tons)	Price for Exports shs/ton[a]	Price Received in Lake Area[b]
1955	81	10,508	560	492
1956	46	17,528	506	438
1957	106	12,523	448	380
1958	-	22,637	372	304
1959	80	22,823	470	402
1960	66	24,684	470	402
1961	-	18,760	444	376
1962	-	21,620	497	429
1963	20	28,720	587	519
1964	-	33,134	533	465
1965	100	41,701	551	483

Source: East African Customs and Excise, Annual Trade Reports of Tanganyika, Uganda and Kenya, 1955-65. (Commissioner of Customs and Excise, East Africa).

Notes: See overleaf.

Notes to Table A.18: a - Price f.o.b. Dar es Salaam.
b - Allowing Shs 68 per ton for transport from Mwanza to Dar es Salaam. East African Railways and Harbours, Tariff Book No.4.Part II (Aread Lithographic Printers, East Africa).

APPENDIX 6

PROJECTIONS FOR SUPPLY AND DEMAND: TANZANIA

The projections of demand to 1971 and 1981, taking 1965 as the base year, were made using the same model as was described in Appendix 3.

Monetary Gross Domestic Product per capita

Average	1960-2	£13.2[32]
	1970	£23.0[32]
	1980	£38.9[32]

Assuming the 1961 figure as £13.2, this indicates a rate of growth of 6.4 per cent per year between 1961 and 1970, and of 5.4 per cent per year between 1970 and 1980. This gives a level of monetary gross domestic product per capita of £16.9 in 1965 and of £24.2 in 1971. This implies an increase of 43 per cent between 1965 and 1971, and assuming the same increase from 1980-1 as from 1970-80, an increase of 143 per cent between 1965 and 1981.

Population

Average	1960-2	9.4 million[33]
	1970	11.3 million[33]
	1980	14.1 million[33]

Assuming the 1961 level of population as 9.4 million, this indicates a rate of growth of 2.1 per cent between 1961 and 1970, and of 2.3 per cent between 1970 and 1980. These figures imply a 13.2 per cent increase in population between 1965 and 1971, and a 41.2 per cent increase between 1965 and 1981.

Elasticity

As was done in the case of Uganda, the projections will be made using a range of elasticity assumptions from 0.5 to 0.95.

Level of total demand, 1965.

The level of total demand for oils and fats in 1965 was 13,221 tons, see Tables A.15 and A.17 of Appendix 4.

Projections 1965-71

$$y^1/y = 1 + 2.3026\,\eta \log_{10} (1.43)$$
$$= 1 + 0.35759\,\eta$$

η	0.35759 η	y^1/y 100 Index of per caput Demand 1971*	Index of Total demand 1971*	Total Demand 1971 (tons)
0.5	0.179	117.9	133.5	17,650
0.55	0.197	119.7	135.5	17,914
0.6	0.215	121.5	137.5	18,179
0.65	0.232	123.2	139.5	18,443
0.7	0.250	125.0	141.5	18,708
0.75	0.268	126.8	143.5	18,972
0.8	0.286	128.6	145.6	19,250
0.85	0.304	130.4	147.6	19,501
0.9	0.322	132.2	149.7	19,792
0.95	0.340	134.0	151.7	20,056

* 1965 = 100

Projections 1965-81

$$y^1/y = 1 + 2.3026\,\eta \log_{10} (2.43)$$
$$= 1 + 0.88788\,\eta$$

η	0.88788 η	y^1/y 100 Index of per caput Demand 1981*	Index of Total demand 1981*	Total Demand 1981 (tons)
0.5	0.444	144.4	203.9	26,958
0.55	0.488	148.8	210.1	27,777
0.6	0.533	153.3	216.5	28,623
0.65	0.577	157.7	222.7	29,443
0.7	0.622	162.2	229.0	30,276
0.75	0.666	166.6	235.2	31,096
0.8	0.710	171.0	241.5	31,929
0.85	0.755	175.5	247.8	32,761
0.9	0.799	179.9	254.4	33,634
0.95	0.843	184.3	260.2	34,401

* 1965 = 100

As for Uganda, projections will now be made using the same model, for 1965 with 1960 as a base.

Using the same data as above, the level of monetary gross domestic product per capita in 1960 was £12.4, and there was an increase of 36.3 per cent between 1960 and 1965.

Similarly, there was an increase in population of 10.9 per cent between 1960 and 1965.

The amount of oil consumed in Tanzania in 1960 is based on the total amount of cottonseed available for crushing, and sales and purchases of liquid oils

in that year. This gives a figure of around 8,000 tons. Unfortunately ghee and solid fats are excluded from this total as the trade figures are not available for 1960.

The same range of elasticity assumptions was made as for the other projections.

Projections 1960-5

$$y^1/y = 1 + 2.3026\,\eta \log_{10} (1.36)$$
$$= 1 + 0.3097\,\eta$$

η	0.3097 η	y^1/y 100 Index of per caput Demand 1965*	Index of Total demand 1965*	Total Demand 1965 (tons)
0.5	0.155	115.5	128.1	10,248
0.55	0.170	117.0	129.8	10,384
0.6	0.186	118.6	131.5	10,520
0.65	0.201	120.1	133.2	10,656
0.7	0.217	121.7	135.0	10,800
0.75	0.232	123.2	136.6	10,928
0.8	0.248	124.8	138.4	11,072
0.85	0.263	126.3	140.1	11,208
0.9	0.279	127.9	141.8	11,344
0.95	0.294	129.4	143.5	11,480

* 1960 = 100

These projections suggest that total demand for oils should have been between 10,000 and 11,500 tons in 1965. In fact the consumption of cottonseed oil was 9,500 tons in 1965, and of all oils and fats 13,000 tons, see Appendix 4. Thus the model would not seem to give an unreasonable fit, in view of the fact that fats have been excluded, and there is likely to have been some substitution by consumers of fats for liquid oils over this period.

APPENDIX 7

PROJECTIONS FOR SUPPLY AND DEMAND: KENYA

The projections of demand to 1971 taking 1965 as the base year were made using the same model as was used in Appendices 3 and 6 for Uganda and Tanzania. Projections could not be made to 1981, as insufficient data was available.

Monetary Gross Domestic Product per capita

1962 £20.9[34]

1970 £25.4[34]

The annual rate of growth of monetary gross domestic product per capita between 1962 and 1970 is given in the Kenya Development Plan as 2.6 per cent. This indicates an increase of 15.5 per cent between 1965 and 1971.

Population

1965 9.4 million[35]

1970 11.0 million[35]

Assuming a rate of growth of population between 1970 and 1971 the same as between 1969 and 1970,[35] this gives a population of 11.4 million in 1971, and an increase in population of 21.3 per cent between 1965 and 1971.

Elasticity

A range of elasticity assumptions from 0.5 to 0.95 will be used as for Uganda and Tanzania.

Level of total demand, 1965

This will be taken as 11,000 tons, see Chapter VII.

Projections 1965-71

$$y^1/y = 1 + 2.3026 \log_{10} (1.155)$$

$$= 1 + 0.14414$$

	0.14414	y^1/y 100 Index of per caput Demand 1971*	Index of Total demand 1971*	Total Demand 1971 (tons)
0.5	0.072	107.2	130.0	14,300
0.55	0.079	107.9	130.9	14,399
0.6	0.086	108.6	131.7	14,487
0.65	0.094	109.4	132.7	14,597
0.7	0.101	110.1	133.6	14,696
0.75	0.108	110.8	134.4	14,784
0.8	0.115	111.5	135.2	14,872
0.85	0.123	112.3	136.2	14,982
0.9	0.130	113.0	137.1	15,081
0.95	0.137	113.7	137.9	15,169

* 1965 = 100

Footnotes

1. Private communication with the Lint Marketing Board, Uganda.
2. Statistics Division, Ministry of Planning and Community Development, Survey of Industrial Production, 1963. (Government Printer, Entebbe, Uganda, October 1965).
3. Private communication with the Lint Marketing Board, Uganda.
4. Private communication with the Lint Marketing Board, Uganda.
5. Kampala Produce Exchange, Monthly Reports, 1963 (Unpublished)
6. Statistics Division, Ministry of Planning and Community Development, Op.cit.
7. East African Customs and Excise, Annual Trade Report for Tanganyika, Uganda and Kenya, 1963. (Commissioner for Customs and Excise, E. Africa)
8. Kampala Produce Exchange, Op.cit.
9. Kampala Produce Exchange, Monthly Reports, 1964 (Unpublished)
10. East African Customs and Excise, Annual Trade Report for Tanganyika, Uganda and Kenya, 1964. (Commissioner for Customs and Excise, E. Africa)
11. Kampala Produce Exchange, Op.cit.
12. Kampala Produce Exchange, Monthly Reports, 1965 (Unpublished)
13. East African Customs and Excise, Annual Trade Report for Tanganyika, Uganda and Kenya, 1965. (Commissioner for Customs and Excise, E. Africa)
14. Kampala Produce Exchange, Op.cit.
15. East African Customs and Excise, Op.cit.
16. Food and Agriculture Organisation of the United Nations, Commodity Review, 1962; Special Supplement, Agricultural Commodities - Projections for 1970. (Eliograf, Rome, 1962)
17. Work for Progress, Uganda's Second Five-Year Plan, 1966-71. (Government Printer, Entebbe)
18. B.F. Massell, Expenditure Patterns in the Central Province of Kenya: A Preliminary Analysis. (Discussion Paper No.29. Institute for Development Studies, Nairobi, Kenya.)
19. Private communication.

Footnotes contd.

20. Private communication.

21. Work for Progress, Uganda's Second Five-Year Plan, 1966-71. (Government Printer, Entebbe)

22. Lint Marketing Board, Annual Report, 1960. (Uganda Argus, Kampala).

23. East African Customs and Excise, Annual Trade Report of Tanganyika, Uganda and Kenya, 1960. (Commissioner of Customs and Excise, East Africa).

24. Uganda Government, Statistics Division, Ministry of Planning and Economic Development, 1966 Statistical Abstract for Uganda. (Government Printer, Entebbe).

25. Ibid

26. Private communication with the Lint and Seed Marketing Board, Tanzania.

27. Private communication with the Lint and Seed Marketing Board, Tanzania.

28. Private communication with the Lint and Seed Marketing Board, Tanzania.

29. East African Customs and Excise, Op.cit.

30. East African Customs and Excise, Op.cit.

31. East African Customs and Excise, Op.cit.

32. The United Republic of Tanganyika and Zanzibar, Tanganyika Five-Year Plan for Economic and Social Development. 1st July, 1964 - 30th June, 1969. (Government Printer, Dar es Salaam, Tanzania, 1964).

33. Ibid

34. Government of Kenya, Development Plan, 1964-1970. (Government Printer, Kenya, 1964).

35. Ibid

This is a study of the vegetable oil crushing industry. Although it deals primarily with Uganda it also includes comparative information from other parts of East Africa. It is suggested that a relocation of the industry within Uganda would save money spent on transportation of cottonseed from ginnery to oil mill.

At the present time Uganda's surplus of semi-refined oil is sold to Kenya, but by 1980 there will be a surplus of oil creating a serious problem for the industry. However, oil cake has a good export market and the demand for this is likely to increase within East Africa. In particular, the cake may be used as a high protein food for children suffering from malnutrition.

Shs. 20/- (East Africa only)