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GROUNDNUT PRODUCTION AND MARKETING
IN EASTERN PROVINCE
A MARKET ANALYSIS

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and
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SUMMARY

This study analyzes factors contributing to sharp declines in the volume of groundnut production marketed through official channels, identifying and evaluating alternatives to change the trends. A summary of findings and recommendations follows.

SUMMARY OF FINDINGS

TRENDS IN SUPPLY OF MAJOR CROPS

National officially marketed groundnut production has declined from a peak in 1967 of 14,810 metric tonnes (185,125 - 80 Kg. bags) to a low of 794 metric tonnes (9925 - 80 Kg. bags) in 1982. Eastern Province averaged over 70% of total marketed production during those years. Groundnuts, once an important earner of foreign exchange, have not been exported for the last two years.

Eastern Province , on the other hand, has become a major producer of maize and sunflowers. The Province now produces 27% of the maize, ranking second only to Central Province, and is the largest producer of sunflowers, contributing 46.9% to national marketed production. Some of the growth in these major crops has been at the expense of groundnut production. Eastern Province has in fact become a major buffer against severe drought related fluctuations in national maize production.

GROUNDNUT GROWERS IN EASTERN PROVINCE

Insights from a survey of 76 small scale farmers in Chadiza, Katete, North Chipata and Lundazi districts provide understanding about groundnut production in the Province and some of the important factors contributing to recent trends. According to the survey, 75% of the farmers grow groundnuts. Projected to a Province level, this could place the number of groundnuts growers at close to 80,000.

More than half of these farmers cultivate less than 4 hectares, growing approximately half a hectare of groundnuts. Typically, the groundnuts growers grow 3.7 times as much maize as groundnuts, reflecting that it takes nearly 3 times as much labor to grow groundnuts as maize.

The average farm family consists of 3 members of working age, with an average land base per working family member of 1.3 hectares. During critical periods of planting and harvesting, the family labour is not adequate to meet labor demand. At land preparation and planting time the farm family is typically short two persons per day and at harvest, one person. Unless outside labour can be hired, this shortage interprets into substantial yield losses due to planting and harvesting delays. Groundnuts production suffers most, because the groundnuts are planted after maize. Critical management factors of timely planting and weeding are neglected because of the labour constraint.

FACTORS INFLUENCING GROUNDNUT SUPPLY

1. Price Policy and Relative Profitability

Uniform price policy has increasingly favored maize at the expense of traditional food crops. Since 1978, there has been a steady decline in the relative price relationship between groundnuts and maize, making groundnuts less profitable. With the newly gazetted prices of K 24.50 for maize and K 71.50 for groundnuts, the profitability of growing groundnuts has declined to its lowest level in history relative to the profitability of growing maize. To put groundnuts on par with maize in terms of a return to labour, a price of K 86.16 per 80 Kg. bag would have to be paid.

The survey of 76 farmers in Eastern Province, which was part of the study, indicates that there has been a definite response by farmers to deterioration in the relative profitability of growing groundnuts. According to the survey, farmers have reduced their hectares by more than 30%. The number of farmers growing groundnuts has declined by 5%. Ox owners, with more hectares under cultivation and more risk capital committed to their operations, are more sensitive to the relative profitability of groundnuts, having reduced their hectareage in groundnuts by 63%. At the same time, the number of ox owners growing groundnuts declined by 25%.

2. Influence of the Informal Market

The decline in production has created a short fall in supply relative to demand for groundnuts, increasing the price the urban consumer is willing to pay. This willingness to pay has been relayed through the

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informal market channels to the farmer. Small traders are willing to pay the farmer from K 65 to K 100 per shelled bag equivalent at the village level. The small trader buys the groundnuts in the shell at the village, transports them to the main road and resells them to other traders. These traders in turn transport the groundnuts to Lusaka and the Copperbelt. In the Copperbelt, the retail prices range from K 1.75 to K 2.25 per Kg..

On the basis of information gathered in Eastern Province and Copperbelt, it is estimated that at least 100,000 - 80 Kg. shelled bag equivalents move through informal market channels annually. The number may actually be as high as 300,000 bags.

Were it not for the informal market, declines in groundnuts production would have been a lot more severe. Marketing services offered by informal traders in the market chain receive incomes from providing marketing services to move the groundnuts from the Eastern Province farmer to the urban consumer. The services are provided much more cheaply and efficiently than ECU provides them and at the same time, the farmer gets a price which is sufficient to encourage him to continue to produce groundnuts.

3. Eastern Cooperative Union Power and Practice

Policy which has provided ECU exclusive monopoly buying power has been counterproductive. The special rights were granted to protect an important export market. That market has dwindled to insignificance in recent years. Exorbitant margins charged by ECU for both ungraded and graded groundnuts are possible, because ECU is in a privileged position as the only legal buyer and uses the government set legal price of K 55 per 80 Kg. bag (1983) or K 0.68 per kilogram. The price received ranges as high as K 1.35 per Kg. on the domestic market. None of these profits are passed on to the producer. He thus prefers the more profitable informal market alternative.

Processors on the other hand, while they depend heavily on ECU for a supply of groundnuts, characterize the Union as an unreliable source of groundnuts. They also offered evidence to show that ECU sometimes deals through a merchant in Sinda, who marks up the price from what the processors had agreed to pay ECU. They end up buying graded nuts from Sinda instead of ECU.

CONSUMPTION AND DEMAND FOR GROUNDNUTS

All groundnuts produced are domestically consumed with estimates of consumption ranging from 350,000 to 750,000 bags nationally, depending on the method of estimation. While national population has been increasing, groundnut production has been decreasing, contributing to the short-fall of groundnuts.

This shortage is not only reflected in the high price consumers will pay, but in the difficulty processors have obtaining nuts. While there is reportedly great potential for exporting processed nuts, the processors cannot satisfy even the local demand for groundnut products. The short-fall will persist as long as the relative profitability of maize to groundnuts remains.

At the national level, vegetable oil demand has been estimated for 1984 at approximately 33,000 metric tonnes. Shortages of vegetable oil make Eastern Province consumers willing to pay far more than the going official price.

ECU officials estimate that local demand for vegetable oil will entirely use all the oil which can be processed by their new plant at Katete. Current estimates place Eastern Province 1984 consumption at from 3500 to 5000 metric tonnes, if the oil plant goes into operation.

ECONOMIC ANALYSIS OF ALTERNATIVE CROP ENTERPRISES FOR EASTERN PROVINCE

Following is a table ranking crops according to their level of socio-economic benefit (as calculated in chapter VII) and providing an appropriate economic price to achieve desired production.

<u>Rank</u>	<u>Net Benefit Per Hectare</u>	<u>Economic Price</u>
1. Chalimbana for domestic consumption	K 406	K 95.00
2. Chalimbana for export	277	82.00
3. Makulu Red for oil expression	221	60.00
4. Sunflowers for oil expression	64	27.95
5. Maize	58	19.00

Firstly, it should be pointed out that all the crops analyzed seem to

have a net comparative advantage for being grown in Eastern Province. The ranking does provide a guide to policies on which crops have the greatest comparative advantage and should be emphasized.

The findings clearly point to the importance of Chalimbana groundnuts for domestic consumption and export. The informal market has and will continue to provide the most efficient market for domestic consumers. Only when domestic consumption has been adequately satisfied will there be significant export potential. Research and extension efforts to increase production of Chalimbana will be rewarded most from an economic point of view.

There is not as clear cut an economic answer to the question of which oilseed to select as the above table might indicate. Makulu Red has a more advanced and ready-to-use technological package which competes well economically at present. In addition Makulu Red is not as fertilizer dependent as sunflowers would be if production and oil yields were to be competitive. This has foreign exchange implications which favor Makulu Red. The chief disadvantage of Makulu Red is labour intensive requirements during the peak labour demand period which will force it to compete with Chalimbana and maize. It also may be difficult to overcome taste preference for other varieties.

Sunflowers on the other hand, while having had dramatic growth in production, are low in quality, resulting in high processing costs per metric tonne of oil. Neither is the technological package as well developed for Zambian conditions. New hybrid introductions have yet to be proven, though the potential looks extremely good and quite competitive. Sunflowers as a fall-back crop for maize production cannot be denied. Sunflowers also provide a means of spreading scarce labour resources. One distinct disadvantage of sunflowers is the dependence on relatively high levels of fertilization to obtain good yields per hectare and high oil content in the seed. Fertilizer requires foreign exchange.

In either policy option, the decision must be accompanied by changes in the price policy for maize, since the relative profitability of maize will be a disincentive to increasing economical production of oilseeds in Eastern Province. Non-economic pricing of maize in Eastern Province is

costing Zambia several million Kwacha annually and impeding development of the other subsectors.

RECOMMENDATIONS

1. Government should decontrol the groundnut market in Eastern Province by statutory instrument to place Eastern Cooperative Union in the same status as are the other Cooperatives in Zambia, i.e. a buyer of last resort for groundnuts. This will not necessarily reduce the quantity of groundnuts to the cooperative, providing they pay a competitive price to the farmer. Farmers will receive more income, providing some incentive for increased production.
2. Increased supply of groundnuts will be largely dependent on a change in maize price policy to bring a balance to the relative profitability of groundnuts to maize. This could be accomplished through economic pricing of maize and other crops on a regional basis.
3. Research and Extension should expand their efforts to improve the production of Chalimbana. For Extension, the initial emphasis should be on the extension of known management packages which would increase yields on existing hectares with locally grown seed. Farmers cannot be expected to buy the exorbitantly priced " improved seed" without good evidence that it is worth the price. Such an effort should boost production to as much as a metric tonne per hectare. There is plenty of room for research on Chalimbana strains with improved yields and seed uniformity. This research should be continued.
4. Oilseed production and processing in Eastern Province should be encouraged. Current development of the respective technological packages gives Makulu Red an economic advantage over sunflowers as a choice for oilseed development. The potential for sunflowers needs much more research to adapt varieties which are economically competitive. Sunflowers should at least be encouraged and developed as a legitimate back-up to maize production and a means of spreading the labor resource effectively.

5. Sunflowers price to farmers should be differentiated to reflect the relative quality of seed, based on oil content and kernel weight. New methods of electronic analysis are available to make a rapid analysis possible. The cooperatives should not be saddled with the requirement to buy worthless seed at gazetted prices.
6. Research, along with continued efforts to improve groundnut varieties, should develop small scale implements and machinery to remove some of the labour bottlenecks in producing groundnuts eg. develop ox-powered technology for lifting and windrowing groundnuts at harvest time.

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I. INTRODUCTION:

Leaders in government have expressed concern over reduced production of groundnuts and sharp reduction in the volumes of production marketed through official channels. These concerns are reflected in a request from the Permanent Secretary of Eastern Province to the Ministry of Agriculture and Water Development for a government study (their minute number EP/3/2/12 of November 1982). The purpose of the study requested was to analyze the factors contributing to these declines and identify and evaluate alternative means to change a trend which has reduced the supply of a traditionally important food crop and a source of substantial export earnings.

A special need was identified in the Eastern Province request to provide guidance to research and extension as to which of two varieties of groundnuts should be promoted to increase groundnut production. Chalimbana grown mostly in Eastern Province is a groundnut valued traditionally for its eating qualities and has a high value for export as a confectionary nut. Makulu Red is a much higher yielding nut, suited largely for vegetable oil and oil-cake production, thus potentially of value for import substitution.

As part of an ongoing effort and in response specifically to this request, the Production and Marketing Section of the Planning Division, MAWD conducted a groundnut subsector study with special reference to Eastern Province, since 70-90% of the marketed groundnuts are grown in Eastern Province. The purpose of the study was to:

- (a) Analyze the processing and marketing system for groundnuts from the producer to the consumer to identify constraints and to determine strategies which would improve the system.

A special effort was made to document the importance of the informal market.

- (b) Analyze the alternative crop production enterprises to determine the mix of commodities which would provide E. Province and Zambia the highest socio-economic value and evaluate alternative policies for achieving the desired production and marketing levels. This would include the evaluation of confectionary groundnut and groundnut oil seed production.
- (c) Provide groundnut supply and demand projections as a basis for planning for the subsector.

To improve the information base from readily available data, a survey of groundnut growers in four districts of Eastern Province was conducted. The purpose of the survey was to:

- (a) determine perceived constraints to increased production and marketing of groundnuts;
- (b) quantify the magnitude of shifts in groundnut production to other crops and determine reasons for those shifts;
- (c) establish production coefficients for hectares, yields, retention rates, input requirements (especially labor);
- (d) determine the extent of farmer use of the informal market for groundnuts, estimate volumes paid and services rendered and trace and describe the distribution system as perceived by the farmer.

This study took place during the period March-May (intermittently) and included an intensive data gathering period of three weeks in Eastern Province as well as visits to refineries and markets in the Copperbelt and Lusaka.

The complete write-up of the survey is found in Annex 7. Information useful to the report will be found throughout in the appropriate sections.

II. BACKGROUND

Eastern Province is the supplier of 90% of groundnuts for Zambia. Almost all of these groundnuts are of the Chalimbana variety grown by small scale farmers. Chalimbana is characteristically a non-uniform large seeded variety highly valued as a confectionery (eating) nut both domestically and for export where it has historically commanded a premium price. In order to protect this export trade it was policy until October, 1975 that Chalimbana should be the only groundnut variety grown in Eastern Province.

The reason commonly given by government for restricting other varieties such as Makulu Red, a nut specially suited for oil extraction, were first that Chalimbana and Makulu Red would mix if both varieties were grown in the same field, giving production of uncertain quality. Secondly there was concern for the varieties crossing genetically. There was also the fear that Chalimbana variety might be replaced by the much higher yielding Makulu Red variety. (Makulu Red is known by researchers to be capable of yielding nearly double the yields of Chalimbana). Thus an important export trade might be lost forever.

The government ban however was lifted allowing the introduction of Makulu Red into production on the basis that previous fears were exaggerated and hoping that the continued decline in marketed production could be reversed. This move also reflected interest in the increased development of oil-seed production to feed the domestic consumption of vegetable oil. Because of strong taste preferences for the confectionery variety, Chalimbana, and because of a shortage in supply of the confectionery variety, Makulu Red has not yet caught on in Eastern Province.

A number of social, economic and political factors have shaped the role of Eastern Province as a major supplier of groundnuts. Among the most important are changes in price policy and the structure of the official marketing channel as well as the previously mentioned ban on certain varieties. This study was commissioned to review those policies and provide information and guidance to government in establishing policies which will lift this subsector from its current state of stagnation.

III. TRENDS IN SUPPLY OF GROUNDNUTS

Historically groundnut production has been important to Eastern Province. Since before independence Eastern Province was the nation's major supplier. In 1961 government statistics* credit the Province with the sale of 142,000 bags of groundnuts through official marketing channels. This represented 94.7% of all the groundnuts sold in Zambia and 95.7% of the marketed value. The K1,600,000 from groundnuts sales represented 81.5% of the value of all crops and livestock sales originating in E. Province. At the same period Eastern Province maize sales represented only 8% of Zambia's total maize production. This groundnut/maize production relationship reflected the colonial government's two price maize policy which discriminated against African producers in favor of line-of-rail European farmers. Groundnuts during this period were the Eastern Province peasant farmers' chief source of cash income.

Groundnut sales peaked in 1967 with a national marketed production of 185,125 80kg bags.

* Taken from "Report on Agriculture Production of Southern Rhodesia, Northern Rhodesia and Nyasaland" p. 53 by Doris J. Dodge as recorded in her book, Agricultural Policy and Performance in Zambia. 1978.

Total national production at this time may have exceeded 300,000 - 80 Kg. shelled bag equivalents or 24,000 tons. At this time a major proportion was exported to Europe. Marketed groundnut production through official channels dropped to less than half in 1968 at 5,390 metric tonnes. Production oscillated up and down and eventually worked back up to another lesser peak in 1976 when 9467 metric tonnes were officially marketed. At this time, Eastern Province was marketing 7330 metric tonnes, 77.4 percent of the crop.

Table 1 shows the marked decline in officially marketed production from 1976 to the present. The volume officially marketed dropped to a low in 1982 of 794 metric tonnes to pick up again slightly in 1983 to approximately 983 metric tonnes (according to preliminary market reports). During this period, Eastern Province has maintained over 70 percent of the market, except in 1977.

This decline is also reflected in the amount of groundnuts available for export and the impact on the value of foreign exchange earned from groundnuts sold abroad. As indicated in Table 2, groundnut exports have dwindled from earning substantial foreign exchange to nothing in either 1981 or 1982.

The extent to which officially marketed production represents a true decline in production will be analyzed below against shifts to marketing in informal channels. The above declines need to be viewed in the light of what has happened to production of other cash crops grown in Eastern Province.

TABLE 1 OFFICIALLY MARKETED GROUNDNUTS

YEAR	ZAMBIA		EASTERN PROVINCE		E. PROV/ZAMBIA
	80Kg. Bgs.	(MT)	80Kg. Bgs.	(MT)	(%)
1976	118,340	9467	91,623	7330	77.4
1977	93,275	7452	38,281	3062	41.0
1978	27,921	2234	20,910	1672	74.9
1979	34,213	2737	28,009	2241	81.9
1980	25,351	2028	18,185	1455	71.7
1981	16,500	1320	11,412	912	69.1
1982	9,925	794	9,263	741	93.3
1983*	12,299	983	11,858	948	96.3

* As of 14/10/83 Source: 1982 Agricultural Statistical Bulletin and Namboard Report of 14/10/83.

TABLE 2 GROUNDNUT EXPORTS AND LOCAL SALES

	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>
Exports (Kwacha)	780,000	1,201,900	560,900	796,300	1,144,500	774,200	791,000
Exports (tonnes)	4,171	4,431	1,997	2,145	2,880	1,289	990
Local Sales (tonnes)	1,282	1,647	995	1,228	2,414	6,041	2,072
Total Purchases (tonnes)	5,453	6,078	2,952	3,373	5,294	7,330	3,062
<hr/>							
	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>		
Exports (Kwacha)	292,079	371,930	747,994	-	-		
Exports (tonnes)	372	465	526	none	none		
Local Sales (tonnes)	1301	1776	929	912	741		
Total Purchases (tonnes)	1673	2241	1455	912	741		
<hr/>							

Source: Eastern Province Cooperative Union 1983.

The increasing recent importance of Eastern Province as a major producer of maize is illustrated in tables 3 from 1976 to 1983. Eastern Province has gone from producing 10.9 percent of Zambia's maize to 27.1 percent. In 1983 Eastern Province is second only to Central Province with a marketed production to date of 142,685 metric tonnes, a 73.8 percent increase in total production from 1976. Eastern Province role as a steady supplier of maize is illustrated in the graph, Figure 1, showing Eastern Province's production from 1975 to 1983. Superimposed on this is Zambia's production, showing the wide importance as a maize supplier. Export of maize from Eastern Province may reach approximately 114,570 metric tonnes, based on the difference between marketed production and what is given as the fixed allocations to millers. This maize will be used in "deficit" areas at a high cost to government in subsidized transport.

Eastern Province has also increased in importance for the production of oil seeds, particularly sunflower. As seen in Table 4, Eastern Province has become the most important supplier of sunflower seeds, with a 1983 production of 13,832 metric tonnes or 46.9% of the national production, possibly again reflecting the relative advantage the province has in droughty years. What is more dramatic is the increase in volume marketed. In 1976 Eastern Province marketed 390 metric tonnes but in 1983 preliminary figures show 13,832 metric tonnes, a production increase of thirty-five fold.

Cotton production in Eastern Province (Table 6) has remained relatively steady. Recent extension efforts by Lintco have shown a positive impact in a substantial comeback from the 1982 low of 1485 metric tonnes of cotton of which two-thirds by weight is the cotton seed, an important by-product for oil extraction. Comparatively speaking, however the Province only produces 8.7 per cent of the cotton.

Increased production of these other food and industrial crops has at least been in part at the expense of hectarage in groundnut production.

TABLE 3 MAIZE (MT)

	ZAMBIA	E. PROVINCE	E. PROVINCE AS % OF ZAMBIA
1976	749,972	82,091	10.9
1977	696,451	84,788	12.2
1978	581,656	69,447	11.9
1979	335,959	46,563	13.9
1980	382,266	66,577	17.4
1981	693,341	106,581	15.4
1982	508,300	114,610	22.5
1983	527,123	142,685	27.1

Source: GRZ Agricultural Statistical Bulletin, 1982 and
Namboard Report 14/10/83.

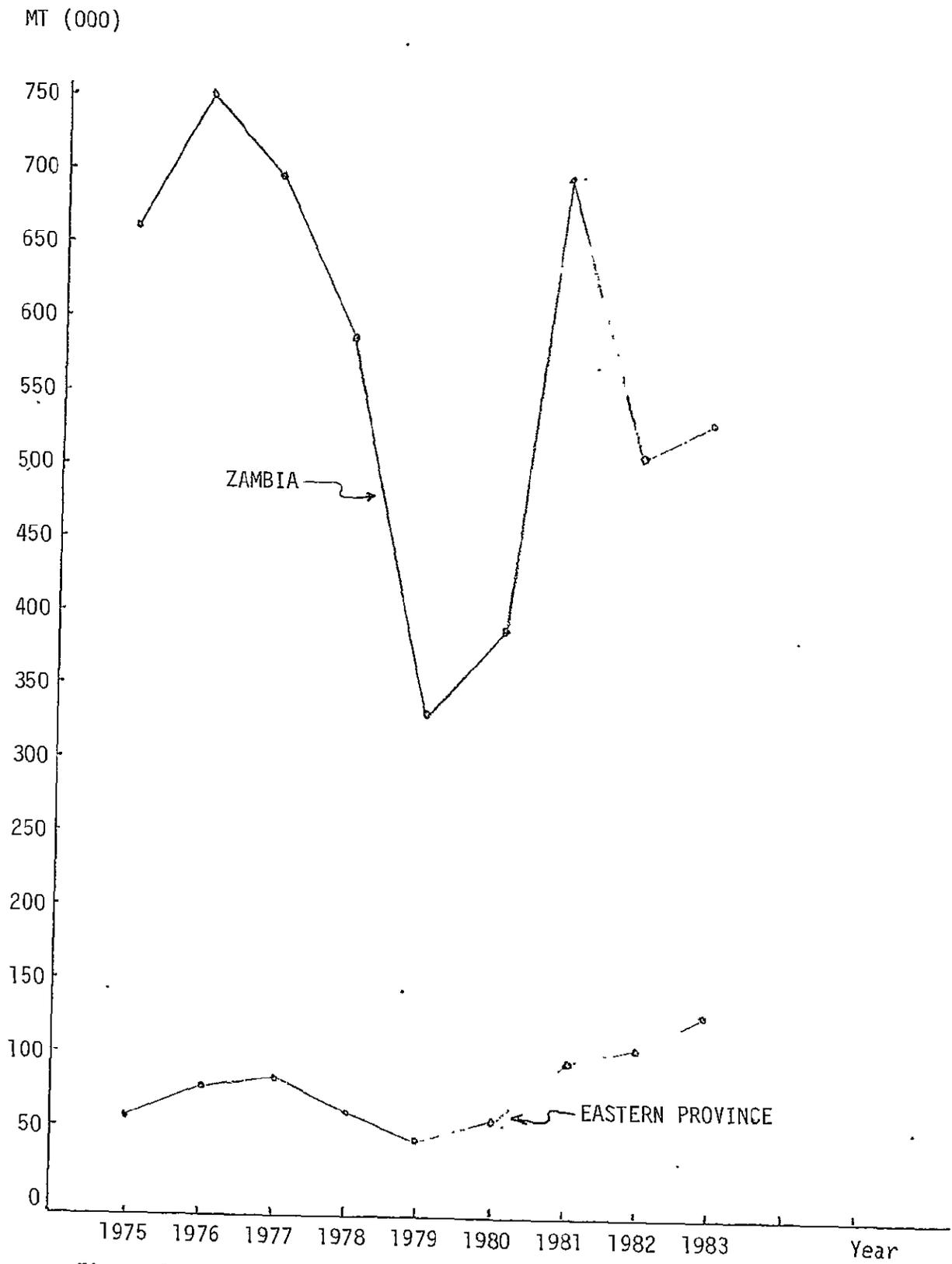


Figure 1 - Eastern Province and Zambia Maize Production

TABLE 4 OFFICIALLY MARKETED SUNFLOWER (MT)

	ZAMBIA	E. PROVINCE	E. PROVINCE/ZAMBIA (%)
1976	15,694	390	2.4
1977	13,321	449	3.4
1978	7,551	716	9.5
1979	11,918	1,337	11.2
1980	17,238	3,093	17.9
1981	19,223	6,518	33.9
1982	20,400	10,640	52.2
1983*	29,493	13,832	46.9

Source: GRZ Agricultural Statistical Bulletin, 1982
and NAMBOARD Report of 14/10/83

*As of 14/10/83

TABLE 6 OFFICIALLY MARKETED COTTON (MT)

YEAR	ZAMBIA	E. PROVINCE	E. PROVINCE AS % OF ZAMBIA
1976	3,885	1,691	43.5
1977	8,929	2,355	26.4
1978	8,430	2,838	33.7
1979	14,916	3,432	23.0
1980	22,913	3,750	16.4
1981	16,752	1,855	11.1
1982	12,786	1,485	11.6
1983	30,652	2,625	8.7
Ave.	14,907	2,504	16.8

IV. GROUNDNUT PRODUCTION IN EASTERN PROVINCE

To understand the factors which have influenced trends in groundnut production and the potential for reversing those trends, it is necessary to understand first who it is that is growing the groundnuts, their resource base, how they allocate those resources and what their production is from those resources.

LAND DISTRIBUTION

Small scale farmers are the predominant growers of groundnuts in Eastern Province partly because the Province is largely of small scale farmers. For most of those farmers, groundnuts provide a major source of food (protein) as well as cash. According to recent estimates by Eastern Province Agricultural Development Project staff, there are approximately 147,000 farm units in the Province. Table 7 shows the breakdown of farm families by farming system in each region in the Province.

The survey by the Planning Division, MAWD of 76 farm families in Chadiza, North Chipata, Katete and Lundazi Districts indicate something of the size of the land base and distribution among the main crops grown. The interviewed farmers were asked what crops they grew and what was the hectarage of each crop grown in last season's planting.

Table 8 shows that more than half of the farm units are of less than 4 hectares, while 27.6 percent were in the range of 4 hectares to 6.99 hectares, and 18% have hectarage above 7 hectares. The category of less than 4 hectares* with 54% of the farms averaged 2.29 hectares per farm unit. The other categories averaged 4.89, 7.68 and 9 hectares per farm respectively. While the average per farm unit is 4.48 hectares for all 76 farms, the weighted average is 4.01 hectares.*

*Footnote: These hectarages are the farmers' own "best guess" and not actually measured hectares. The team found some confusion between hectare and acres, so they allowed the farmers to report in acres and then the response was converted to hectares. Extension staff who assisted with the interview sometimes were involved in crop measurement exercises where they could verify the hectares in question. Standard deviations were used to give some indication of the variance of the responses. The categories chosen give much lower standard deviation than the 3.45 S.D. for the whole sample and were subjected to "students t-test" to determine upper and lower confidence intervals.

TABLE 7 ESTIMATED FARM FAMILIES BY FARMING SYSTEM

<u>Farming System</u>		<u>Estimated Farm Families</u> <u>1982</u>
Eastern Plateau South	Ox Owners	40,400
	Ox Hire	36,400
	Hand	<u>37,000</u>
	Sub-total =	113,800
Eastern Plateau North (A)	Ox Owners	1,200
	Ox Hire	2,100
	Hand	<u>3,100</u>
	Sub-total =	6,400
Eastern Plateau North (B)	Ox Owners	1,200
	Ox Hire	600
	Hand	<u>1,200</u>
	Sub-total =	3,000
Large Circle Chitemene (Chama District)		1,000
Luangwa (Chama) Hoe System		8,600
Luangwa (Central) Hoe System		11,600
Luangwa (South) Hoe System		<u>3,200</u>
	Sub-total =	24,400
	Total E. Province =	147,600 =====

Source: Eastern Province Farming Systems Survey - 1982 Overview Information from Extension Staff and Extracts from Schultz's Land Use Survey, 1974, EPAD. Department of Agriculture, Chipata 1982.

TABLE 8 FARM SIZE DISTRIBUTION AS REPORTED BY 76 E. PROVINCE FARMERS

Farm Size (Ha)	<u>< 4Ha.</u>	<u>4-6.9</u>	<u>7-9.9</u>	<u>10+</u>	<u>All Farms</u>
No. of Farms	44	21	8	3	76
% in Category	57.9	27.6	11.8	3.9	100
Ave. Farm Size in Category (Ha.)	2.52	4.89	8.1	14	4.21
Standard Deviation (Ha.)	.92	.66	.68	-	2.89
Coefficient of Variation	.360	.135	.085	-	.68

Source: E. Province Groundnut Survey, MAWD 1983.

Table 9 provides some idea of the average hectares in each crop for local maize, hybrid maize, groundnuts and sunflower (average for those growing the crop). When the crops are distributed according to the farm size categories (Table 10) with the average acreage in each category for each crop a slightly different picture emerges. The weighted average for all groundnut growers (as reported by the 76 farmers) was .63 hectares per farm. The weighted average for hectares in local maize per farm was 1.58. The weighted average of hectares in hybrid maize for the 42 growers was 1.66 while sunflowers averaged .73 hectares for 35 farmers growing the crop.

TABLE 9 CROP DISTRIBUTION OF 4 MAJOR CROPS - 76 E. PROVINCE FARMERS

	<u>No. Growing</u>	<u>Percent Growing</u>	<u>Average Hectares</u> [*]
Groundnuts	57	75	.62
Local Maize	74	97	1.50
Hybrid Maize	42	55	1.68
Sunflowers	35	46	.34

* Average for those growing

Source: E. Province Groundnut Survey 1983

Farmers growing groundnuts did not significantly vary the size of hectares planted to groundnuts across farm size categories, whereas the maize plantings did increase significantly with farm size. This would indicate the related importance of maize to the larger scale farmers in the survey.

In Table 11, the relative importance of the various crops grown by groundnut producers is illustrated. There were typically (for all groundnut growers) only .62 hectares of groundnuts grown compared to 1.48 hectares of hybrid maize and 1.52 hectares of local maize. Sunflower hectares were about equal to groundnut hectares per farm.

The relationship of maize hectares to groundnut hectares is somewhat exaggerated because only 63 percent of the groundnut producers grow hybrid maize. A ratio using the weighted average of the maize and groundnut hectares planted gives 3.78 maize hectares to one hectare of groundnuts. This ratio is close to the inverse of the relative requirements for labor for maize versus groundnuts as will be illustrated below.

TABLE 10 CROPS DISTRIBUTION BY CATEGORY OF LAND SIZE

	Hectares Per Farm and No. Growing								Weighted Average	
	<4 Ha.		4-6.9Ha.		7-9.9 Ha.		10+ Ha.			
	Ha.	No.	Ha.	No.	Ha.	No.	Ha.	No.	Ha.	No.
Groundnuts	.56	31	.68	19	.58	5	1.5	2	.63	57
.S.D.*	.32		.32		.25		-		-	
Local Maize	1.27	42	1.52	21	2.0	8	5.3	3	1.58	74
.S.D.*	.52		.83		.94		-		-	
Hybrid Maize	.93	18	1.52	16	3.03	6	5.25	2	1.66	42
S.D.*	.69		.98		1.50		-			
Sunflower	.54	22	.91	8	1.35	4	1.0	1	.73	35
S.D.*	.32		.60		1.25					

*Standard Deviation

Source: E. Province Groundnut Survey 1983

TABLE 11 CROP DISTRIBUTION OF 57 GROUNDNUT GROWERS

	Number Growing	Hectares	Ratio of Crop/Groundnuts
Groundnuts	57	.62	1:1
Local Maize	52	1.52	2.45:1
Hybrid Maize	36	1.48	2.38:1
Sunflowers	23	.84	1.35:1

Source: E. Province Groundnut Survey 1983

LABOR REQUIREMENTS AND UTILIZATION

According to agronomists and groundnut plant breeders interviewed there are three management practices which are essential to good yields. These are (1) getting the groundnuts planted and harvested on time, (2) adequate plant population and spacing and (3) weed free fields. The ability to be timely and to adequately weed groundnuts depends on available labor. Labor availability is especially critical, because groundnut production is labor intensive and planting, weeding and harvesting times come at the same time for both maize and groundnuts. The problem is intensified, since maize usually receives first priority. When weather or other factors delay maize operations, groundnut production and yields suffer. Often available family labor has to be supplemented with hired labor, if the crop is to be properly tended. Labor at the critical periods may be in short supply. It is possible that fairly sizeable fluctuations in groundnut production nationally could be attributed in part to shortages of available labor.

The survey attempted to determine labor availability on the farm and how it was used among the various operations for each crop produced. Questions were asked about how much hired labor was used in the various cropping operations. In addition, the farmer was asked his own perception of how long it took to complete each of the necessary cropping operations from tillage through harvesting and marketing. With knowledge about available family labor, amount of labor hired and the number of days it took to carry out each operation, an estimate was made of labor available per hectare of land, relating this to size of land holdings and the mandays required to raise and market maize, groundnuts and sunflowers.

While it would have been useful to have asked specific questions about dates where labor was in short supply, this was not done.

First, looking at the question of labor availability, data collected from the 76 farm units indicates something of the farmers' own perceptions of labor availability and use. As can be seen in Table 12, farmers reported an over all weighted average of 3.23 family members of working age per farm. Relating this to the average farm size of 4.21 hectares, there are approximately .78 family members per hectare or a land base of 1.3 hectares per family member. When the available family labor is categorized by the previously mentioned four farm size categories, the land base per family member is .91 hectares, 1.32 hectares, 1.8 and 5.24 hectares respectively. There is also a noticeable correlation between the availability of family labor and the size of the farm unit.

Table 12 - Available Family Labor and Use of Hired Labor

	<u><4 Ha.</u>	<u>4-6.9 Ha.</u>	<u>7-9.9 Ha.</u>	<u>10+ Ha.</u>	<u>Weighted Average</u>
Numbers of farms	44	21	8	3	76
Available family labor	2.8	3.7	4.5	2.7	3.2
Standard Deviation	1.7	1.73	2.14	1.15	
Coefficient of Variation	.61	.467	.475	.43	
Number using hired labor	11	8	3	none	
Average mandays of hired labor used	95.2	226	211	none	158

Source: E. Province Groundnut Survey, MAWD 1983

As one might expect, the farmers' perception of how much labor each cropping operation would require turned out to be extremely varied. According to farmers' perceptions reported, on the average, (Table 13) it takes 90 mandays to grow, harvest and market a hectare of maize. It takes 287 mandays for a hectare of groundnuts and 107 mandays for sunflowers per hectare. Groundnuts

takes three times as much labor as maize and nearly three times as much labor as sunflowers. While the magnitudes of these perceptions are subject to wide variation, the important thing to derive from this is that the farmer knows that it takes a lot more labour for groundnuts than for either of the other crops. This perception of the relative magnitude of labour requirements coupled with his understanding of the return to labour available to him, influenced his decision to shift some of his groundnut hectares to maize and sunflowers. (See section on shifts in groundnut production.)

Farmers' own perceptions aside, these averages fall well within previously established parameters for the various cropping operations.

Table 14 also gives a breakdown of the perceived labour requirements for producing groundnuts by operation. Shelling and marketing require nearly a third of all the labour.

Man-day requirements by production operation (Table 14) further emphasize the labour intensive nature of groundnut production. When planting time and harvest time operations are aggregated, one can understand the potential for shortages of labour. Most of the 57 groundnut growers interviewed till, plant and weed once. One third of them weed twice and only one weeded three times. The mandays required for each of these weedings reflect the relative importance and amount of effort involved. Shelling requires double the mandays of the tillage operation. The shelling labour requirements represent slightly more than 30 percent of all production and marketing operations (Table 15).

TABLE 13 MANDAY REQUIREMENT* PER HECTARE FOR MAIZE, GROUNDNUTS,
AND SUNFLOWER

	<u>Maize</u>	<u>Groundnuts</u>	<u>Sunflower</u>	<u>Groundnuts /Maize Ratio</u>
Chadiza	49.1	184.3	46.2	3.7:1
Chipata	70.7	241.9	159.1	3.4:1
Katete	93.2	343.3	152.1	3.7:1
Lundazi	93.2	309.8	40.4	3.3:1
E. Province	89.5	287.2	106.7	3.2:1

Source: E. Province Groundnut Study, MAWD 1983.

*Manday requirement formulas.

1. Mandays Required Per Operation = $\left[\frac{\text{available family labor}}{\text{sliding factor}} \times \text{days per operation} \right] + \left[\frac{\text{days of hired labor used}}{\text{number hired}} \right]$
2. Mandays Per Hectare = $\left[\text{Sum of Mandays Required Per Operation} \right] \div \left[\text{Hectares in Crop} \right]$
3. Sliding Factor for Effective Family Labor = 1, .9, .8, .7, .6, .5 with all above six giving 3 effective persons of family labor. (This is to allow for the fact that not all adults will always be able to give full time to the field operations.)

TABLE 14 AVERAGE MAN-DAY REQUIREMENTS FOR GROUNDNUT PRODUCTION OPERATION

<u>Operation</u>	<u>Man-Days* Per Hectare</u>	<u>Number Reporting</u>
Tillage	43.99	57
Planting	36.85	57
Weeding No. 1	49.49	57
Weeding No. 2	11.64	19
Weeding No. 3	4.98	1
Lifting	49.27	57
Stripping	45.70	57
Shelling	87.68	32
Marketing	2.66	31

* not additive

Source: E. Province Groundnut Study, MAWD 1983.

TABLE 15 GROUNDNUT SHELLING & MARKETING MANDAY REQUIREMENTS

	<u>MANDAYS PER HA.</u>	<u>PERCENT % TGMD</u>
Chadiza	103.61	56.21
Chipata	105.83	43.75
Katete	100.81	29.37
Lundazi	59.80	19.30
E. Province	92.13	32.09

If one takes the average groundnut producer depicted by the survey (illustrated back in Table 11) and estimates the combined planting time and harvest-time requirements for the two crops it becomes obvious that these critical periods will tend to have labor shortages (Table 16). Tillage and planting combined for maize and groundnuts requires 121 mandays (as perceived by the farmers). If the average groundnut producer has 3.23 persons available to work during this period, it will either take longer than 25 days to get the job done with possibility of substantial yield reduction or labor will have to be hired. At harvest time likewise either it will take the average groundnut producing unit longer than 25 days to harvest (not including shelling) or hired labor will be required. In years when either of these seasons is cut short the labor bottleneck becomes severe and national yields are bound to suffer. Thus it is that farmers have tended to give priority to growing maize as a crop which requires less labor and provides more income return to the labor used.

TABLE 16

	<u>2.5 Ha. Maize</u>	<u>.6 Ha. G'nuts</u>	<u>Mandays Required</u>	<u>Mandays* Per Day</u>	<u>Labor Shortage Per Day</u>
Tillage/Planting	72.78	48.50	121	4.84	1.61
Harvest (Shelling not included)	43.47	56.98	100.45	4.02	.788

Source: E. Province Groundnut Survey, MAWD, 1983.

*Mandays per day assures 25 day planting and harvest periods.

USE OF OX POWER

The survey carried out by E. Province Agricultural Development Project staff in 1982 as an overview assessment reports that on the plateau (in E. Province) approximately one third of the farmers are ox owners, one third are hiring oxen and another third are hand cultivators. They also report that the average farm size of hoe cultivators is about 1.8 hectares, ox-hires 3.7 hectares and ox-owners 6.7 hectares with apparently larger farms in the Lundazi area.

Of the 76 farmers reporting in the E. Province Groundnut Survey, 43 were hoe cultivators, 24 were oxen owners, 6 were renting oxen and 3 hired a tractor for tillage operations (Table 17).

TABLE 17 TILLAGE TECHNOLOGY AND FARM SIZE

	<u>Number</u>	<u>Per Cent</u>	<u>Ave. Hectares</u>
Oxen Owners	24	31.58	5.08
(S.D)	-	-	(2.26)
Oxen Renters	6	7.89	3.38
(S.D)	-	-	
Tractor	3	3.95	2.73
(S.D)	-	-	
Hoe	43	56.57	3.3
(S.D)	-	-	(1.58)

There is a relationship between oxen ownership and farm size. The sample was too small to determine a definite relationship of tractor renting and farm size. Oxen renters in this sample had smaller farms than the hoe cultivators. Quite often the ox renters were in villages where others owned the oxen and had smaller holdings. Again here the sample was too small to get a very clear picture. The hoe cultivators, by far the largest group in the sample averaged 3.3 hectares per farm unit.

The largest number of oxen users was in the Katete District where 19 of 27 farmers either owned or rented oxen power.

GROUNDNUT TECHNOLOGY AND FARMERS YIELDS

This section is not intended as a complete review of the agronomic aspects of groundnut production. However, there are a number of important factors which relate to the supply of groundnuts, both now and in the future and which effect the analysis of what crops should be encouraged in Eastern Province. These factors will be briefly covered including findings from the E. Province Groundnut Study.*

VARIETIES

While there are a number of varieties suitable to E. Province growing conditions, this study will look only at Chalimbana and Makulu Red varieties.

Chalimbana is the variety most commonly grown in Eastern Province. It is classed as a premium nut on world markets and is highly popular in both rural and urban areas of Zambia for eating directly as well as to mix with

*For further information on groundnut growing see "GROUNDNUTS - How to Grow Series No. 5" Edited by P.T. Nelson, Chief Crop Husbandry Officer, Department of Agriculture, MAWD 1976.

other food as a relish. At one time this was the only variety allowed to be cultivated in E. Province, however this ban has been lifted since 1975.

Chalimbana has a low spreading growth habit which requires more space per plant than the upright type, Makulu Red. The variety has some resistance to the disorder, "Pops" (empty pods due to abortion of kernels) associated with low calcium levels in the soil. (In some fields liming is essential to obtain good yields).

Makulu Red is an oil extraction nut, medium to late maturing with a growing period of 140-180 days. The variety is known for its relatively high yields and higher oil content. Makulu Red is not popular as a relish in the Zambian diet. This variety is somewhat prone to "pops", but recommended for higher rainfall areas of Zambia.

When the 76 farmers of the groundnut survey were asked what variety of groundnut they grew 54 of the 55 groundnut producers grew Chalimbana. Only one grower raised Makulu Red. Ten of these 55 producers raised Natal Common.

When asked why they chose Chalimbana more than the other varieties they replied most commonly that, it was a good source of income, and seed was most readily available. Five preferred Chalimbana for home consumption. Three farmers considered Chalimbana to be a better yielding variety.

While the response to the formal questions do not adequately portray the farmer attitude toward Makulu Red, informal conversation seemed to indicate that Makulu Red seed availability was a major constraint to growing this variety.

SEED SELECTION

Farmers prefer to use their own seed saved back from each year's harvest.

Of the 76 farmers interviewed, 62 answered the question on where they obtained groundnut seed though only 55 were currently growing the crop. Of these 62 farmers, 54 used locally grown seed while eight obtained their seed from Eastern Province Cooperative Union.

The price of seed is a major deterrent. Commonly, the farmer still has to be shown that "Improved Seed" from any source will provide adequate returns for the added investment.

LAND PREPARATION

The main essential of land preparation is to provide groundnuts a weed free environment in which to grow. Groundnuts do not yield well with infestations of weeds. "A good cleaning of the seed bed when early rains have caused weeds to sprout is essential". Preplanting weeding and preparation may be in direct competition with land preparation and planting of the maize crops. It is the impression of the team from limited field observations that weed control is a major management problem in groundnut production.

FERTILIZATION

Groundnuts seldom respond well to direct fertilizer application but yield well on the residual fertilizer from a previous crop. It is recommended that groundnuts are planted after a well fertilized crop e.g. maize which has been well fertilized with compound fertilizers.

The point is that adequate fertilizer in the cropping program is essential to achieve above subsistence level yields for groundnuts. There were 41 groundnut producers who used some fertilizer in the cropping program, mostly applied to maize. The average level of application was 341 kgs. per hectare.

TIMELY PLANTING

To achieve the best yields groundnuts should be planted as early as possible with the first rains. Yield is very much reduced by delayed planting. In fact yields may be halved by a delay of two to three weeks. The object is to plant early to allow for plant growth throughout the full season. In the later plantings emergence and establishment may be poor with potential of more severe infestations of rosette and leaf spot.

Early planting is dependent on adequate labor for tillage. Low yields can be indirectly caused by delayed planting due to a short supply of labor. The survey shows that labor is most likely to be short in the optimum planting period and may be one of the key causes of low yields, especially since maize must be planted first.

PLANT POPULATION

Plant population must be adequate to achieve good yields. Wide spaces between rows or within the rows are an invitation to aphid attack which results in infestations of rosette. A healthy ground cover of groundnuts is also good competition for weeds. According to plant breeders and agronomists interviewed the recommended optimum spacing for Chalimbana is 90cm. x 12.5 to achieve a final plant population of approximately 90,000 plants per hectare. Makulu Red, because of its upright growth pattern will need ^a plant population of 133,000 plants per hectare which should result from planting in a spacing of 75cm. x 10cm. (between rows and in the rows respectively).

According to EPAD staff row spacing and in-the-row spacing are a serious problem of management. There is a tendency to skimp on seed and not to observe the optimum spacings. This was supported by the teams' observations in limited field visits.

Another major contributor to spacing problems is both non-viable or damaged seed and the rotting of the seed in the ground caused by fungi attack. It is important to select whole, undamaged seed and to treat the seed with a fungicide.

YIELDS

According to researchers at Msekera Research Station, Chalimbana under experimental conditions is capable of producing from 1500Kg - 2000Kg per hectare whereas Makulu Red is capable of producing from 2500 - 3000Kg per hectare. Under field conditions with available seed and good management practices Chalimbana is capable of producing 1000 Kilograms per hectare (12.5 bags x 80Kgs) while Makulu Red can produce 20 bags per hectare.

According to a survey of 75 groundnut cultivators in the Kalichero area done by the Farm Management Officer at Msekera 1971/72, mean yields were 6.8 x 80Kg bags with the highest at 12.0 x 80kgs per hectare. Rough yield estimates carried out in the E. Province Groundnut Survey would put yields from 6.5 - 7.5 x 80kg. bags per hectare. This difference between what is and what should be can largely be made up by improved management, i.e. cultivators using own seed and good management practice should be able to move from 6 bags per hectare to 12 bags per hectare of Chalimbana by early planting, full plant population, good weeding and timely harvesting and curing, as long as the crop is in a rotation where adequate fertility of the soil is maintained. While the researchers need to press on to improve yields of various varieties certainly there is an urgent challenge to Extension efforts to improve yields through a revitalized groundnut extension program effort.

V. FACTORS INFLUENCE TRENDS IN GROUNDNUT SUPPLY

PRICE POLICY

Price policy for groundnuts has varied over the years. Policy has reflected a concern on the one hand for encouraging production of Chalimbana for export and on the other hand to stimulate production to meet all domestic oil needs. Attempts have been made to maintain price stability to sustain producer confidence. Concern for keeping consumer prices at "reasonable" levels has often been a limiting factor on price policy. At times too, recognition has been given to the relative price impact of maize on levels of groundnut production and prices have been raised to increase profitability of groundnuts production to more competitive levels.

Various methods have been used to arrive at effective administered prices including import and export parity price, although domestic prices have remained below these parity price levels. In 1970/71 a uniform price policy was established in line with a general uniform price policy and has remained in effect to the present. In more recent years these prices have been based on estimated costs of production.

The 1984 price for Chalimbana was increased 20% from K55 to K71 to adjust the relative price relationship between groundnuts and maize and to bring official producer price closer to the prices being offered by the informal market. The attempt to approach prices offered on the informal market and to readjust the price relationship between maize and groundnuts implicitly recognizes the failure of the official market price mechanism to either stimulate production or to compete for marketable commodity. As will be seen below the recent adjustment of price of maize to K24.50 from K21.50 originally gazetted has reversed the effort to improve the relative price relationship of the two commodities.

As the prices now stand, the maize/groundnut price relationship has deteriorated to the lowest level since independence and will be a deterrent to increases in production of groundnuts. (This also illustrates the problem of selective adjustment of individual commodity prices without consideration of impacts on overall agricultural production). In Table 18 the real maize and groundnut prices are compared. From the high in 1978 of a price 4.73 times the price of maize groundnut price has dropped to a new low gazetted for 1984 of 3.2 times the price of maize. Assuming the same basic costs of production relationships the relative profitability of maize to groundnuts has increased enormously since 1978.

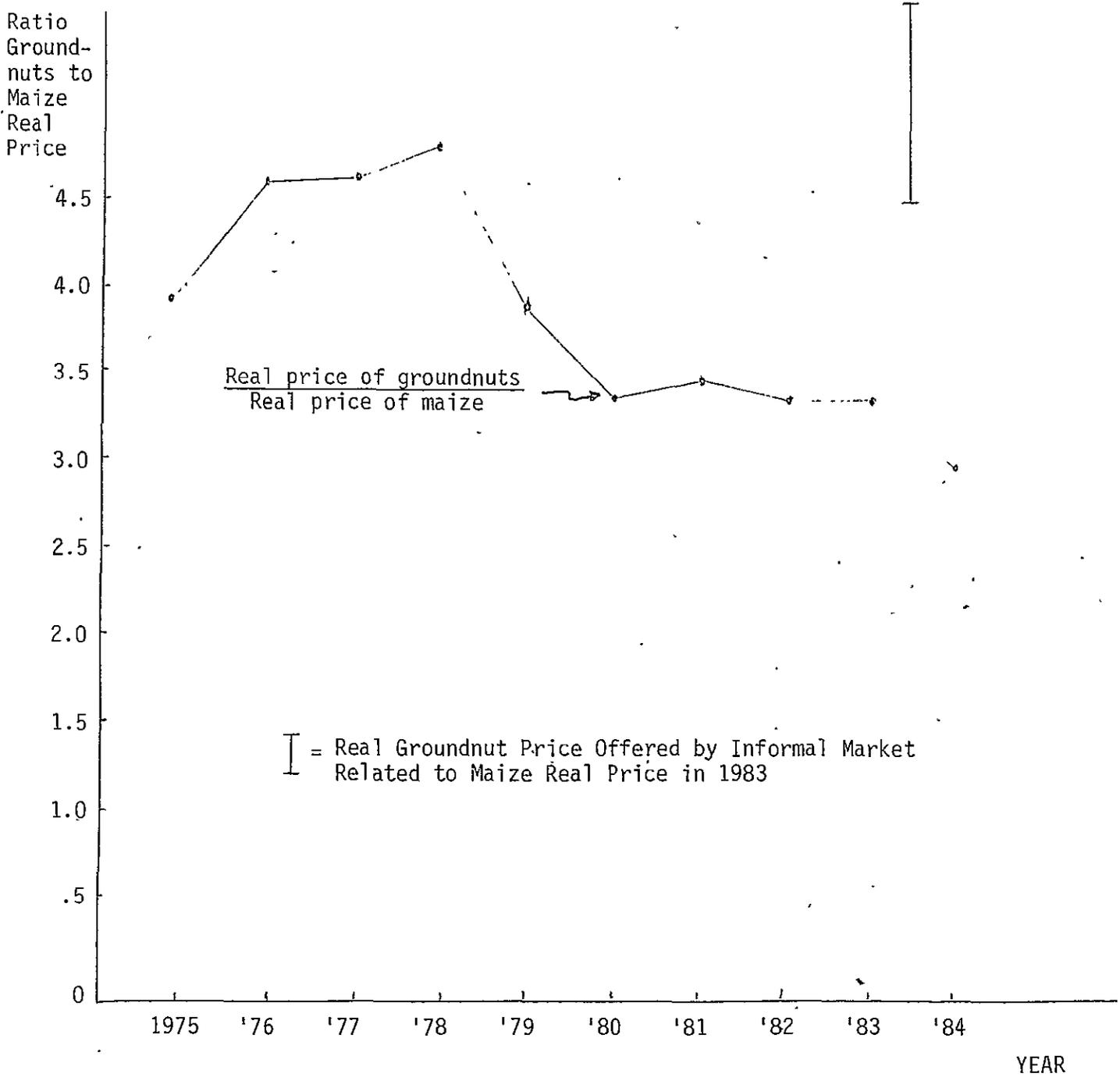
Figure 2 graphically illustrates the price relationships given in Table 18. In addition it shows the contrast in real prices being offered for groundnuts on the informal market as against the official market. This shows in part the reason why many groundnut producers have shifted to marketing on the informal markets. When the farmer is offered from 65 to 100 Kwacha per bag for his crop he is simply a lot better off than he would be selling to ECU. The informal market price is reflecting the shortfall in groundnuts supply relative to the demand, both rural and urban in Zambia, which has largely resulted from a price policy favoring maize production relative to groundnut production and other traditional food crops. A more thorough documentation of the informal market will be addressed later. At this point it is safe to say that a major factor contributing to the dramatic drop in officially marketed groundnuts is official price policy. The informal market has resulted from the vacuum created by this price policy, reserving for the farmer the option to continue to grow groundnuts profitably and providing to the small scale farmer a viable source of income. At the same time it has supplied urban Zambia with much demanded Chalimbana at prices the urban consumer is willing to pay.

TABLE 18 REAL GROUNDNUT PRICE PER METRIC TON AND REAL MAIZE PRICE 1975-83

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Groundnuts	212.5	263.05	219.61	215.88	220.3	215.62	230.76	240.67	229.17	
Maize	55.6	58.92	49.19	45.65	56.88	64.07	64.85	71.32	67.77	
Ratio G/M	3.82	4.46	4.46	4.73	3.87	3.37	3.56	3.37	3.38	3.2

Source: Agricultural Statistics, Planning Division MAWD 1983

FIGURE 2 RELATIVE PRICE RELATIONSHIP GROUNDNUTS/MAIZE - REAL PRICES



PROFITABILITY

The financial profitability of alternative crop enterprises is influenced by the price received and the cost structure of the enterprise. The following factors influence the cost structure and the relative profitability:

1. total labor requirement
2. peak labor requirement
3. quantity of purchased requisites
4. special expertise needed
5. financial risks involved
6. markets available

How these factors will influence the relative attractiveness of one crop over another will differ by farm type, since different constraints operate on each group. For this analysis two farm types will be used comparing the relative attractiveness of three crops, groundnuts, sunflower and maize. The two farm types, which are typical of the groundnut producers in Eastern Province are:

1. Subsistence plus farmers
2. Small Scale Commercial Farmers

The purpose of the analysis is to measure the relative profitability by comparing what price it would take to give the same return over costs as maize, given the price of maize in 1984.

1. THE SUBSISTANCE PLUS FARMER has little or no access to capital including credit, and purchased inputs. Seed is saved from year to year. Production is confined to the extension of food production, with local maize and groundnuts being major crops. Some will include sunflowers production.

Typically the level of technical knowledge is low. Financial risks are relatively low because unmarketed produce will be eaten or sold locally. As illustrated by the data from the E. Province Groundnut Study Survey, the overriding constraint is labour on total production. Following are assumptions used in analyzing this farmer type profitability response, (Table 19)

Table 19 - FOR THE SUBSISTANCE PLUS FARMER

CALCULATION OF PARITY PRICE OF GROUNDNUTS AND SUNFLOWER TO MAIZE PRICE

1. <u>Assumption:</u>	<u>Local Maize</u>	<u>Groundnuts</u>	<u>Sunflowers</u>
Production costs	K6 /Ha.	K 90 /Ha.	K21 /Ha.
Man-hours*	735	1610	665
Yields (bags)	10 (90 Kg.)	7 (80 Kg.)	12 (50 Kg.)

2. <u>Gross Returns:</u>	<u>Kwacha</u>
Maize price per bag	24.50
Total returns per hectare	245.00
Net Returns	239.00
Returns per man-hour	.3187

3. Formula for determining parity price for groundnuts and sunflowers:

$$\left[\begin{array}{l} \text{Price of g'nuts or} \\ \text{sunflowers to give} \\ \text{same return to} \\ \text{labor} \end{array} \right] = \frac{\left[\begin{array}{l} \text{manhours of g'nuts} \\ \text{or sunflower per} \\ \text{Ha.} \end{array} \right] \times \left[\begin{array}{l} \text{return per man-hour} \\ \text{for maize} \end{array} \right] + \left[\begin{array}{l} \text{Cost of} \\ \text{g'nuts} \\ \text{or Sun-} \\ \text{flowers} \\ \text{/Ha.} \end{array} \right]}{\text{yield per Ha. for groundnuts or sunflowers}}$$

* Labor requirements from " Resource Guide - Data in Agriculture " by Josef Jonsson, Farm Management Officer, Department of Agriculture, Kabwe, Zambia 1977.

TABLE 20 PARITY PRICE AND RELATIVE PROFITABILITY OF MAIZE, GROUNDNUTS AND SUNFLOWERS FOR THE SUBSISTANCE-PLUS FARMER

	<u>Parity Price</u> (Kwacha)	<u>Official Price</u> (Kwacha)	<u>Rel. Profitability</u> (Kwacha)
Maize Price	24.50	24.50	-
Groundnut Price	86.16	71.50	- 14.66
Sunflower	19.41	21.50	+ 2.08

For the Subsistence Plus farmer with little or no financial cost except the seed cost, and with labour the over-riding constraint, it would take (Table 20) K 86.16 to bring the groundnut production up to a level of profitability on par with maize at the official price of K24.90. At the official price of groundnuts of K71, every bag raised for the official market will lose K22.27.

Sunflowers show only a relatively slight advantage with a gain per bag of K2.08 for every bag raised and sold on the official market.

The assumptions on how much labor is needed to produce groundnuts as opposed to maize is critical here to the analysis. If we use the relationship suggested by the Survey of groundnut growers, accepting their perceived 3:1 relationship i.e. 2100 manhours for groundnuts and 700 manhours for maize, the profitability gap of official prices is widened even further as given in Table 21.

TABLE 21 PARITY PRICE RELATIONSHIP MAIZE TO GROUNDNUTS WITH 3:1 LABOUR RATIO

	<u>Parity Price</u>	<u>Official Price</u>	<u>Rel. Profitability</u>
Maize Price	K 24.50	K 24.50	-
Groundnut Price	K115.29	K 71.50	K - 43.79

Looking at this from the historical perspective and using the official prices for maize and groundnuts, we can see that in fact profitability does influence the trends in officially marketed production. From a peak profitability in 1978, groundnut profitability has deteriorated dramatically relative to maize, (Table 22).

TABLE 22 HISTORICAL TRENDS IN GROUNDNUT PROFITABILITY RELATIVE TO MAIZE

	<u>Maize Price</u>	<u>G'nut Parity</u>	<u>Official G'nut Price</u>	<u>Profitability Dif./Bg</u>
1976	K 6.30	K 23.75	K 25.00	+ 1.25
1977	K 6.30	K 23.75	K 25.00	+ 1.25
1978	K 6.80	K 26.82	K 28.60	+ 1.78
1979	K 9.30	K 35.15	K 32.00	- 3.15
1980	K11.70	K 43.15	K 35.00	- 8.15
1981	K13.50	K 50.55	K 42.70	- 7.85
1982	K16.00	K 58.58	K 48.00	-10.59
1983	K18.00	K 68.11	K 55.00	-13.11
1984	K24.50	K 86.16	K 71.50	-14.66

2. SMALL SCALE COMMERCIAL FARMER (EMERGENT FARMER)

These farmers have limited access to capital and credit. They will use some purchased inputs, depending on availability of those inputs and their perception of the value in production of using those inputs relative to the cost.

However, inputs are often readily available, the levels of technical /not knowledge for using those inputs properly may be lacking resulting in relatively poor yields and markets may often be somewhat unreliable. This increases the financial risk these farmers face. Labour continues to be a major limiting factor, since there is not enough capital for total mechanization and unlimited labour hire.

As far as groundnuts are concerned, the farmer will still use "unimproved" seed, but because of fertilizer in the rotation (the residual of which has to be charged to groundnuts) his yields will be improved over the "Subsistence Plus" farmer. The only "improved seed" purchased will be the hybrid maize. Oxen draft power will be used since a large number of E. Province groundnut growers are using draft power. The following assumptions are the calculations to analyze this farmer type of profitability response to the current relative price situation.

TABLE 23 CALCULATION OF PARITY PRICE OF GROUNDNUTS AND SUNFLOWER TO MAIZE PRICE FOR THE SMALL SCALE COMMERCIAL FARMER

<u>1. Assumptions:</u>	<u>Hybrid Maize</u>	<u>Groundnuts</u>	<u>Sunflower</u>
Production costs	K 480	K 215	K 101
Manhours	602	1463	518
Yield Level (80Kg. Bags)	30	8	10

<u>2. Gross Returns</u>	<u>Kwacha</u>
Maize price per bag	24.50
Total returns per Ha.	735
Net returns per Ha.	255
Returns per manhour	.4236

Table 23 con'td

3. Parity Price and Relative Profitability Per Bag

	<u>Parity Price</u>	<u>Official Price</u>	<u>Rel. Profitability</u>
Maize	K 24.50	K 24.50	-
Groundnut	K104.34	K 71.50	K -32.84
Sunflower	K 32.04	K 21.50	K -10.54

*1984 Official Prices

With this group of small scale farmers the relative profitability of maize production, using a moderate level of technology far outweighs the profitability of groundnuts or sunflowers as illustrated in Table 23. If groundnuts were costless to produce, it would take a parity price of K 77.47 per bag or a yield of 8.58 bags per hectare to equal the relative profitability of maize. If groundnut yields were increased to 11.8 bags per hectare the relative profitability per hectare of maize would still be equal given the price/cost relationship assumed. Maize yields would have to drop to 25 bags per hectare, before it would pay to grow groundnuts at a price of $\frac{K71.50}{\underline{\quad}}$ (or alternatively a price of K20.84 with maize yields held at 30 bags).

This analysis would lend to the conclusion that small scale commercial farmers would be even more prone to shift out of groundnuts production than the "Subsistance Plus" farmers. Furthermore it would take a substantially higher price from the informal market to induce them to produce groundnuts for other than their own consumption.

FARMER RESPONSE TO CHANGE IN RELATIVE PROFITABILITY

Given the deterioration in the relative profitability of growing groundnuts, vis a vis the official prices offered for groundnuts, maize and sunflowers, one would ask, "what then has happened to groundnut production?" Has it actually declined in line with relative profitability or has it shifted entirely over to the informal market?

One of the main purposes of the E. Province Groundnut Survey was to determine, if possible, just what has happened to groundnut production. The 76 farmers interviewed were each asked what their largest hectareage ever planted was as against their current hectareage in groundnuts. The current hectareage reported was that planted for the 82/83 crop (still in the ground in March/April).

In addition, a number of questions were asked about farmer use of informal markets. The details of the responses to informal market related question will be covered in the next section.

The survey results (Table 24) indicate a 39.7 percent net change in the number of hectares grown and 35.2 percent net change in the average hectares in groundnut production. There was also a relatively small net change in the number of farmers who produce groundnuts, perhaps revealing the relative importance of groundnuts for home consumption.

TABLE 24 NET CHANGE IN GROUNDNUT PRODUCTION, 76 E. PROVINCE FARMERS

	<u>Most</u>	<u>Row</u>	<u>% Change</u>
Hectares	53.75	32.6	39.3
Ave. Size (Ha)	.9	.58	35.3
Number Growing	59	56	5.08%

Looking at the oxen owners, who were typically the larger scale producers (ave. hectares 5.08) among the 76 farmers surveyed in E. Province, 20 of 24 used to grow groundnuts but only 15 still grow them (Table 25). The 15 who still grow groundnuts average .527 hectares of groundnuts whereas the 20 previously averaged 1.06 hectares. The total hectareage in groundnuts cultivated by oxen owners has fallen from 21.2 hectares to a current level of 7.9 hectares, a decline of 62.7% compared to an overall percentage for all groundnut growers of 39.3 percent. It appears that the oxen owners are much more susceptible to the relative profitability of maize than the other cultivators.

TABLE 25 NET CHANGE IN GROUNDNUT HECTARAGE AMONG OXEN OWNERS

	<u>Most</u>	<u>Now</u>	<u>% Change</u>
Hectares	21.2	7.9	62.7
Ave. Size (Ha.)	1.06	.527	50.3
Number Growing	20	15	25.0

While these magnitudes reflect the perception of groundnut producers and are not measured hectares, it seems reasonable to conclude that there has been a substantial drop in the number of hectares under cultivation fairly largely creating a shortage of supply relative to demand for groundnuts in Zambia. One could believe that were it not for the informal market, groundnuts production for market would have disappeared almost entirely, due to the unprofitable nature of the enterprise relative to the profitability of maize and sunflowers.

Most likely the risk averse nature of groundnut growers has also been a deterrant to a total shift away from groundnut cultivation for market.

INFLUENCE OF THE INFORMAL MARKET

To get some kind of an estimate of the influence of the informal market, it is useful to roughly estimate the volume flowing through that channel. The most recent peak in marketed production came in 1976 with a marketed production recorded at 118,000 80Kg. bags from E. Province. If we assume that all marketed production reflected the same drop of 39 percent since 1976 as the decrease in hectarage of the 76 small farm units of the survey, there would be a marketable production of 72,000 bags in 1982/83. With an officially marketed production of slightly less than 10,000 bags this would give an estimate of over 60,000 bags moving through informal market channels.

However, there is indication that the same production base existed in 1976 which existed in the peak production year of 1969. (This was before uniform pricing of maize was instituted when maize prices became extremely attractive to E. Province farmers). In 1967 there were 187,000 80Kg. bags marketed nationally of which approximately 70% were marketed from Eastern Province i.e. 131,000 bags. A 39 percent reduction would leave approximately 80,000 bags available for market in 1982, with approximately 70,000 bags flowing through informal channels. If on the other hand we use the following assumption discounted from the production information provided by the survey we come up with even higher figures. The assumptions are:

1. 147,000 farming households in Eastern Province
2. 50 percent are groundnut growers
3. .5 hectares groundnuts per household

4. Yields 7 80Kg. bags per hectare
5. 2-80Kg. bags retained per household for seed and food.

From these assumptions the following estimates are made:

1. 147,000 farming households
2. 73,500 groundnut growers
3. 257,250 80Kg. bags produced
4. 147,000 bags retained for seed and own consumption
5. Marketable groundnuts 110,250 80Kg. bags
6. Volume on informal market 100,000 80Kg. bags.

Other findings of the survey verify that the informal market is very active. Furthermore, it is common knowledge that the Chalimbana groundnuts, distinguished by the size of pod are a common scene on our urban markets and since the official market does not adequately supply the marketeers, the groundnuts must be supplied by informal channels.

From the survey, farmer response to questions about the use of informal markets revealed that in ten of twelve villages visited in Chadiza, N. Chipata, Katete and Lundazi Districts at least one individual (and often several) admitted that he traded sometimes on the informal markets, though only six farmers of 56 groundnut growers would admit that they had traded with private traders in the 1982/83 season. (See Table 26)

TABLE 26 MARKET CHANNELS REGISTERED USED IN 1982/83

	<u>Number Using</u>	<u>Number Using Sometimes</u>
1. ECU	27	-
2. Private Traders	6	16
3. Other Villagers	4	-
4. Didn't sell	9	-
5. No response	10	-

The survey indicated that apart from the official market there are other main ways through which groundnuts are channelled as described below:

i) 'Resident traders' live in the area of production, own a scotch cart oxen driven. At time of harvest purchase the nuts from the growers, at prices indicated below:

- (a) Unshelled - K25/bag
- (b) Shelled - K15/tin (6 tins fill 80Kg bag)
- (c) Shelled - K80 - K90/80Kg bag

These traders transport the nuts by means of scotchcart to the main road, to sell to other traders from the urban areas, mainly Lusaka and Copperbelt based. For their role, these agents add a margin of about K5 per bag for transporting the produce to the main road, giving rise to the following prices.

- (a) Unshelled - K30/bag
- (b) Shelled - K85 - K95/80 Kg bag

The Lusaka and Copperbelt traders in turn add certain margins for their transportation costs, resulting in the following estimated prices:

- (a) Unshelled - K35 - K45/80Kg bags
- (b) Shelled - K140 - K180/80Kg bags

The selling is mainly to marketeers who in turn sell to the final consumer in small quantities of 75 grammes at 20n each, and on this basis, groundnuts cost about K2.70 per Kg.

ii) The second channel involves agents. The urban based trader makes initial contact with the grower before the crop is harvested. On most occasions the trader provides bags enough for anticipated production to the producer. In certain cases a deposit is made to the producer. The trader then comes upon harvesting time for collection and payment, prices in this trade are usually as follows:

- (a) Unshelled - K25/80Kg bag
- (b) Shelled - K15/tin (6 tins fill a bag of 80Kg)
- (c) Shelled - K80 - K90/80Kg bag

These traders like the 'resident traders' are not interested in weighing the amount they buy. The farmers find this to be an advantage especially when they have had a lot of pops. Further the transaction involving no weighing is much preferred by Chalimbana growers, who claim to get a better deal since big nuts fill up a bag easier resulting in less weight.

These traders then transport the nuts to the urban areas in Lusaka and the Copperbelt. They sell most of the nuts to marketeers while a small proportion is sold to certain companies involved in groundnut processing.

As in any other business, the steps involved mean margins added, thus resulting in the nuts costing about K2.50 - K4.00 per Kg to the consumer.

iii) The third informal channel is that involving the farmer, he harvests his produce, transports to the main road, then by bus or truck takes his produce to the urban areas, there the nuts are sold to marketeers K36.00 per unshelled, or with a 1:4 ratio K144.00 shelled 80Kg bag.

iv) The fourth manner involves the official marketing organization ECU. Speciality foods of Kitwe is involved in Chalimbana processing with two final products called Chalimbana peanuts, and Chalimbana peanut butter. The company indicated that their main source of groundnuts are:

- a) ECU
- b) Sinda Store

That the company gets 100 tonnes/year from ECU and 150 tonnes per year from Sinda Stores. That both sources have their nuts graded. The question therefore is on how Sinda Stores obtain graded groundnuts. Sinda Stores sell nuts at K1.50/Kg of shelled nuts or K120 per 80Kg bag of shelled nuts indicating quite a high margin.

v) It was observed that the chances of illegal trade with neighbouring country are high. The reasons forwarded were that farmers in some of the affected areas tend to sell their produce across the border for a foreign currency which enables them buy the essential commodities which are not readily available on the Zambia side.

With the above visible channels through which groundnuts in particular Chalimbana are marketed, one therefore, gets to support the earlier notion that about 200,000 bags of groundnuts go through the informal sector.

Out of these findings, distance is not really a factor playing a part in determining the selling of groundnuts, because an average of 1.5Km is the distance to the nearest ECU depot. Other factors thus exist namely; that private traders provide certain facilities that are not offered by the official marketing institution. These are:

- a) Private traders trade through essential commodities which are rarely available in the production, thus driving the farmers to trade.
- b) Private traders relatively offer a good price,
official price - K48.00 + K4.00 = K52.00
private traders' price - K80 - K90
- c) Private traders purchase directly without weighing as is the case with ECU buyers. This is considered a good deal to the farmer since he stands to win should there be a lot of crops.
- d) Private traders, buy at the door step making it very easy for farmers to sell.
- e) Most private traders provide empty bags, farmers thus avoid going to ECU to queue up for empty bags. Especially in cases where the bags are provided free, farmers avoid the cost of obtaining an empty bag by trading directly with private traders.
- f) Private traders buy in other units other than the 80Kg bag required by ECU. This makes it easy for farmers who cannot generate surplus of up to 80Kg to sell.

The above market conditions are conducive conditions for farmers to trade through the informal sector. Furthermore, a lot of small traders in the market chain receive incomes from providing marketing services to move groundnuts from the farmer to the urban consumer. The services are provided more cheaply than what ECU provides them and at the same time the farmer gets a price which is sufficient to encourage him to keep producing groundnuts.

There is however, the fact that operating illegally tends to be a disincentive to increasing production. This is an unfortunate fall-out of ECU having monopoly rights to buy and sell groundnuts.

The impact of prices paid by the informal market would be greater if producers and marketeers could operate openly.

EASTERN COOPERATIVE UNION MARKETING POWER AND PRACTICES

Coupled with price policy constraints to groundnut production is the monopoly buying and selling power enjoyed by ECU and its predecessor EPCMA. In 1966 groundnuts were decontrolled everywhere except in the Eastern Province. Then in 1970 the National Agricultural Marketing Board Act gave NAMBOARD and its agents (the cooperatives) exclusive rights to purchase various agricultural commodities including groundnuts. Again in 1973/the National Agricultural Marketing Act, Statutory Instrument No. 62, groundnuts were only a controlled product in Eastern Province. In the other provinces the Cooperatives are residual buyers in a market where any agency can purchase groundnuts from any other agency.

However, since Eastern Province produces nearly 90% of the groundnuts grown for market, ECU effectively has market control of officially marketed groundnuts and would-be buyers must purchase through them.

Eastern Province has had this privileged market power to protect and encourage the production of groundnuts for the export market which historically was very important to Zambia. This policy was reinforced by the regulation which excluded all groundnut varieties from production in Eastern Province except Chalimbana, the confectionery nut, which is exported (This regulation has been lifted since 1975).

A look at the marketed production statistics is testimony to the fact that this policy has not worked. Zambia's officially marketed production cannot satisfy domestic demand, let alone sell groundnuts for export. There is a tendency to blame the "black marketeers" for ECU's troubles, when in fact the problem lies with ECU and the policy which has protected the cooperative.

The problem needs to be looked at both from the standpoint of the union's relationship to the farmer from whom it buys groundnuts on the one hand and from the viewpoint of the processors and other agencies who must deal through ECU to obtain groundnuts.

For the farmers who sell groundnuts to ECU there is a very large margin between the price the farmer gets (K55 FA0) for a shelled bag and the price at which ECU resells the product. If sold wholesale, the ungraded nuts sell for as high as 81.80 for a marketing margin of K29.80 per 80Kg bag. Retail the ungraded nuts sell up to 1.05 per Kg. or K84 per 80Kg bag with a margin K32 per bag. The graded nuts range from a price of K56.80 per 50Kg bag (K90.98 per 80Kg bag) for the "trade" grades of nuts down to residue and splits, the by-product of shelling and grading which sell K54.80 per Kg bag. These latter which are residue are sold for the same price as the farmer received for his nuts. In conversation with farmers involved in the survey it became apparent that the farmer somehow realizes that he is receiving too low a price for the worth of what he sells ECU and that ECU is charging as much or more for the groundnuts as what he could get trading with local traders. In years when two-thirds to four-fifths of the groundnuts are ^{exported,} the margin of the traded nuts may be even much higher e.g. K1.15+ per kilo or K92 per bag. These large margins are possible because ECU is in a privileged position as only legal buyer and the government set legal price is K52 (1982).

There have also been a number of marketing practice which have created misunderstanding with the farmers and given them the impression that ECU traders in the depots are cheating. One is the controversial ratio of 5 bags unshelled to equal one bag shelled used as a standard by ECU to determine the "official" unshelled price. Farmers who have shelled many groundnuts by hand realize that the ratio should in fact be four to one in terms of the relative price relationship.

The farmer feels he shouldn't be penalized in this way. The farmers interviewed in some cases preferred to go to the extra work of shelling and pre-grading rather than sell to ECU in the shell even though the economics of such a decision do not seem rational.

A common complaint of the farmers was that they had to wait for their money and were paid by checks difficult to cash. In 1982 ECU instituted cash sales for groundnuts to try to resolve this problem. However, a number of interviewees had not yet been informed of the changes.

It was discovered that farmers are also suspicious of the weighing procedures used with groundnuts. They much prefer to have the groundnuts measured by volume.

It must be said at this point on ECU's behalf that they have made a recent concerted effort to improve marketing practices and farmer relations. The problem is that many farmers are still skeptical or have not heard the message. It is also very difficult for ECU to provide the same level of services offered by the informal market as outlined in the previous section.

The major deterrant to the farmer is the price difference between what he can get from informal market sources and what ECU offers. If official prices on the other hand were to approximate the prices being offered by urban consumers through informal channels, it is questioned whether ECU could afford the price without additional subsidies as will be illustrated later. As long as the great difference in price to the farmer from formal versus informal sources exists the farmer will continue to limit sales to ECU. Processors on the other hand, while they depend heavily on ECU for a supply of groundnuts, characterize ECU as an unreliable source.

According to them, ECU is given to renegeing deals at the last minute. They offered evidence to show that ECU sometimes deals through a "Sinda Connection" who marks the price up from what the processors had agreed to pay ECU. Since they need the graded nuts, they buy them from the Sinda dealer when they cannot get them from ECU.

VI. CONSUMPTION AND DEMAND FOR GROUNDNUTS

The consumption and demand for groundnuts, both current and prospective, needs to be analyzed from both the view of confectionery or eating groundnuts and from groundnuts as oilseeds. In either case it is nearly impossible to arrive at true demand figures i.e. true price and quantity relationships because of limited accurate data on total marketed production, price relationships, the volume moving through informal channels (for which there is no official data available) and the amount groundnut producers retain for their own consumption.

A. CONFECTIONARY GROUNDNUTS

Confectionery groundnuts and local varieties make up the bulk of production and consumption. While Eastern Province produces and markets 75-90% of all officially marketed groundnuts and these are nearly all of the confectionery type, every province has some groundnut production, largely local varieties for home consumption.

Domestic consumption has taken an increasing share of groundnut production. In 1971 80% of all groundnuts marketed by Eastern Province Union (4171 metric tons) went to export markets, but by 1976 only 17.8 percent of ECU's marketed production went to exports (1289 mtr), Zambia's peak year of marketed production of recent history, with 9467 metric tons. Most recently there have been almost no exports of groundnuts.

Most of the marketed nuts move through informal market channels and are consumed by urban consumers. This also has been an increasing trend which makes it very difficult to know what total consumption of groundnuts really is.

Official production figures place the 1983 forecast at approximately 9200 metric tons including locally retained production for home consumption. This would indicate a very marked reduction in Zambia's total consumption of groundnuts, since in 1967 officially marketed production alone was over 14,960 metric tons.

There is reason to believe the consumption figures are much higher than this. For example following is an estimate of Eastern Province production contribution to domestic consumption, assuming that all that is produced is consumed the same year:

1. Sold through official markets	10,000 80Kg bags
2. Sold through informal market	80,000-100,000 80Kg bags
3. Retained (based on 73500 producers retaining 2 bags per household)	146,000 80Kg bags
4. Total Domestic Consumption Contribution by E. Province	236,000 - 250,000 80Kg bags

These estimates probably are conservative. The survey indicated that 75% of the surveyed farmers produced groundnuts and that the average production was 5 bags per household. With 147,000 farm units in Eastern Province this would raise Eastern Province contribution of total production/consumption to 551,250 bags or 44,100 metric tons. This implies a much larger flow of groundnuts to urban areas through informal channels; perhaps over 300,000 bags (26,480 mt.).

Since all the other provinces produce groundnuts, but mainly for local consumption, the upper bound of current national production and consumption could be at 750,000 of groundnuts (60,000 - 80,000 metric tons) with the lower bound estimated at 350,000 metric tons.

While the national population has been increasing at a rate in excess of 3 percent groundnut production has diminished by 20 to 30 percent. This has resulted in a short-fall of groundnuts for domestic consumption. It is not therefore astonishing that the informal market is operating in a range of prices to attract producers to grow some groundnuts, since the official prices are not attractive. The relatively high price paid by the informal market simply indicates a commodity in short supply relative to demand.

The shortage of eating type groundnuts has caused difficulty for processors who need a reliable supply.

Interviews with processors in Ndola, Kitwe and Luanshya indicate that there is a serious shortage of groundnuts for use in making peanut butter, processed nuts and cooking oil. Specialty Foods, a long-time customer of ECU has problems with obtaining sufficient supplies and the reliability of ECU as a source of supply was pointed to as a serious problem. Their projected immediate needs were for 400MT annually made up of 100MT of lower grade Chalimbana and 300MT for processed nuts.

Lyons Brook Bond reported that they have been trying to break into the market because of strong demand both in Zambia and in Europe but have been unable to because of the short supply of groundnuts which is totally controlled by ECU. Lyons Brook Bond have a current need for high grade peanut meal in their cereal production. They would also very much like to enter the confectionery nut processing business.

Both Lyons Brook Bond and Specialty Foods shared enthusiasm for the possibility of exporting the processed nuts to Europe where, by their estimates, the demand for Zambia's Chalimbana nut would be great. The processing of the nuts would increase employment of Zambians, add value to the product exported and increase the foreign exchange earned. Such a venture would however require a reliable supply of groundnuts in sufficient quantities. The ECU cannot or will not guarantee these supplies to the processors, sometimes backing out of previously made commitments at the last minute.

Since both companies are largely interested in confectionery nuts as opposed to the oil extracting nuts, they look largely to Eastern Province as a source of supply. Management at both places would willingly contract with local farmers to produce Chalimbana nuts for them at prices which are competitive with current prices on the informal market. They indicated that, if it were legal, they could compete with the current private trade and still obtain their groundnuts cheaper than the price from ECU (of 1.35/Kg).

The conclusion is that there is a demand for the edible groundnuts greater than the supply, just to satisfy domestic consumption. This shortfall, brought on by the relatively higher profitability of producing maize than of producing groundnuts under current uniform pricing policy, would be even greater were it not for the service rendered by the informal market to pay high enough prices to E. Province farmers to keep a supply coming for the urban consumer.

As will be demonstrated later, prices being offered on the world market for exported Chalimbana cannot compete with what the urban consumer is willing to pay for groundnuts in the current state of short supply. Increased production will first of all have to satisfy this shortfall. Increased production is dependent upon price policies which allow the producer to receive what the urban consumer is offering.

OIL SEED GROUNDNUTS DEMAND

It has been projected that 1984 demand for vegetable oil in Eastern Province will 3675/metric tonnes, (at 5kgs per annum per person) 3540 mt. coming from demand in urban areas while 135 metric tonnes comes from demand in rural areas.* At the national level vegetable oil demand has been estimated by the same source at approximately 33,275 metric tons by 1984. While again actual demand elasticities are difficult to determine there is no doubt that Zambia's thirst for vegetable oil is enormous. Where there is a shortage of oil as is often the case in Eastern Province consumer's willingness to pay may far exceed what the going officially controlled price may be.

ECU officials consulted by the team are confident that local demand for vegetable production will entirely use up all the vegetable oil which can be produced by their new processing plant in Katete.

A look at the total oil seed marketed in Eastern Province for 1982 and 1983 (Table 27) shows that already in 1983 Eastern Province production has outstripped the local demand of 3675 metric tons with an oil potential production of nearly 5000 metric tons, mostly coming from sunflowers. If Eastern Province were to develop the oilseed groundnuts/ production of seed would have to reach as the sole source of oil, somewhere between 8,000 and 9,600 metric tons of seed, about ten times current marketed production.

*Study of the Oilseed Industry in Zambia by N. MacFarlane, Consultant, National Oilseeds Development Programme, Zambia. FAO Rome, 1983.

TABLE 27 VEGETABLE OIL POTENTIAL FROM OILSEED CROPS IN E. PROVINCE

	<u>Extraction</u> (%)	<u>1982</u> (MT)	<u>1983</u> (MT)
Sunflower	30	3192	4150
Cotton seed	15	223	394
Groundnuts	40	296	379
<hr/>			
TOTAL	-	3711	4923
<hr/>			

VII ECONOMIC ANALYSIS OF ALTERNATIVE CROPS FOR EASTERN PROVINCE

This section will evaluate which crops should be emphasized in Eastern Province from an economic point of view. The objective is to select those crops for production which will provide the most efficient use of Eastern Province's resources. The following crops will be evaluated:

1. Chalimbana groundnut for domestic consumption
2. Chalimbana groundnut for export
3. Makulu Red groundnut for local oil extraction and oil-seed cake production
4. Sunflower for oil extraction and oil-seed cake production
5. Maize production for domestic consumption

The alternatives will be ranked by their level of net benefit per hectare. A border price approach is used to value all products derived from a particular crop. From these product values are deducted all resource costs used to produce, process, market and transport the product, including the labor resource, valued at an appropriate shadow price. Estimated costs and values for 1984 are the basis for the analysis. The estimates are derived from information provided by Refiners of Oil Products of Zambia Ltd. (R.O.P.), Eastern Cooperative Union (ECU), National Milling and studies by the World Bank, Department of Marketing and Cooperatives, FAO and others.* The relative cost and net benefit relationships are assumed not to change through 1990.

* Footnote: Some caution is needed in interpreting results, since some of the cost and technical coefficients provided by R.O.P. and E.C.U. were given by word-of-mouth and not taken from actual records. E.C.U., for example, has no track record of processing costs for their new Katete oil mill, nor were they very specific about capital outlays for the plant. Costs are therefore synthesized from available information.

To be consistent throughout, a good level of management is assumed for small scale commercial farmers for whom production decisions (as demonstrated earlier) are most likely to shift according to the relative profitability of growing the crops. Technological packages for achieving the assumed yields are already in place, and for Chalimbana and maize, many small scale commercial farmers are already achieving the assumed yields. A large scale effort of seed multiplication and extension will be needed over a protracted period to bring the production of Makulu Red groundnuts and improved sunflower varieties to economic levels of production on a Province wide scale. Following are the crop by crop analyses and a summary comparison of the relative benefits of producing the various crops.

A. CHALIMBANA FOR DOMESTIC CONSUMPTION

At present, Chalimbana is entirely consumed domestically. The economic price which influences the marketing of groundnuts is that of the informal market sector. This price, based on interviews of Eastern Province farmers surveyed, centers around K90 per 80-Kg. bag of shelled groundnuts (actually sold unshelled but converted to shelled equivalents) at the farm gate for the 1982/1983 crop. Traders offering this price have already netted out their transportation and distribution costs. With yields at 10 bags per hectare, this provides a 1983 farm gate value of K900. It is anticipated that the value will be increased to K950 for 1984. As seen in Table 28, crop costs of production must be subtracted to give a remaining net benefit of K406 per hectare. This value per hectare will be compared with the net benefit from other crops being analyzed.

Annex 1

At this point, a few comments about costs of production are in order. It is assumed that producers of Chalimbana will save back their own seed, since agronomists and breeders say it is possible to achieve up to one tonne of yield with good management. Seed is priced at its opportunity cost of selling on the

informal market. Fertilizer is priced at 1.5 times the official price to recognize the subsidy element. As with the rest of the crops, Chalimbana will be grown by farmers using oxen powered equipment. Planting of groundnuts will be done by hand. The labor requirements assume that shelling will be done by the traders or by the consumer.

Table 28 - Net Benefit per Hectare of Chalimbana for Domestic Consumption

Farm gate value per hectare	K 950
Production costs per hectare (See Annex 1)	544
Net value per hectare	406
Farm gate price offered by informal market for 80 Kg. bag of Chalimbana	95

B. CHALIMBANA FOR EXPORT

Chalimbana for export has two components. Four-fifths of the crop is of export quality. The other one-fifth consists of lower grade nuts and broken, which are the result of the grading and handling process. The weighted average of the two value components is the basis for determining the net benefit per hectare.

Eastern Cooperative Union (ECU) is currently the sole export agent for groundnuts. ECU has a ready market in the U.K. for all the groundnuts they can export. However, since 1981, there have been no significant exports, because of the relatively higher profitability of trading domestically. A problem with with aflatoxin kept one shipment from going abroad.

The historical data of groundnut bids (C.I.F. London) provide a basis for valuing the exportable component. The London bid price averaged £ 570 from 1977 to 1981. ECU has typically received a substantial premium above the going world price, because of the popularity of the Chalimbana nut. It is estimated that by 1984, bids for Chalimbana will have reached £ 620 per metric ton, based on projections by World Bank showing substantial growth in groundnut prices through 1990. An anticipated exchange rate of US\$ 1.494 per pound Sterling and US\$.65 per Kwacha gives a Kwacha equivalent London C.I.F. price of K1462. According to ECU officials, shipping charges to approximately £100 from Chipata to London due to a special arrangement with MANIKA Freight. Insurance amounts to 3.5 percent of the value of the shipment and brokerage fees take an additional 2 percent. The 1984 projected Chipata value per metric tonne is K1153 (Table 30). From this are deducted the economic costs of marketing, processing and transporting from rural depots to the Umozi plant in Chipata. (See Annex 5 for detailed calculations.) These costs, taken from ECU records and projections and prorated on a per bag of through-put basis, amount to K 1100 per metric ton of seed. Assuming 0.8 metric tonnes produced per hectare (10-80 Kg. bags), this gives a farm gate value of K 881 per hectare. When production costs of K 544 per hectare are deducted, a net benefit per hectare of K 337 remains.

The oil extracting component of Chalimbana is valued by comparing the costs of two means of delivering oil to Eastern Province consumers: 1) the current approach of importing crude vegetable oil, refining it at R.O.P. and transporting it to Eastern Province for distribution; 2) locally producing the oil seeds in Eastern Province, extracting the oil and distributing it locally.

Table 29 - Value and Volume of ECU Exports 1977-1981

Year	Exports (mt.)	Price CIF U.K. Port ()*	Price FOB Chipata (K)
1977	988	535	588
1978	372	490	582
1979	465	470	585
1980	526	770	1159
1981	none	585	782
Average bid		570	

Source Eastern Cooperative Union, 1983

*See Annex 6 for exchange rates used in calculations.

Table 30 - Net Benefit of Chalimbana for Export (Exportable Component)

	<u>Kwacha/mt seed</u>
Export parity price FOB Chipata	1153
ECU processing and marketing costs (Annex 5)	53
Farm gate value per metric tonne of seed produced	1100
Farm gate value per hectare	881
Production costs per hectare (Annex 1)	544
Net value per hectare	337

Table 31 shows the calculations for determining the net value per hectare for Chalimbana used oil extraction. The value of imported crude is given by R.O.P. A Lusaka current landed cost of K 700 is projected to reach K 895 by 1984. The costs of refining and packaging the oil are again those given by R.O.P., but adjusted by a conversion factor of .75 to reflect non-economic costs in the stated financial costs. Distribution costs through NIEC Stores adds 2 per cent of wholesale value to the costs. Transportation is charged for the distance from Lusaka to Katete, the location of the new ECU oil plant. Total resource cost of R.O.P. refined oil in Katete, including distribution, is K1479.

By contrast, ECU's cost of producing and distributing a metric ton of oil is estimated to be K 1362. Oil processing costs are estimates based on information provided by ECU and by a recent report by the Department of Marketing and Cooperatives.* These costs per metric ton of oil reflect a Chalimbana oil yield of 40 per cent, 58 per cent oil seed cake yield per metric ton of seed and crop yields per hectare of 10-80 Kg. bags. The cost per metric ton of oil are derived from costs per metric ton of seed found in Annex 4 and Annex 5. Costs of producing seed are found in Annex 1.

* " A Location Study for the Proposed Eastern Co-operative Union Ltd. Oil Mill And Stockfeed Plant ", Department of Marketing and Cooperatives, Research and Planning Unit, MAWD, October, 1982.

The net benefit of ECU oil extraction of Chalimbana groundnut versus R.O.P. oil processing of crude oil is K 117 per metric ton of oil to Eastern Province consumers, translated into a net benefit per hectare of K 37. When the value per hectare of exporting Chalimbana and the value of extracting oil are combined, on a four-fifths/one-fifth basis, the overall net benefit (Table 32) per hectare is K 277.

Table 31 - Net Benefit of Chalimbana for Oil

<u>Cost to Import Crude</u>	<u>Kwacha/mt. Oil</u>
Crude vegetable oil landed price Lusaka	895
Refining Costs (R.O.P.) with conversion factor of .75	250
Packing Costs (R.O.P.)	325
Distribution Costs (2% of wholesale)	28
Transportation costs to Katete	77
Cost of refined oil in Eastern Province	1479
<u>ECU Cost to Produce the Oil</u>	
ECU processing costs (Annex 4)	79
Cost of seed production	1700
ECU marketing costs (Annex 5)	126
Packaging and distribution costs	254
Value of protein cake (K482 landed price, .58mt/mt of seed)	699
Transport savings of protein cake from Lusaka to Chipata	98
ECU cost to produce and distribute oil	1362
<u>Net Benefit for ECU Oil Extraction in Eastern Province</u>	
Net benefit per metric ton of oil	117
Net benefit per hectare	37

Table 32 - Combined Net Benefit of Chalimbana for Export and Oil

Contribution of Chalimbana exports	
0.8 X K377 export net value per hectare	K 270
Contribution of Chalimbana for oil and cake	
0.2 X K 37	7
Weighted average net benefit per hectare	277*
Maximum farm gate price per 80 Kg. bag	82

*Footnote: This net benefit is based on the assumption that Eastern Cooperative Union produced oil is of equal quality as that of R.O.P. refined oil. The quality in fact, is not identical, given the different method of processing.

C. MAKULU RED FOR OIL AND OIL SEED CAKE

This section contrasts the cost of R.O.P. providing oil to Eastern Province consumers with that of ECU using Makulu Red groundnuts as a source of oil. R.O.P. costs are the same K 1479 per metric tonne of oil. Differences in cost per metric tonne for processing, seed cost, marketing cost etc. reflect the difference in oil yield of seed (44 per cent), the oilseed cake yield (54 per cent) and the yield per hectare of Makulu Red (16 - 80 Kg. bags per hectare). The processing costs and marketing costs per metric ton of seed are derived from calculations in Annex 4 and Annex 5. Costs are modified by the value attributed to the oil seed cake produced in the process of extracting a metric tonne of oil. Also, net transportation savings resulting from producing the oil seed cake locally versus importing and shipping to Chipata reduce the overall cost. As demonstrated in Table 33, Makulu Red shows a net benefit to Eastern Province of K221 per hectare.

The relatively high value per hectare indicated must be evaluated in the context that there will be a cost to bringing Makulu Red into significant production given current problems of seed multiplication and distribution. The value of growing Chalimbana among Eastern Province farmers is well established. It is also a preferred food both in Eastern Province and nationally.

Table 33 - Net Benefit Per Hectare of Makulu Red Groundnuts

<u>Cost of Importing Crude</u>	<u>Kwacha/mt. Oil</u>
Cost of R.O.P. refined oil at Katete	1479
<u>ECU Cost to Produce Oil</u>	
ECU processing costs	72
Cost of producing seed	1314
ECU marketing costs	120
Packaging and distribution costs	254
Value of protein cake (National Milling quote of K482 Landed Lusaka and 54% cake in tonne of seed	592
Net transport savings for protein cake	82
ECU total cost to produce oil	1086
<u>Net Benefit</u>	
Net benefit per metric tonne of oil	393
Net benefit per hectare	221
Maximum farm gate price per 80 Kg. bag	60

D. SUNFLOWERS FOR OIL AND OIL SEED CAKE

The growth in sunflower production in Eastern Province has resulted in the Province being self-sufficient in the amount of oil seed needed to satisfy oil consumption requirements. With the arrival of the new oil processing plant in Katete, the Province now has the potential to produce all its oil needs. Currently, sunflowers are being grown partly as a fall-back crop when maize production fails. However, the growth in sunflowers and maize production at the same time and not the one at the expense of the other reflects the relative profitability of the two crops.

Current levels of technology for sunflower production are very low with resulting low per hectare costs of production. This results in low yields per hectare and relatively low quality seed, i.e. low in oil content and high in per cent hull. Such low quality seed increases the overall cost of processing. An official price structure which does not differentiate between low quality and high quality seed, based on oil content, encourages the continuation of the low quality seed production.

The introduction of an improved package of techniques as assumed in the budgets found in Annex 1 requires that the added cost of improved seed, fertilizer, weeding etc. be offset by the increase in value of the output. However, in this case, without the differentiation of price related to seed quality, while the costs increase nearly 3-fold, the value of product doubles, with resulting lower profitability.

Table 34 shows an economic evaluation of the two levels of technology. In both cases, the net benefit of producing sunflowers is positive, but low relative to the other oilseed crops. Lower yields per hectare and lower oil yield per tonne of seed are the major causes. Economic evaluation calls for a differentiated price to reflect the lower quality of seed produced.

Table 34 - Net Benefit Per Hectare of Sunflower for Oil and Oil Cake

<u>Cost to Import Crude</u>	<u>Low</u> <u>Kwacha/mt Oil</u>	<u>High</u> <u>Kwacha/mt Oil</u>
Cost in Katete of R.O.P. refined oil	1479	1479
<u>ECU Cost to Produce Oil</u>		
Processing cost	121	90
Cost of producing seed	1200	1410
Marketing costs	185	136
Packaging and distribution cost	254	254
Value of oil seed cake	556	522
Transport cost savings on oil seed cake	79	73
ECU cost to produce a metric tonne of oil	1125	1295
<u>Net Benefit</u>		
Per metric tonne of oil	354	184
Per hectare	46	64
Maximum price per 50 Kg. bag	K 15.54	K 27.95

E. MAIZE FOR DOMESTIC CONSUMPTION

Maize currently is the dominant crop in Eastern Province, because of its relative profitability per hectare. While Zambia as a whole has been forced to import approximately 2 million 90Kg. bags annually due to drought, Eastern Province's contribution has served as a buffer against even larger shortfalls. At the same time, a policy of uniform pricing throughout Zambia has made maize profitable to farmers in regions which have a comparative advantage in producing other food crops. The border price approach demonstrated in Table 35 provides an economic evaluation of the net benefit realized from Eastern Province producing maize to serve as a substitute for importation of maize.

Most recently, maize has been imported from Lilongwe, Malawi at a Lusaka landed price of K 327 per metric ton. When Namboard handling charges are included, this raises the cost of imported maize to K 357 or K 32.13 per 90 Kg. bag.

The cost of producing maize in Eastern Province is K 703 per hectare or K 195 per metric ton, assuming per hectare yields of 40 - 90 Kg. bags. ECU estimated costs for 1984 for marketing in 1984 add K 26 and Namboard handling costs add another K 30. Transportation per metric ton of maize is K 90 for a total Lusaka landed cost of Eastern Province maize of K.341 per metric tonne. The difference in resource cost between the two alternatives gives a net benefit to Eastern Province of K 16 per metric tonne or K 58 per hectare. At the assumed 40 - 90 Kg. bags per hectare, the economic price to pay the farmer would be K 19 per 90 Kg. bag. It should be noted that the net benefits of maize are very sensitive to changes in yields. For example, assuming 30 bags per hectare with the same set of costs gives a negative net benefit of K -47 while 50 bags would give a net benefit of K 248.

Table 35 - Net Benefit of Maize Production per Hectare

<u>Cost to Import Maize (from Lilongwe)</u>	<u>Kwacha/mt</u>
Maize price landed Lusaka including 750 Km. of transportation @ K .15/Km.	327
Namboard handling charges	30
Total cost of Importing Maize	357
<u>Cost to Produce and Market (ECU)</u>	
Maize cost of production per metric tonne	195
ECU handling costs	26
Namboard handling costs	30
Transportation Chipata to Lusaka	90
Total cost of maize per metric ton	341
<u>Net Benefit</u>	
Per metric tonne	16
Per hectare	58
Maximum price per 90 Kg. bag grown in Eastern Province	19

F. COMPARISON OF ECONOMIC BENEFITS

The above analysis provides a comparison of net benefits to Eastern Province for producing alternative crops. To the extent possible, true economic resource costs are reflected in the costs of production, marketing and distribution of these crops. The analysis is based on a given set of institutions with given cost structures. The net benefits accruing to Eastern Province do not therefore necessarily reflect the levels achievable from more efficient institutions. Neither R.O.P. nor ECU are cost effective. If R.O.P., for example, were more efficient, given ECU's cost structure, the benefit of producing oilseeds and processing oil in Eastern Province would be less. Likewise, a more efficient institution than Eastern Province/^{Cooperative Union}would increase the net benefit of local production and processing. None-the-less, the analysis does provide a basis for ranking the crops according to their comparative advantage for production in Eastern Province.

The ranking of net benefits places Chalimbana groundnut production for domestic consumption at the top, with a net benefit to Eastern Province (Table 36) of K 406 per hectare and an economic farmgate price (provided by the informal market)of K 95 per 80 Kg. bag. The very high demand for Chalimbana relative to supply domestically will continue to give this signal until such time as the supply of Chalimbana has increased to satisfy the shortfall. This ranking underlines the importance Zambians place on Chalimbana as an important element in their diet.

Chalimbana groundnut production ranks second in net benefits received from the production primarily for the export market, with a net benefit of K 277. Combining the first and second place rankings underscores the priority of increasing the production of Chalimbana. To a great extent, major increases in

production can be realized through improved management on existing hectarages. According to agronomists and researchers, retained local Chalimbana seed, with seed treatment and good management practices is capable of one metric tonne per hectare under field conditions. This is an increase of at least 5 bags per hectare more than current common yield levels. The technological package exists. What is lacking is the Extension effort to disseminate the information and assist farmers to improve management. At the same time, Research needs to continue its efforts to achieve yield levels of Chalimbana similar to those being realized by Malawian strains. Improved seed uniformity is also desirable for the shelling with mechanical shellers. Currently, the high cost of improved groundnut seed relative to the potential for increasing yields, is a major deterrant to the purchase of the improved seed stock. Until such time as there are major breakthroughs in the relative yields of improved Chalimbana seed varieties, the improved seed will not find a ready market.

Makulu Red groundnut production for oil expression ranks third, less than Chalimbana production for export, with a net benefit of K 221 per hectare. The net benefit is more than three times that of sunflower production, ranked fourth with a net benefit of K 64 per hectare. Makulu Red's relatively superior showing to sunflowers is due to yield levels per hectare realizable with existing seed stocks (1.28 metric tonnes or more per hectare compared to one tonne) and oil yield of 44% as opposed to 35%. At the same time, these yield levels can be realized without direct application of fertilizer, whereas sunflowers to reach the above yields must receive fertilization similar to levels for maize producing 40 bags per hectare.

There are a number of problems which must be discussed concerning the promotion of Makulu Red or other oil expressing groundnut variety. Firstly, to establish Makulu Red groundnut production will take a large start up effort with

Table 36 - Comparative Net Benefit and Appropriate Economic Prices

<u>RANK</u>	<u>NET BENEFIT/HA.</u>	<u>ECONOMIC PRICE</u>
1. Chalimbana for domestic consumption	K 406	K 95.00
2. Chalimbana for export	277	82.00
3. Makulu Red for oil expression	221	60.00
4. Sunflowers for oil expression	64*	27.95
5. Maize	58	19.00

* A yield of 2.28 metric tonnes per hectare would increase the net benefits to K 230 per hectare. The average yield of all experimental plots in Zambia in 1982/83 was 1.5 metric tonnes. However the cost budget used above was given by researchers at Mt. Makulu as the most realistic, given seed availability and current levels of variety development.

high development costs to develop and disseminate an Extension technological package and to have adequate seed to carry out the extension effort. The static analysis does not take the time lags into account to compare benefit now versus benefit later. Secondly, there is still concern in the minds of some researchers that there will be a diluting of the purity of Chalimbana if Makulu Red is introduced, or that because of the economics of production, a valuable export crop will be lost. One of the most difficult problems facing the introduction of Makulu Red is the taste preference of Eastern Province producers, as previously elaborated. Finally, groundnut production is in direct competition for scarce labor resources during the peak planting and harvesting seasons. It takes at least double the labor requirement to produce a hectare of Makulu Red as it does a hectare of maize, even when we have been assuming that shelling is done by the ECU sheller. Typically, because of the higher financial profitability of maize production, maize gets the labor required at the expense of groundnuts.

The same start-up costs exist in developing an improved production capacity for sunflowers. While there is an established production of sunflowers, seed quality is extremely low and yields reflect the low level of technology employed. Sunflowers do provide a chance to use the labor resources when they are not so much in competition with other crops. This lower opportunity cost of labor has been reflected in the budgets used for the analysis. The lower yield level per hectare of one tonne of seed combined with a 35% oil yield does not compare favorably with Makulu Red at the assumed level of production. However, if yields were raised to from 1.28 to 1.5 tonnes per hectare, maintaining oil content at 35% the level of net benefit would raise to from K 230 to K 343 per hectare, reversing the ranking of the two oilseeds. Such yields are quite possible with sunflower varieties existing in the country as evidenced by the average over all experimental plots of 1500 Kgs. per hectare in 1982/83.

Maize ranks fifth with a net benefit of K 58 per hectare. The low value of maize at the border, relative to costs of production and transportation, place maize at an economic disadvantage to the other crops considered. While the actual border price is approximately K22 per 90 Kg. bag, with the subtraction of marketing charges, the maximum economic price payable to the Eastern Province farmer is K 19 per bag. However, near the border, there may be some movement of maize into Malawi if such a price is paid. The difference between the economic price of maize and the K 24.50 price currently gazetted for 1984, gives some measure of the economic cost to Zambia of the uniform pricing policy. The higher financial price also serves as a disincentive to the production of other food crops as demonstrated in Table 37.

Table 37 - Relative Profitability Per Hectare of Crops Using Economic Prices

	Chalimbana	Makulu Red	Sunflower	Maize 1	Maize 2*
Gross Returns	950	933	559	760	980
Costs of Production	544	740	495	703	480
Net Returns	406	193	64	57	500
Returns to labor	4.42	2.66	1.61	2.16	5.81

* Gazetted 1984 maize price of K 24.50

As pointed out earlier, small scale commercial farmers are very sensitive to the scarcity of labor in their operations, and thus are very sensitive to the returns to labor realizeable with different crop production alternatives. Even with the economic price of K 19 per bag of maize at 40 bag yields per hectare, the small scale commercial farmer might rank maize production nearly on par with the production of Makulu Red. When paid the K 24.50 gazetted price, he would logically choose to further reduce the production of the other crops.

With Zambia facing a major foreign exchange crisis, it is important to evaluate crop production alternatives as to their status as net users or net savers of foreign exchange. Groundnut production is a high level user of domestic resources, especially labor, whereas maize and sunflowers (improved production) are heavily dependent on the use of fertilizer to achieve good yields of good quality seed. At a high shadow price of foreign exchange, these more foreign exchange dependent crops are increasingly disadvantaged.

Chalimbana for domestic consumption neither uses much foreign exchange, nor does it earn any except as it serves as a substitute for foods which are imported, namely oil and energy foods. Chalimbana for export is a net earner of foreign exchange, but not as substantially as might be expected, because of a large foreign exchange component for overseas transportation and handling costs. Relative to the total value of the raw product this foreign exchange component is fairly high. Exporting processed nuts might increase the net foreign exchange savings.

Processing of Makulu Red groundnuts and sunflowers requires substantial foreign exchange both in terms of the capital investment and also the expertise required in the processing industry. The lower quality of sunflower seed for oil extraction increases processing costs. This combined with the dependency on higher rates of fertilizer use in seed production puts sunflowers at a foreign exchange disadvantage to Makulu Red groundnuts. Both commodities are net savers of foreign exchange.

Maize produced by large scale commercial farmers is actually a net spender of foreign exchange. However, the technical package of the small scale commercial farmer is much less dependent on the use of foreign exchange, providing a small savings of forex.

There is not a clear cut economic answer to the question of which oilseed to select as a recommendation to Eastern Province planners, researchers and Extension leadership. Makulu Red has a more advanced and ready-to-use technological package, which can compete well in terms of yields and oil content. Production of Makulu Red should be a substantial net saver of foreign exchange. The chief disadvantage of producing Makulu Red is labor intensive requirements during the peak labor demand period. There is a possibility that farmers will substitute one type of groundnut production for another. It will take a substantial extension effort to convince farmers of the value of growing the nut.

Sunflowers on the other hand, while having had dramatic growth in production, are of low quality and result in high processing costs per metric tonne of oil. The technological package is not as well developed for Zambian conditions, as varieties currently in substantial use are of inferior quality to Makulu Red performance. New hybrid introductions have yet to be proven, though the potential looks extremely good and quite competitive. Sunflowers provide a fall-back crop to maize in times of weather delays. Sunflowers also provide a means of spreading the use of the scarce labor resource, since sunflower critical periods for planting and harvesting do not compete with groundnut and maize production. One of the greatest disadvantages of sunflower production for oil extraction is the relatively high dependence on foreign exchange in production, because of the need for fertilizer for good yields and high oil content.

Economic analysis of the current technological packages and the comparative level of foreign exchange savings would point to the use of Makulu Red as a source of oil and oil seed cake in Eastern Province. This development must not however be at the expense of pushing improvement in the production of Chalimbana for domestic consumption and export.

In either policy option, the decision must be accompanied by changes in the price policy for maize, since the relative profitability of maize will be a disincentive to increasing economical production of oilseeds in Eastern Province.

ANNEX 1 - CROP COSTS CALCULATIONS

A. GROUNDNUTS COSTS PER HECTARE WITH GOOD MANAGEMENT

<u>CHALIMBANA</u>	<u>FINANCIAL</u>	<u>ECONOMIC</u>
Seed* - 90 Kgs. at K1.125/Kg.	K 101.25	K 101.25
Fertilizer - 150 Kgs. "D"-Compound at .48 (1.5)	72.00	108.00
Ox hire - See Annex 2	86.75	86.75
Labor - 139 days at 1.50 per day (no shelling)	--	208.50
Bags and twine - 10 bags at .9	9.00	9.00
Transport of fertilizer and groundnuts	6.50	6.50
Interest on borrowed capital at 13%	<u>23.69</u>	<u>23.69</u>
* Treated seed	K 320	K 544
Totals		
 <u>MAKULU RED</u>		
Seed* - 90 Kgs. at 2.56 (improved seed)	K 230.40	K 230.40
Fertilizer - 150 Kgs. "D"- Compound at .48 (X 1.5)	72.00	108.00
Ox hire - See Annex 2	86.75	86.75
Labor - 166 days at K 1.50 per day	--	249.00
Bags and twine - 16 bags at K 0.90	14.40	14.40
Transport of fertilizer and groundnuts	9.50	9.50
Interest on borrowed capital at 13%	<u>42.42</u>	<u>42.42</u>
Totals	K 455	K 740

*Treated Seed

ANNEX 1 - CROPS COSTS CALCULATIONS

B. SUNFLOWER COSTS PER HECTARE - GOOD MANAGEMENT

	<u>FINANCIAL</u>	<u>ECONOMIC</u>
Seed - 7 Kgs. at K 3.00 per Kg.(Improved composite)	K 21.00	K 21.00
Fertilizer - 200 Kgs. "D"- Compound at .48 /Kg.	96.00	144.00
200 Kgs. Ammonium Nitrate at .46	92.00	138.00
Ox hire - See Annex 2	68.45	68.45
Labor - 74 days at .75	---	55.50
Bags and twine - 20 at .9	18.00	18.00
Transport to and from depot	20.00	20.00
Interest on borrowed capital at 13%	<u>29.51</u>	<u>29.51</u>
Totals	K 363	K 495

C. MAIZE COSTS PER HECTARE - GOOD MANAGEMENT

	<u>FINANCIAL</u>	<u>ECONOMIC</u>
Seed - 20 Kgs. SR-52 at K 1.206 /Kg.	K 24.12	K 24.12
Fertilizer - 200 Kgs. "D"- Compound at K .48 /Kg.	96.00	144.00
200 Kgs. Ammonium Nitrate at K .46 /Kg.	92.00	138.00
Herbicide - 4 litres Primagram at K 10.45	41.80	41.80
Ox hire - 56 hours (See Annex 2)	107.45	107.45
Labor - 86 mandays at K 1.50	---	129.00
Transportation to and from depot	45.00	45.00
Bags and twine 40 at K .9	36.00	36.00
Interest on operating capital	<u>37.69</u>	<u>37.69</u>
Totals	K 480	K 703

ANNEX 2 - COST CALCULATIONS FOR OX-POWER

A. INVESTMENT COST USING THE CAPITAL RECOVERY APPROACH

	<u>INVESTMENT COST</u>	<u>ANNUAL FACTOR</u>	<u>ANNUAL COST</u>	<u>PER HOUR COST</u>
Pair of Oxen	K 1000	.2774	K 277.40	K .93
Plough	90	.2013	18.12	.24
Harrow	130	.2013	26.17	.75
Ridger	100	.2013	20.13	.40
Cultivator	160	.2013	32.21	.64
Scotch cart	640	.2013	128.83	.25

B. OPERATING COSTS PER HOUR

Feed and veterinarian K 150 divided by 300 hours = K .50 per hour

C. COST OF OPERATIONS PER HECTARE

Ploughing	15 hours at 1.67	K 25.05
Harrowing	7 hours at 2.18	15.26
Ridging	10 hours at 1.83	18.30
Cultivating	14 hours at 2.01	28.14
Planting	10 hours at 2.07	20.70

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ANNEX 3 - COST OF PRODUCTION USED FOR THE PROFITABILITY CALCULATION

- A. Subsistence Plus Farmer - used only the opportunity cost of retained seed i.e. what the farmer could have received for the seed had he sold it instead. Since labor was the resource assumed variable among enterprises but within the farm, it was not included directly in the costs but the relative labor requirements become the basis for measuring the returns to labor.
- B. Small Scale Commercial Farmer Cost Budgets - here we tried to typify "what is" with a farmer using relatively good management on maize ("hybrid") production but traditional practices on groundnuts and sunflowers. The increased yield advantage on groundnuts comes from having residual fertilizer in the rotation which the groundnuts can utilize.

1. Maize - Same as annex 1.

2. Groundnuts:

Seed 90 Kgs	-	K 101.25
No fertilizer	-	
Ox hire	-	86.75
Bags and Twine	-	7.00
Transport	-	6.50
Interest	-	<u>14.20</u>
		K 215.00

3. Sunflowers:

Seed 7 Kgs local	-	K 3.00
Ox hire	-	68.45
Bags & Twine	-	9.00
Transport	-	10.00
Interest	-	<u>10.45</u>
		K 101.00

ANNEX 4 - CALCULATING THE CAPITAL COSTS AND OPERATING COSTS OF ECU
OIL PROCESSING PLANT IN KATETE

A. Capital Cost

The costing approach is the "Capital recovery" approach. The idea is to provide an appropriate economic return on the investment at the same time providing a basis for recovery and replacement and a recognition of the time value of money. The annual cost using such an approach is the same payment per annum as if a person had borrowed the whole sum at interest and paid back in equal annual installments. A 12 per cent interest rate is used.

The installation cost/building investment is costed over twenty years at 12%. The machinery is costed over ten years at 12%. Because of lags in the time it has taken to install the mills, the costing probably should have been increased. However, it was felt that the cost benefit outcome would not be altered significantly by using the original figures quoted by ECU. Following are the estimated capital costs for the oil mill:

OIL MILL INVESTMENT COSTS PER ANNUM AND PER TON

<u>Item</u>	<u>Investment*</u> <u>Costs</u>	<u>Annual Cost</u> <u>Factor</u>	<u>Annual</u> <u>Cost</u>	<u>Cost Per</u> <u>Metric Ton</u>
1. Building	K 200,000	.1339	K 26,780	
2. Machinery & Equipment	K 315,000	.1770	K 55,755	
3. Total Annual Cost	-	-	K 82,535	K 5.16

*An existing structure was used so installation costs are used as a "poor data" proxy for building investment.

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Labour, maintenance and power costs were estimated using a previous study entitled "A Location Study for the Proposed ECU Oil Mill...Plant", done by the Department of Marketing and Cooperatives and study done by crane:

Operating and Overhead Costs Per Annum and Per Metric Ton (2/3 Capacity)

	<u>Annual</u> (K)	<u>Per MT</u> (K)
1. Maintenance	103,000	6.44/MT
2. Labor	129,580	8.10/MT
3. Power	64,000	4/MT
4. Mill Overhead Costs (3% of total)	124,533	7.78/MT

Investment, Mill Overhead and Operating Costs

1. Investment	-	5.16
2. Overhead	-	7.78
3. Operating	-	18.54
		31.48/MT Seed

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ANNEX 6 - EXCHANGE RATES USED IN ESTIMATE

	<u>US\$/z</u>	<u>\$/Kwacha</u>
1976	1.702	1.2603
1977	1.906	1.3161
1978	2.035	1.2704
1979	2.1647	1.2720
1980	2.3255	1.2592
1981	1.9739	1.1428
1982	1.7088	1.0675
1984	1.494	.65 .(assumed projections)

Source: B.O.Z.

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ANNEX 5 MARKETING AND PROCESSING COSTS FOR VARIOUS CROPS HANDLED
BY EASTERN COOPERATIVE UNION 1983

1. Number of bags of produce handled by ECU:

Maize	-	1,600,000	83.9%
Groundnuts	-	21,000	1.1%
Sunflowers	-	276,000	14.5%
Other	-	10,000	.5%
			<u>100.0%</u>

2. Overhead Costs (Head Office) allocated 50% to produce handling:

a. total cost - K4,151,100 x .5 = K2,075,550

b. allocation to produce by percent of volume

		<u>Allocated Cost</u>	<u>Per Metric Ton</u>
Maize	-	K 1,741,386	K 12/MT
Groundnuts	-	22,831	K 24/MT
Sunflower	-	300,954	K 22/MT

3. Direct Trading Costs Allocated 100% to produce handled:

a. total direct costs. 3,605,126 - 3064 (ocean freight) = 3,602,000

b. allocation to produce by percent of volume

		<u>Allocated Cost</u>	<u>Per Metric Ton</u>
Maize	-	K 3,022,078	K 21/MT
Groundnuts	-	39,622	K 42/MT
Sunflowers	-	522,290	K 38/MT

4. Adjustment for non-economic costs with factor of .80:

Maize	-	K21 + K12 = K33 x .8 = 26/MT
Groundnuts	-	K42 + K24 = K66 x .8 = 53/MT
Sunflowers	-	K38 + K22 = K60 x .8 = 48/MT

db