AN ECONOMIC APPRAISAL OF THE RUBBER PROCESSING INDUSTRY IN BENDEL, OGUN AND ONDO STATES OF NIGERIA

BY

ADEBIYI ADESIDA
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TO MY LOVING MOTHER

MAMA KUNBI

ABSTRACT

This study attempts to assess the economic performance of the rubber processing industry in Bendel, Ogun and Ondo States of Nigeria. The Nigerian rubber industry which experienced a boom in the early 1950's started to face some serious set-backs during and after the civil war which broke out in 1967. This set-backs were manifested in form of declining productivity and consequent decline in its contribution to foreign exchange earnings. The study which covers the period 74 - 75 assesses the economic performance of some rubber processing firms in the three states mentioned above in order to identify some of the factors responsible for the set-backs in the industry. The data used for the study were collected mainly through the use of questionnaires and personal interviews. Other sources of data include Federal office of statistics and ministries of Agriculture and Natural Resources in all the three states.

Chapter 1 assesses the economic importance of rubber industry in terms of foreign exchange earnings, employment generation and value added to the Nigerian economy. The rubber industry contributed 6.2 percent of the country's total export earnings in 1963. By 1972, it accounted for 4,7 percent of the country's industrial labour force and

Chapter 6 uses non-parametric statistical technique to assess the factors limiting expansion and economic performance of the industry. The major limiting factors are lack of capital and inadequacy of raw materials. Labour is not a limiting factor although the industry is short of skilled and managerial personnel.

A financial analysis for the industry and the estimation of a profit function for rubber processing industry were the major highlights of chapter seven. The financial analysis shows some weak points in financial management positions of some firms while the profit function shows that volume of sales, and selling expenses are the two major factors affecting profits in the processing industry.

Some policy recommendations were advanced and these include the need for individual processors to strive to make use of their under utilized capacity instead of plant expansion. Also, each processor must upgrade his management capability. The rubber commodity board should (i) appoint a committee to look into the present state of affairs of the rubber industry, establish rubber lumps marketing centres and make provisions for price incentives to producers of natural rubber at all levels.

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I certify that this work was carried out by Mr. Adebiyi Adesida in the Department of Agricultural Economics, University of Ibadan.

SUPERVISOR

S. A. Oni, B.Sc., M.Sc. (Calif), Ph.D. (Ibadan)
Senior Lecturer in the Department of Agricultural Economics, University of Ibadan - Nigeria.

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INTRODUCTION

1. THE ECONOMIC IMPORTANCE OF RUBBER IN NIGERIA

A. General Consideration

Prior to the advent of petroleum on the Nigerian economic scene, rubber ranked fourth as Nigeria's most valuable agricultural export commodity. In 1960, rubber accounted for about 8 percent of its total export earnings and in terms of aggregate figure, rubber export was estimated as ₦28.5 million.

Table 1.1 below shows the comparative importance of rubber earnings in relation to other major export commodities. It can be observed from this table that the percentage contributions of rubber to Nigeria's export earnings have declined drastically from about 8.4% in 1960 to 0.57% in 1974. This decline in percentage contribution of rubber is primarily due to the fact that the entire agricultural exports have been relegated to the background following the upsurge in petroleum export as well as the expanding domestic market for rubber leading to reduction in total rubber exports.

Nevertheless, rubber is still a significant agricultural commodity in Nigeria, particularly so in Bendel State where about 90 percent of Nigerian rubber output is produced.

Table 1.2 summarizes the trend in volume and value of rubber exports in Nigeria. It can be noted from the Table that the volume of rubber export

Table 1.1. Comparative earnings from Nigeria's major agricultural exports

Year	Total Exports (₦m)	Rubber %	Palm oil %	Palm Kernel %	Groundnut %	Cocoa %	Aggregate of Five as % of Total Exports*
1960	339.4	8.4	8.2	15.4	13.5	21.6	67.1
1961	347.2	6.3	7.6	11.5	18.5	19.4	63.3
1962	337	7.9	5.3	10.0	19.2	19.8	62.2
1963	379.4	6.2	4.9	11.0	19.2	17.0	58.3
1964	429.4	5.7	5.0	9.8	16.0	18.7	55.2
1965	536.6	4.1	5.1	9.9	14.1	15.9	49.1
1966	542	2.3	4.8	2.9	13.1	20.2	43.3
1967	568.2	4.0	3.9	7.9	14.4	9.3	39.5
1968	422.2	1.5	0.02	2.4	9.0	12.1	25.02
1969	635.8	1.5	0.06	1.6	5.6	8.3	17.06
1970	1885.7	0.92	0.05	1.15	2.3	7.06	11.48
1971	1293.4	0.96	0.24	2.0	1.9	11.14	16.24
1972	1411.9	0.49	0.02	1.1	1.3	7.16	10.07
1973	2277.4	0.85	-	0.82	2.0	4.9	8.57
1974	5794.7	0.57	-	0.75	0.12	42.6	4.04

SOURCE: Annual abstract of statistics and digest of statistics (various issues) F.O.S. Lagos.

* These percentages were obtained by summing up the naira value of the five export crops and finding what percent the amount is of total export value.

Table 1.2. Volume and value of rubber exports from Nigeria (1960-1973)

Year	Total exports from Nigeria (TONS)	Value of all exports (₦,000)	Percentage of all export earnings (%)
1960	57,229	28,478	8.4
1961	55,167	22,048	6.3
1962	60,591	22,712	7.9
1963	64,152	23,576	6.2
1964	73,226	24,332	5.7
1965	68,963	21,976	4.1
1966	71,398	22,948	2.3
1967	48,646	12,694	4.0
1968	52,807	12,622	1.5
1969	57,288	19,288	1.5
1970	59,286	17,568	0.92
1971	51,072	12,406	0.96
1972	41,802	7,350	0.49
1973	49,385	19,396	0.85

SOURCE: Annual abstract of statistics digest of statistics (various issues) F. O. S. Lagos.

Table 1.3 : Percentage change in volume and value of total exports of rubber from Nigeria (1960-1973)

Year	Total exports (TONS)	Percentage change	Value (₦,000)	Percentage change
1960	57,229	-	28,478	-
1961	55,167	-3.6	22,048	-22.57
1962	60,591	5.87	22,712	-20.25
1963	64,152	12.10	23,576	-17.21
1964	73,226	27.95	24,332	-14.56
1965	68,963	20.50	21,976	-22.83
1966	71,398	24.75	22,948	-19.42
1967	48,646	-14.99	12,694	-55.43
1968	52,807	- 8.08	12,622	-55.68
1969	57,288	0.10	19,288	-32.27
1970	59,286	3.59	17,568	-38.31
1971	51,072	-10.76	12,406	-56.44
1972	41,802	-26.96	7,350	-74.19
1973	49,385	-13.71	19,396	-31.89

SOURCE : Annual abstract of statistics and digest of statistics (various issues) F. C. S. Lagos.

was on the increase until the civil war broke out in the country in 1966. Since the war broke out and even after the war, there has been a decline in both volume and value of rubber export. The decline in export earnings from rubber can be attributed to the decline in rubber prices and the rise in production of the synthetic rubber which has virtually become a perfect substitute for natural rubber. The presence of synthetic rubber also subjects the world market price of natural rubber to wide fluctuations. At present, like many other agricultural products, rubber prices vary from week to week at international markets.

In order to assess the trend in volume and value of rubber exports, Table 1.3 was computed, using 1960 volume and value as the base. It can be observed in this table that the volume shows initial increasing and later declining trend while the value shows a general declining trend which is a reflection of the falling prices obtained for natural rubber.

B. Employment generation

Probably, the most significant contribution of the rubber industry to the Nigerian economy is the high employment opportunities it offers to both the rural and urban population. Anschel estimated that between 184,000 to 304,000 people representing 12 to 15 percent of the Bendel state active population are engaged in peasant rubber production[1].

Also, in terms of industrial employment, rubber manufacturing firms have always ranked high in employment generation. The industrial survey in 1972 showed that about 8,000 people were employed by rubber processing industry. This represented about 4.7 percent of the country's total industrial labour force at that time. The industry therefore goes a long way in helping the nation to achieve self-reliance and self-sufficiency in that it provides relatively large quantities of both skilled and semi-skilled labour. The industrial survey also indicated that about 3.7 percent of the total labour force in the rubber industry was either skilled or semi-skilled. Table 1.4 shows only the number of people employed by all rubber manufacturing firms including the plantation factories but excludes peasant smallholders.

Also, in the rural areas, a lot of skill and experience have been acquired at different levels in the industry. This embraces the smallholders, tappers and rubber curing workers. People who work in the factory acquire, over the years, the technical skill required to handle the processing machines. Almost most mills train some processing managers on the job.

C. Value added by rubber industry

Another important aspect of the industry is its contribution to the country's gross domestic product in terms of value added. For the past

Table 1.4. Employment in the rubber manufacturing industry compared with total employment in all industrial establishments in Nigeria (1965 - 1972).

Year	Number employed by all industrial establishments (a)	Number employed by rubber industry (b)	(b) as % of (a)
1965	95,614	6,823	7.14
1967	76,395	2,382	3.12
1968	86,721	3,362	3.88
1969	102,532	6,102	5.95
1970	129,203	8,589	6.65
1971	145,445	6,013	4.13
1972	167,470	7,660	4.57

SOURCE : Annual abstract of statistics (various issues) F.O.S. Lagos.

Table 1.5. Value added by the rubber manufacturing establishments employing ten or more persons in Nigeria (1965-1973)

Year	No. of estab.	Gross output (₦,000) (a)	Industrial costs (₦000) (b)	Value Added (₦,000) (a-b) = (c).
1965	35	22,882	12,994	9,888
1967*	21	12,618	6,456	6,162
1968*	25	17,918	9,474	8,444
1969*	31	27,022	14,744	12,282
1970	33	34,312	18,640	15,672
1971	27	59,924	35,036	24,888
1972	35	37,490	20,333	17,157
1973	29	39,755	19,423	20,332

SOURCE : Annual abstract of statistics (various issues) F.O.S. Lagos.

* Excludes Imo, Anambra, Cross River and River States of Nigeria.

ten years the rubber manufacturing sector has shown some encouraging trends in its value added in the economy. This may be due to some protection and other industrial incentives accorded the firms in the industry.

Table 1.5 summarizes the value added by the rubber industry between 1965 and 1973. The term value added is here defined by the Federal Office of Statistics as the naira value difference between the value of gross output and the industrial costs of the industry. The value added by rubber industry rose from ₦9.8 million in 1965 to ₦24.9 million in 1971 but dropped to ₦20.3 million in 1973.

D. Secondary Benefits

The rubber industry like most other industry provides two types of benefits. These are the direct economic benefits which can be measured in naira value as discussed in section A to C and the secondary benefits which are also important for economic development purposes. The establishment of a new rubber plantation/factory is likely to be accompanied by such activities as road building, housing construction for workers; establishment of markets and the building of schools for staff children. These activities help in no small way to develop the areas and thus make life more comfortable for the people living in these areas. The rubber

plantations in Bendel, Ogun and Ondo states helped to enhance the living standards of the people around the project sites and thus reduced the drift of rural people to the urban centres. An example of such plantation is the Pamol Rubber Estates in the Bendel state of Nigeria. It has well built roads, camps for all grades of workers with both electricity and pipe-borne water. Also it provides school for staff children.

II. HISTORICAL DEVELOPMENT OF RUBBER PROCESSING IN NIGERIA

The rubber processing industry is made up of a group of firms and mills that process natural rubber in the form of latex, scrap and lumps into semi-finished forms such as rubber sheets, crepe and crumbs. These are intermediate products which are either exported or consumed by local manufacturing firms. These products can be further processed into finished and final products such as tyres and tubes, shoes, mattresses, bags and many wearing apparels.

There has been a lot of questions and debate as to the exact form in which natural rubber was first exported from this country. As documented by Sara Berry, natural rubber was first exported from the country in 1885, the export being about 534 pounds and it rose over a decade to about 5,069,577 pounds in 1895. The great increase in production was due to the

exploitative activities of some commercial Ghanaians who exploited and ruined all available rubber producing trees in the southern parts of the country(14).

In an attempt to replenish the trees, government started the growing of the high yielding rubber specie Funtumia elastica in plantations and at the same time encouraged the villagers to establish communal plantations in suitable places near the villages. There was an enthusiastic response to this call, particularly around the Bendel state area. Many farmers took to the cultivation of natural rubber and also many private investors established large rubber plantations. Among these were JoThomas rubber estate which, according to its chairman, was established in 1899 and subsequently started to process rubber around 1925. The Millers Brothers established another rubber estate at Sapele just about the same time. Also, in 1907, an English firm established another estate at Ikot Mbo in the Cross River State of Nigeria.(57)

Most of the rubber export from this country before the 1950s were processed by rubber smallholders. In most cases, they employed primarily very crude processing methods which in a way led to the low quality reputation earned in the international market by the Nigerian export processed rubber. Instead of using the standard coagulants such as formic acid and acetic acid, the smallholders made use of cassava starch water, citrus

juice from various wild trees for the coagulation of their latex. Usually, a bottle was used to roll the coagulum until the required thickness was attained. This would then be passed several times through the hand-mangle (smooth roller) until the sheet gave a standard thickness of about 1/8-1/4 of an inch. Smoking of the sheets was carried out by the small-holders in a kitchen combined with the drying in the sun whenever the weather was bright.

The then prevalent poor quality made the former Western Region government (which was made up of Bendel, Ogun, Oyo, Ondo and parts of Lagos states) to step up its development activities concerning the entire rubber industry. It embarked on various programmes to train peasant rubber holders, tappers and processors. Seeing that not much success was achieved, government started to establish co-operative processing factories in the villages. Government's aim was to assist the smallholders in getting better priced sheets by using modern processing techniques. This was welcomed by the farmers and many villages were formed into co-operative processing societies.

In order to encourage indigenous enterprising private investors, government decided to set up a model sheet rubber factory at Benin.

This was to demonstrate to the people the gains and benefits from factory rubber processing. So between 1950 and 1960, there were many commercial rubber processing factories in the region including six rubber plantation factories. Almost all the factories were engaged in rubber sheets production but with time many either changed completely to or incorporated crepe rubber production. Although, this has lower selling price, it was easier and less complex to manufacture. In addition, crepe rubber has a relatively lower cost of production.

In the late 1960s, smallholders' manual methods of production of rubber sheets and crepe were virtually discontinued. They instead concentrated mostly on the production of rubber lumps to feed the existing mills. The practice of paying a flat price on the basis of weight without much regard to quality, coupled with the low prices of lumps encouraged the lumps producers to adulterate their rubber lumps. The presence of these adulterants which could not be removed during the processing of lumps into crepe rubber was also in part responsible for the low grades of crepe rubber.

In the last decade, especially during and after the civil war, many processing firms had folded up due to the acute shortage of raw materials. Harris[25a] reported in 1965 that there were more than 20 firms engaged

in the industry. In 1966, Lloyd [36] reported that about 18 crepeing factories were in operation and Okereka [39] in the middle of 1969 stated that there were 13 crepeing factories excluding the plantation factories. At the time of the present survey (November - December 1976), there were about 14 factories including 5 plantation factories in the Bendel State that were engaged in either rubber sheets, crepe or crumbs production. Out of these, only 2 mills were established after the civil war, while in Ogun and Ondo states there were only 3 plantation integrated factories.

At the time of this survey, over 80% of the non-plantation factories are working below 50% of their installed capacity as a result of shortage of raw material. If this continues for the next decade, probably only the plantation mills would continue to process rubber, the other marginal factories having being forced to close down.

Another aspect of the problem peculiar to the industry is the diversification of products. As mentioned earlier, rubber sheets processing was the first to be introduced into the country, followed by crepe production. The changing to crepe production involved the purchase of new sets of crepeing machines and other capital necessary investment. Between 1969 and 1970, however, some firms as a result of a new type

of rubber product termed rubber crumbs developed in Malaya, commenced production of rubber crumbs. The technological process differs a little from those of rubber sheets and crepe, hence new capital investments had to be made by any existing firms that wished to produce crumbs. Crumb rubber has some advantages over other products. It can be put into a variety of uses. While it takes about 4-6 days to produce rubber sheets and more time to produce crepe, crumb rubber comes out in 5-6 hours. It is now being produced in the three states studied by the author.

Table 1.6 shows the year of establishment and the location of all the existing rubber processing firms in the Bendel, Ogun and Ondo states of Nigeria by December 1976. It can be observed from the table that over 80% of the existing mills are situated in Bendel State. This further stresses the important role played by the state as the major natural rubber producer in the country. These mills were established at different periods of this century. However, the bulk of the firms were established between 1950-1970. Ogun state has two mills, while Ondo state has only one factory. The three mills were established in the 1960s by the former Western State government.

III. NEED AND JUSTIFICATION OF STUDY

In the last two decades, the Nigerian Rubber Industry has been facing some problems. Considering all the government's efforts to increase

Table 1.6 : Processing firms in the area of study as at December, 1976.

Firm code	Years of establishment	Location	State
A01	1957	Sapele	Bendel
A02	1971	Amukpe	"
A03	1925	Ogbarafe	"
A04	1959	Amukpe	"
A05	1959	Benin	"
A06	1962	Ogbara	"
A07	1960	Amukpe	"
A08	1961	Amukpe	"
A09	1969	Utagba-Umo	"
A10	1955	Benin	"
A11	1960	Urbonigbe	"
A12	1908	Ogbarafe	"
A13	1961	Benin	"
A14	1964	Ilushin	Ogun
A15	1967	Ikenne	"
A16	1962	Araromi	Ondo
*A17	1974	Benin	Bendel

SOURCE : Field survey (November - December 1976). *Started production in June 1975. Hence not included in the study.

rubber yield, its foreign exchange earnings over the years showed a declining trend. This in part has been attributed to the world market prices of natural rubber which keep on fluctuating from week to week.

Another major problem which stems from the rubber industry itself is the shortage, in recent times, of raw materials such as latex, lumps, and scraps. All these problems have important implications for the firms in the rubber processing industry.

Many firms had folded up due to the lack of regular supply of natural raw rubber. The problem was aggravated at the outbreak of the civil war when most of the itinerant rubber tappers of Bendel state had to leave for the Eastern states. Between 1966 and 1968, out of the 18 factories in Bendel state, 5 were forced to close down due to the lack of raw materials. Even after the civil war was over, the rate at which processing firms are being established is far less than the rate of exit. As for now, virtually all the smallholder-processors and co-operative processing societies have folded up.

The rubber processing industry in a way links the natural raw rubber producers with the consumers of rubber sheets, crepe and crumbs. These can either be manufactured locally into finished products or exported. Considering its important role in the whole rubber economy, in order to forstall the present decline in the rubber industry, there is an urgent need to

re-appraise the existing rubber processing firms in light of their operational performance. Such appraisal will provide the necessary framework for guidelines on future policy on the rubber industry in Nigeria.

IV OBJECTIVES OF STUDY

The major objective of this study is to appraise the economic performance of all the rubber processing firms in Bendel, Ogun and Ondo states of Nigeria. This broad objective will be fulfilled by examining the following specific objectives:

1. To examine the pattern of capital investment among the rubber processing firms.
2. To assess the employment structure within the rubber processing industry in terms of skilled and unskilled labour, Nigerians and non-Nigerians.
3. To determine the costs and returns involved in rubber processing business of the three states.
4. To derive a cost function for Rubber processing industry and also identify the factors militating against the expansion of the industry.
5. To carry out a financial analysis of the industry and estimate the determinants of profit within the rubber processing industry.

6. Finally, to make appropriate policy recommendations towards improving the economic performance and expansion of the industry.

PLAN OF THESIS

In the rest of the thesis, chapter two deals with the review of previous studies and the methodology adopted in the study. The review examines all available, relevant studies, reports and past work dealing with rubber processing. The Research Methodology describes the area and scope of field investigation, sampling procedures, data sources and the limitations of data used.

Chapter three presents some background information of the rubber processing firms. This information includes the types of ownership, the location, sources and pattern of capital investments, employment structure and technology involved in rubber processing.

Chapter four focuses on the costs and returns in rubber processing. This includes some theoretical considerations as well as empirical input-output relationships giving details of cost profile, gross and net returns in the industry.

Chapter five analyses the cost function of the rubber industry, while chapter six discusses some factors limiting the expansion and

economic performance of the rubber processing industry.

Chapter seven is concerned with a financial analysis of the rubber processing industry. This chapter is involved with the derivation of some financial ratios as well as empirical estimation of the determinants of profit in the rubber industry.

The last chapter presents a summary and conclusion of the study. This conclusion also highlights some policy recommendations for the expansion and better economic performance of the industry.

CHAPTER II

REVIEW OF LITERATURE, METHODOLOGY AND DATA SOURCES

This chapter presents a review of previous studies, reports and past works dealing with the Nigerian rubber Industry with particular reference to rubber processing. It also outlines the methodology adopted and the data sources.

A. REVIEW OF PREVIOUS STUDIES

A lot of research studies have been carried out in the past on the Nigerian Rubber Industry. Almost all these studies focussed attention on the economics of rubber cultivation. The rubber processing sector, which is an integral part of the whole industry has however been neglected or unexplored from the view point of research. This is why it was not possible to find an earlier study that dealt specifically with the rubber processing industry in Nigeria. Some of these studies mainly touched on the pattern of production and government developement programmes while some dealt with marketing.

The study by Anschel[8], gave a general background to the rubber industry with particular reference to the economics of peasant rubber production in Nigeria. It is observed from his study that the smallholders cultivated about 95% of the rubber farms and produced 85% of total rubber output

in the country. Secondly, he confirmed that most of the smallholdings are made up mainly of unselected seedlings and wild rubber species which yield relatively low quantity of latex. Crude tapping methods also contribute to lower yield of rubber. Despite all these, Anschel concluded that small holdings are more profitable than large rubber estates due to the large overhead expenses on the rubber estates.

With regards to rubber processing, Anschel identified some rubber processing factories, but he did not analyse the economics of factory - rubber - processing. He only discussed smallholders manual rubber processing.

A more relevant study about rubber processing is the work of Patrick Gromely[25]. He gave a descriptive account of the economic behaviour of the rubber processing sector of the industry. He regarded the processors (at the time of his study) as being Oligopsonistic since he believed that they had power to influence the price of rubber lumps and scraps which they processed. This he attributed to the fewer number of processors unlike the very numerous smallholders that produced mostly adulterated rubber lumps. He in effect advocated the expansion of the rubber processing industry rather than cut down the number of the existing mills.* He also suggested that public authorities such as the newly

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* The reduction in the number of the existing processing units was strongly recommended in 1968 by a committee headed by the Oba of Benin appointed by the Mid-Western State Government.

established Bendel State Rubber Development Agency (BRDA) could enter the processing industry and compete with the existing processing firms.

Another relevant study is that of Obi[38]. This study concentrated on the government owned crepe factory at Ikpoba, Benin City. Although, the study sportlights some of the broad problems of the whole rubber industry with particular focus of attention on the problems facing the processing factories. The findings and recommendations are two generalized to be meaningful and useful for the rubber processing industry.

Other available studies include the work of Okereka[39], Laurent[33], Saylor[52], Sawyer[51] and Zwanhunsen[62]. These studies were rather general in scope and none of them focus attention on the economic appraisal of existing rubber processing firms in the country. This is why the present study is designed primarily to appraise the performance of the existing rubber processing firms in Nigeria.

It is the authors firm belief that if processors are efficient, they would increase the demand for raw rubber and so encourage increasing production of rubber.

B. METHODOLOGY

Area of Study

The study was carried out in Bendel, Ogun and Ondo States. These states were chosen primarily for three reasons. Firstly, Bendel State

is the major rubber producing state in the country and should therefore have the greatest number of rubber processing firms.

Secondly, the three states (i.e. Bendel, Ogun and Ondo) including Oyo state and part of Lagos State comprised the former Western Region. In that wise, they would all have many things in common. Many policies made concerning the rubber industry were made by the old Western Region of Nigeria. Such policies included the establishment of many of the existing large rubber plantations, co-operative processing units and the rehabilitation of the existing rubber holdings and various other development programmes.

Lastly, apart from financial and time limitations, the three states account for over 94% of the output of rubber in Nigeria while the other Eastern States where rubber is also produced (comprising of Cross River, Anambra, Rivers and Imo States) account for only 6% of the country's rubber output[43].

Selecting the sample

The list of all the rubber processing establishments in Bendel, Ogun and Ondo States was obtained from the industrial survey section of the Federal Office of Statistics, Lagos. A more current and comprehensive list of all existing processing factories in Bendel State was provided

by the Tree Crops division of the Bendel State Ministry of Agriculture and Natural Resources. At the time of the writer's field survey, there were only fourteen operating processing establishments in Bendel State. In Ogun state, there were only two processing units while Ondo state had only one establishment.

In the three states, all known existing processing units were studied. Two categories of processing units were identified. There were the processing units which are integral parts of large rubber estates and which obtain their raw materials from the estates. The other category include those mills which do not belong to any rubber estate and which obtain their raw materials mainly from local small holders.

All the identified firms in the two categories studied were found to fulfil some industrial survey specifications stipulated by the Federal Office of Statistics; Firstly, the size of the establishment with respect to the minimum capital investment must not be less than ₦10,000. Also, the level of employment must not be less than 10 employees. Thus, in this study, no smallholders or local manual-processor was considered.

C. SOURCES OF DATA

The data used for this study were obtained from two main sources, namely primary and secondary sources.

Primary Sources

The records kept by individual firms served as the major source of the data. This was collected during the writer's field investigation with the aid of questionnaires. The various firms were visited in person together with two field enumerators during the months of November and December, 1976. Each firm gave appointment dates to the author for personal interviews. This was at the convenience of the senior officer granting the interview. During the interviews, the respondents were given enough time to discuss fully their processing business, and other factors influencing their economic performance. Also, at such interviews, the investigator was able to obtain some brochures, pamphlets and other relevant documents, all of which enhanced our background knowledge of the processing firms under study.

Secondary sources:

Some basic data were also obtained from publications by the Federal Office of Statistics and the Federal Ministry of Industry, Lagos. The Bendel State Ministries of Agriculture and Natural Resources, Finance and Economic Development also provided useful information. Other institutions visited were the defunct Western State's Agricultural Investment Corporation and the Ogun and Ondo States Ministries of Agriculture and

Natural Resources. Very useful verbal information were also collected from senior employees of the above institutions. Finally, those processors who have been in the rubber industry for a very long time provided some useful historical information about the entire rubber processing industry in the country.

Limitations of data

Despite all the skills and caution of the investigator in soliciting and enlisting the support and co-operation of the respondents, some vital information was still missing. Some of the processors evaded questions pertaining to the firms' profits, tax rates, initial capital investment and the present total paid up capital of their establishments. The respondents always became uncooperative when the interviewer tried to persuade them to supply these data.

In view of the above mentioned problems, the investigator had to use some indirect procedures to obtain information on profits and all the operating expenses. The use of such indirect procedures necessarily limit the reliability of our data and the extent to which these data can be used for broad policy recommendations. However, when these data were cross-checked with those supplied by the same firms to the Federal Office of Statistics, no major variations were found for each firm for the period covered in this survey.

The techniques of analysis:

In the analysis, the author employed three statistical techniques, namely: tabular, non-parametric and multiple regression. The budgetary technique was used for the economic analysis in chapter four while details of the non-parametric and regression techniques are presented in chapters five, six and seven. Also, in chapter seven, the author computed some financial ratios for the firms which gave the needed data.

CHAPTER III

BACKGROUND INFORMATION OF THE SAMPLED RUBBER PROCESSING FIRMS

A. The location of the rubber processing firms

All the rubber processing firms included in the study are located in the southern part of Nigeria. This location pattern can be explained by two major factors. Firstly, high rainfall is a necessity for high latex yields and this has led to the restriction of rubber production to the southern rain belt. Secondly, latex, the major input of the industry is very bulky. As a result of this bulky nature, most processing firms rationally locate their plants near the sources of latex supply.

The location of the selected processing firms has been analysed and presented in table 3.1. It can be observed from this table that about 82 per cent of all the firms are located in Bendel State whilst about 12 per cent are located in Ogun state with only 6 per cent located in Ondo State.

Factors determining the location of firms in the industry.

As regards the factors that determine the choice of particular site for each mill, seven factors were specified as major determinants. The top executive of each firm was asked to identify these factors and the results of their responses are summarised in table 3.2. It can be

Table 3.1. Location of rubber processing firms state-wise comparison

State	Number	Percentage
Bendel	14	82.35
Ogun	2	11.76
Ondo	1	5.89
Total	17	100

Source : Field Survey (November - December, 1976).

observed from the table that all the sixteen responding firms indicated "closeness to the source of raw materials" as the major determining factor for the location of the factory. Next to this was "access to roads, rail and seaports". The latter factor is important in the transportation of raw materials and the evacuation of finished products.

Other important factors are availability of water and electricity which are essential for the continuous operation of the rubber processing mills.

Table 3.2. Factors determining the location of each firm in the industry

Factors	No. of Firms	Percentage
Cheap labour	9	56.25
Close to raw materials	16	100
Access to roads, rails and seaports	14	87.5
Where land is available	3	18.75
Availability of water and electricity	12	75
Government recommendation	7	47.75
Industrial estate	7	47.75
Others	-	-

Source: Field survey (November - December), 1976.

B. Types of business organizations

The rubber processing industry like all agro-allied industrial establishments can broadly be classified into five major categories of ownership viz:- single proprietorship, patnership, private limited liability company, wholly government owned and quasi-government

corporation. The ownership pattern of all the firms studied is presented in table 3.3:

Table 3.3 Types of Business Ownership

Type	Frequency	Percentage
Single proprietorship	2	12.5
Patnership	4	25
Private liability company	5	31.25
Quasi - government Corporation	5	31.25
Government	-	-
Others	-	-

Source Field Survey (November - December) 1976.

It can be observed from table 3.3 that most of the firms are either private limited liability companies or quasi - government corporations. In early 1950's and 1960's, the industry was dominated by single proprietors who were most Greek nationals. As a result of the continued lack of raw materials and the Nigerian Indigenization decree, many of such firms folded up while others were sold out to Nigerian investors.

C. Capital Investment pattern

Capital has always been a major limiting factor to many commercial ventures in this country. Even in the present days of oil - rich Nigeria, capital is still not easy to come by. The Federal government in its endeavour to ease this problem has established in recent times many credit corporations. These include the Nigerian Agricultural Bank, the Nigerian Industrial Development Bank and the Nigerian Bank for Commerce and Industries. These credit corporations have made little or no contributions to the rubber processing industry as indicated in table 3.4.

Table 3.4: Sources of investment funds

Sources	Frequency	Percentage
Government	6	37.5
Personal Savings	7	43.75
Co-operative Societies	-	-
Foreign Investors	6	37.5
Commercial Banks	9	56.25
Credit Corporation (NAB, NIBD, NBCI)	-	-
Others	-	-

Source : Field survey (November - December) 1976.

The major sources of capital investment in the industry in order of importance are commercial banks, personal sources, government (these are government - owned firms) and foreign funds.

D. Employment structure

The employment pattern in the rubber processing firms in 1974 and 1975 is presented in tables 3.5 and 3.6. The rubber processing industry like most modern manufacturing industries is relatively less labour intensive. Almost all the operations are carried out by power driven automatic machines. These machines are however operated by semi-skilled and skilled labour. In 1974, all the firms under study employed about 2724 people and in 1975, the employment decreased to 2287 persons. The detailed breakdown of the employment figures are presented in tables 3.5 and 3.6.

Table 3.5: Employment distribution by categories in the firms in 1974 and 1975

	1974		1975	
Category	Number Employed	Percentage	Number Employed	Percentage
Managerial	60	2.2	53	2.3
Clerical	162	5.9	148	6.5
Technical	349	12.8	329	14.4
Operatives	2153	79.1	1757	76.8
Total	2724	100	2287	100

Source : Field work (November - December) 1976

Table 2.3 : Employment distribution by categories in each firm 1974 and 1975

Firm	Managerial				Clerical		Technical		Operative		Total	
	Nigerian		Non-Nigerian									
	1974	1975	1974	1975	1974	1975	1974	1975	1974	1975	1974	1975
[illegible]	3	3	1	1	5	5	55	51	136	120	200	180
[illegible]	3	3	-	-	7	7	11	11	103	101	124	122
[illegible]	3	3	-	-	6	6	25	21	56	43	90	73
[illegible]	1	1	3	3	2	2	10	12	120	108	136	126
[illegible]	1	1	-	-	3	3	3	3	68	33	75	40
[illegible]	8	8	1	1	39	36	44	42	130	104	222	191
[illegible]	11	8	1	-	1	1	3	2	188	131	204	142
[illegible]	4	3	-	-	10	3	8	6	230	60	252	72
[illegible]	2	2	1	1	6	8	5	6	99	104	113	121
[illegible]	1	-	-	-	17	15	7	5	137	66	162	86
[illegible]	1	1	-	-	19	11	35	29	75	76	130	117
[illegible]	1	1	1	1	8	8	32	31	383	394	425	435
[illegible]	2	2	1	1	1	1	10	10	47	34	61	48
[illegible]	4	3	-	-	9	9	30	28	125	132	168	172
[illegible]	1	1	-	-	4	8	10	11	49	46	64	66
[illegible]	5	5	-	-	25	25	61	61	207	205	298	296
Total	51	45	9	8	162	148	349	329	2153	1757	2724	2287
% of Total	1.9	2.0	0.3	0.3	5.9	6.5	12.8	14.4	79.1	76.8	100	100

Source : Field Survey (November - December) 1976.

On the whole, over 75 per cent of the workers can be classified as operatives (unskilled labour), while about 20 per cent are semi-skilled and only 2.5 per cent are highly skilled. The Nigerian professionals in the industry over-shadow their expatriate counterparts in both years. The situation was attributed in part to the indigenization decree which led to the departure of some expatriate managers.

The drop in the number of unskilled labour employed in 1975 was due to the Udoji award which resulted in rise in wages and consequent decline in the number of operatives. Many casual workers were laid off whilst some were forced to seek more renumerative employment outside rubber processing industry.

Many criteria were employed in the analysis of firm sizes. These criteria include number of employees, value of annual turn-over and present capital outlay of each firm. Tables 3.7, 3.8 and 3.9 summarised our findings.

Table 3.7: Size of firms as determined by number of employees 1974 and 1975

Number of Employees	1974		1975	
	Frequency	%	Frequency	%
Under 100	4	25	6	37.5
100 - 199	6	37.50	8	50
200 - 299	5	31.25	1	6.35
300 - 399	1	6.25	1	6.25
400 - 499	-	-	-	-
Over 500	-	-	-	-
Total	16	100	16	100

Source : Field work (November - December) 1976.

It can be observed in table 3.7 that none of the processing firms employed more than 400 employees in 1974 while the figure range dropped to less than 200 employees in 1975. This further confirms the fact that many people had to leave the rubber industry for more remunerative jobs.

Table 3.8 : Size of firms as determined by value of turnover 1974 and 1975

Annual Turnover (₦)	1974		1975	
	Frequency	%	Frequency	%
Under ₦100,000	-	-	-	-
₦100,001 - ₦500,000	3	18.75	5	31.25
₦500,001 - ₦1,000,000	6	37.25	6	37.5
Over ₦1,000,000	7	43.75	5	31.25
Total	16	100	16	100

Source : Field Survey (November - December) 1976

Also in table 3.8, the value of the annual turnover ranged between ₦0.1 million to over one million naira during the two years. The drop in the value of the annual turnover in 1975 was attributed by most processors to the shortage of raw materials and as a result of the various industrial actions when production in many mills had to stop.

Table 3.9 : Size of firms as determined by the present value of assets 1975

Value of assets (₦)	1975	
	Frequency	%
Under ₦50,000	1	6.67
₦50,001 - ₦100,000	2	13.33
₦100,001 - ₦500,000	10	66.67
₦500,001 - ₦1,000,000	2	13.33
Over ₦1,000,000	-	-
Total	15	100

Source : Field survey (November - December) 1976.

It can be observed from table 3.9 that the bulk of the value of the assets of the processing firm in 1975 ranged between ₦100,000 to ₦500,000.

E. The Major Inputs in rubber processing

The major raw material in rubber processing industry is natural rubber. This can be obtained in forms of latex lumps and scraps. Processing firms that engage in the production of rubber sheets make use of latex while crepe rubber processors make use of rubber lumps or scraps.

Latex and lumps can be used in the production of rubber crumbs. Apart from raw rubber, some chemicals such as formic acid and acetic acid are also used as coagulants in the production of rubber sheets and crumbs. Other inputs include water which is supplied by the state governments and electricity which is mainly supplied by National Electricity Power Authority. These two inputs are of great importance to all mills.

As precautionary measures against the irregular supply of water and electricity, most of the firms have installed stand-by generators and water tanks. Firms that process crepe use a lot of water in order to remove dirts and particles from heavily adulterated rubber lumps. In smoking of rubber sheets, some firms employ charcoal or fire woods. Fuel and all lubricating oils for the generators and other heavy machinery are other operating input which are obtainable from local oil and gas marketing companies.

F. Sources of raw materials

The two major sources of natural rubber are peasant farmers and large rubber plantations. Factories which are integral parts of large rubber estates readily obtain latex and lumps from their parent rubber estates while others obtain rubber lumps from peasant rubber holders. Another important source is through the local contractors. Table 3.10 shows the main sources of raw materials as stated by the processors.

Based on personal observations during the field survey, only mills situated in rubber estates engaged in rubber sheets processing. This is attributed to the regular supply of high quality latex from the fields.

The local contractors play very important role in the industry with regards to the procurement of raw materials, particularly for mills that have no rubber plantations.

Table 3.10 : Sources of raw materials

Sources	No. of firms	%
Own estates	8	50
Local farmers	10	62.5
Local contractors	8	50
Other estates	1	6.25
Others	-	-

Source : Field survey (November - December) 1976.

The rubber contractors go to the interiors to assemble rubber lumps, and scraps of different qualities from small holders. They in turn sell to processors in lorry loads. Since there is generally an acute shortage of rubber lumps, they sell to processors who offer good prices. They

also make sure that the processors are ready to pay on the spot. The old practice whereby contractors signed contracts with certain processors has virtually stopped.

G. The technology of rubber processing and products of the Industry

The industry has three major products. These are rubber sheets, crepe and crumbs. Sheet rubber is divided into standardized grades; No. IX RSS, No. 1 RSS, RSS II, RSS III, RSS IV, RSS V, RSS VI and cuttings. The grades are made from the same coagulated wet rubber sheets. Skim rubber made of skim latex is never used in whole or in part in the production of any grade.

Crepe rubber is generally regarded as lower grade of rubber. Unlike rubber sheets, it is valued according to the appearance. Light brown crepe earns better than the dark brown crepe. Crepe is made from lumps and scraps of all types and grades.

Rubber crumbs can be made from latex and lumps. Crumbs made from sheets generally have higher grades than those made from lumps and hence earn more revenue. Table 3.11 presents the types of finished products and the number of firms that process them.

Table 3.11 : Types of finished products

Type	No. of Firms	%
Sheet	7	43.75
Crepe	11	68.75
Crumbs	5	31.25

Source : Field survey 1976.

Processing of rubber sheets*

Processing of rubber into sheets can be analysed under small scale or factory technology. The small scale processing is employed by smallholders who employ crude processing techniques whilst factory processing employ improved techniques. The technology for processing rubber will focus attention on factory processing only, and the stages of processing include latex dilution, coagulation, milling, drying and smoking. Inspection, grading and packing are also carried out as integral parts of the processing.

* A comprehensive literature on rubber processing is given by (i) Loren, J. Polhamus; Rubber botany cultivation and utilization pp. 179 - 208.

(ii) Zwanhuiwen, Th., Rural Industries for agricultural raw materials in Eastern Region. F.A.O. Report 1968.

Dilution of the latex

The transportation of latex from the fields to the factory sites is done in tanks. Latex is then diluted with water to a certain standard Dry Rubber Content (DRC). The dilution is required to make the rubber as uniform as possible and to obtain coagulum with a proper degree of hardness. Insufficiently diluted latex makes hard coagulum which is difficult to mill and requires excessive power. Too much dilution on the other hand makes soft coagulum which is easily torn during milling. The dilution also facilitates the settling of dirt particles after sieving and the bubbling away of gases which can reduce the sheet quality.

Coagulation in Tanks

The coagulating tanks are completely different from the transportation tanks. They are made of aluminium and hence known as all metal coagulation tanks. They usually have standardized interior dimension of 30000 x 700 x 400 mm with 75 aluminium partitions and a capacity of 76 sheets of approximately 1.5 kg dry weight when filled to a height of 34cm with latex of 16 per cent DRC. The aluminium partitions fit into notches in the side bars at the top of the tank and are kept in position by a partition spacer in the bottom of the tank.

The tanks are either fixed or movable. They are filled by means

of a latex guide between the latex receiving troughs running under the outlet cocks of the receiving tanks. After filling to the specified height, froth is skimmed off and coagulant in form of formic acid is added under constant stirring with an aluminium latex stirring rake. After the addition of the coagulant and skimming, the partitions are thoroughly wetted to prevent the air bubbles from sticking to the aluminium which cause pits on the surface of the coagulum. With care, the partitions are placed in the notches to prevent having coagulum of uneven thickness.

When coagulation has set in, clear water is added to the tanks. This promotes even contraction of coagulum and prevents them sticking to the partitions and also it prevents the formation of spots on the coagulum. On complete coagulation, the tanks are pushed to the other end of the track and one by one placed directly in front of the battery. The coagulum is fed over a short chute straight into the machine between the first two rollers. This can be performed by a man.

Milling of sheet rubber and milling machinery

The sheeting batteries are a combination of four to five pairs of smooth rollers, one pair of printing rollers spirally grooved which are mechanically driven. Usually, the first pair is made up of two, 12 or 18 sided rollers to improve the grip on the thick coagulum. The gap

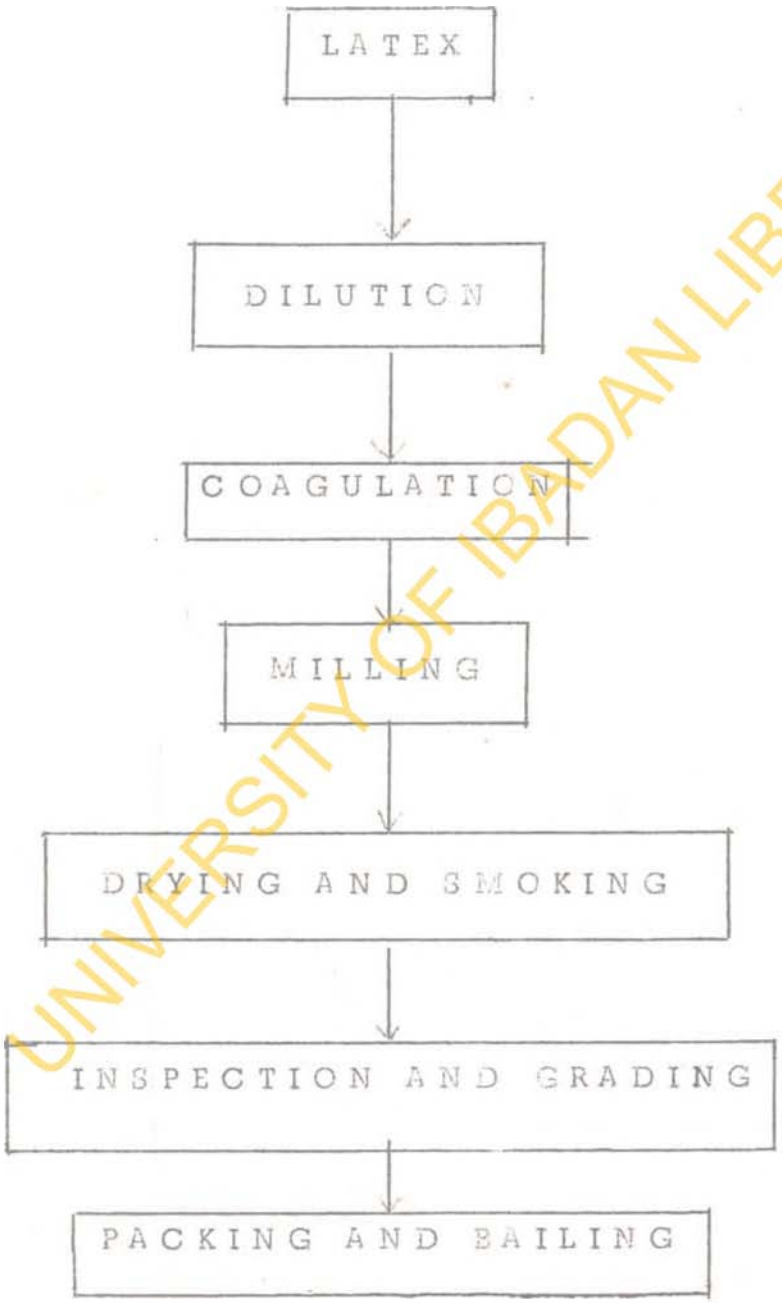
between the rollers decreases from one pair to the next and they are geared together to run at differential speeds to take care of the elongation as the coagulum passes through the milling battery. The rollers are driven either by an electric motor or by a Diesel engine.

After passing through the final pair of rollers, the sheet is washed in a special tank at the end of the sheeting battery in which the water is constantly changed. This is to further remove the remaining serum from the surface of sheets in order to prevent the formation of fungi and air bubbles caused by fermentation. Where available, sheets are smoked on trucks mounted on rail tracks and these are left to drip for about an hour in a suitable cool atmosphere before pushing them into the smoke-rooms. Dripping should not be too long to prevent rustiness and internal mouldy spots.

Drying and smoking of the sheets

The sheets after dripping for about an hour still contain some 30% of moisture of which about a third is contained in the sheet and two-thirds is surface water. They also contain serum with non-rubber constituents on which mould can easily develop. The purpose of curing is to preserve and to dry the sheets. Preservation is brought about by certain constituents of the smoke particularly phenols which are

Figure 1 : Chart showing rubber sheet processing



easily absorbed by the wet sheets. Smoking also promotes a uniform colouring of the sheets and lightly coloured spots and streaks which are apparent in the smoked sheets disappear.

Asborption of smoke constituents is most rapid when the sheets are still wet. The curing process can be divided into two stages; (i) the actual smoking stage during which much smoke and moderate heat is supplied and (ii) the drying stage when increased heat and little or no smoke is supplied. In general sheet with a thickness of 3 - 3.5 cm. can be cured in 4 - 6 days.

An important condition is that sheets to be smoked and dried in one batch in a smoke house should have the same thickness. A typical curing scheme for rubber sheet of about 3 - 3.5 cm thickness is given below.

First day

Smoke room temperature	-	$40^{o}C$ for the first 3 hours rising to $45^{o}C$.
Smoke production	-	should be at full capacity.
Ventillation	-	Bottom window fully opened and later reduced to half open while chimney should be fully opened.

Second day

Temperature - 50^{oC} to 55^{oC}

Smoke production - about 1/4 full capacity.

Ventillation - Bottom and chimney half open.

Third Day

Temperature - 55^{oC} - 60^{oC}

Smoke production - about 1/4 full capacity

Ventillation - Bottom very nearly closed while chimney 1/4 opened.

Fourth day

Temperature - 60^{oC}

Smoke production - very little and slightly opened.

Strict temperature control in smoke house is very important. The temperature is recorded at regular intervals. Ideally, a sheet is considered completely dry when the rubber has become transluscent without greyish opaque spots and eyes.

Smoke houses

Smoke houses are built in several ways but they all have to meet a few principal requirements. The apartments are designed to hold the total daily production. This will allow for proper smoking and drying of freshly milled rubber sheets. Smoke is produced in many ways but each smoke

house apartment must be provided with maximum and minimum thermometers. The walls of the smoke houses must be properly made so that as little heat as possible escapes. The production of smoke and heat and the ventillators should be simple to regulate. The compartments should be easily accessible so that charging and discharging of sheets during the smoking period if required will take the minimum of time. The roof is provided with one or more chimneys with regulating valves. The side walls of the lower part having ventillation holes should have sliding valves.

Inspection and grading of sheets

Sheet rubber grading is also carried out using appearance criterion, but unlike crepe rubber, sheets are inspected by holding them up against the light or putting them on a special table with a milk glass. The brightly lit glass facilitates the inspection for dirts, particles, air bubbles which are cut away with a pair of scissors. The opaque parts which are not properly dried at the edges are cut off and they are regarded and sold as cuttings. The sheets are then sorted out into standardized grades.

Packing and bailing

The rubber industry uses two sets of grades for natural rubber. Grade distinctions are made on the basis of cleanliness, quality of curing,

mould and rust content. The Nigerian rubber industry adopts the malayan rubber research institute specified grades. These grades have been stated earlier. Sheets of the same grades are packed together in bales. The grades are clearly written on the bales before they are taken to the stores where they are held until they are shipped or sold locally.

Processing of crepe rubber

Crepe rubber is made from rubber lumps and scraps. The rubber lumps are sometimes heavily adulterated. On getting to the factories, lumps are cut into two to expose the internal part and see if adulterated. Unlike few years back, processors now pay remunerative prices for lumps of good qualities. After collection the lumps are put in concrete walled tanks where they are continually soaked in water until they are ready to be milled. It is advantageous to soak the lumps in water since this softens the rubber and makes it amenable to machining.

Milling and crepeing machines

The crepeing machines are principally made up of; (i) a set of granulators, with rollers of about 12 inch diameter by 18 inch face. (ii) The macerator and the intermediate mill whiich are diamond grooved. (iii) A set of smoothers (finishers) with smooth rollers and (iv) a scrap washer.

The scrap washer as seen in some factories consists of a heavy trough in which revolve two large and heavy rollers. These rollers have strong raised and blunt corrugations which grip the rubber and knead it as it passes through them. The rubber is carried up again by the corrugations so that the action is automatic. A lot of water is used by the scrap. This further softens the rubber and allows the dirt to settle. The scrap washer eventually produces a disjointed but continuous homogenous wet rubber.

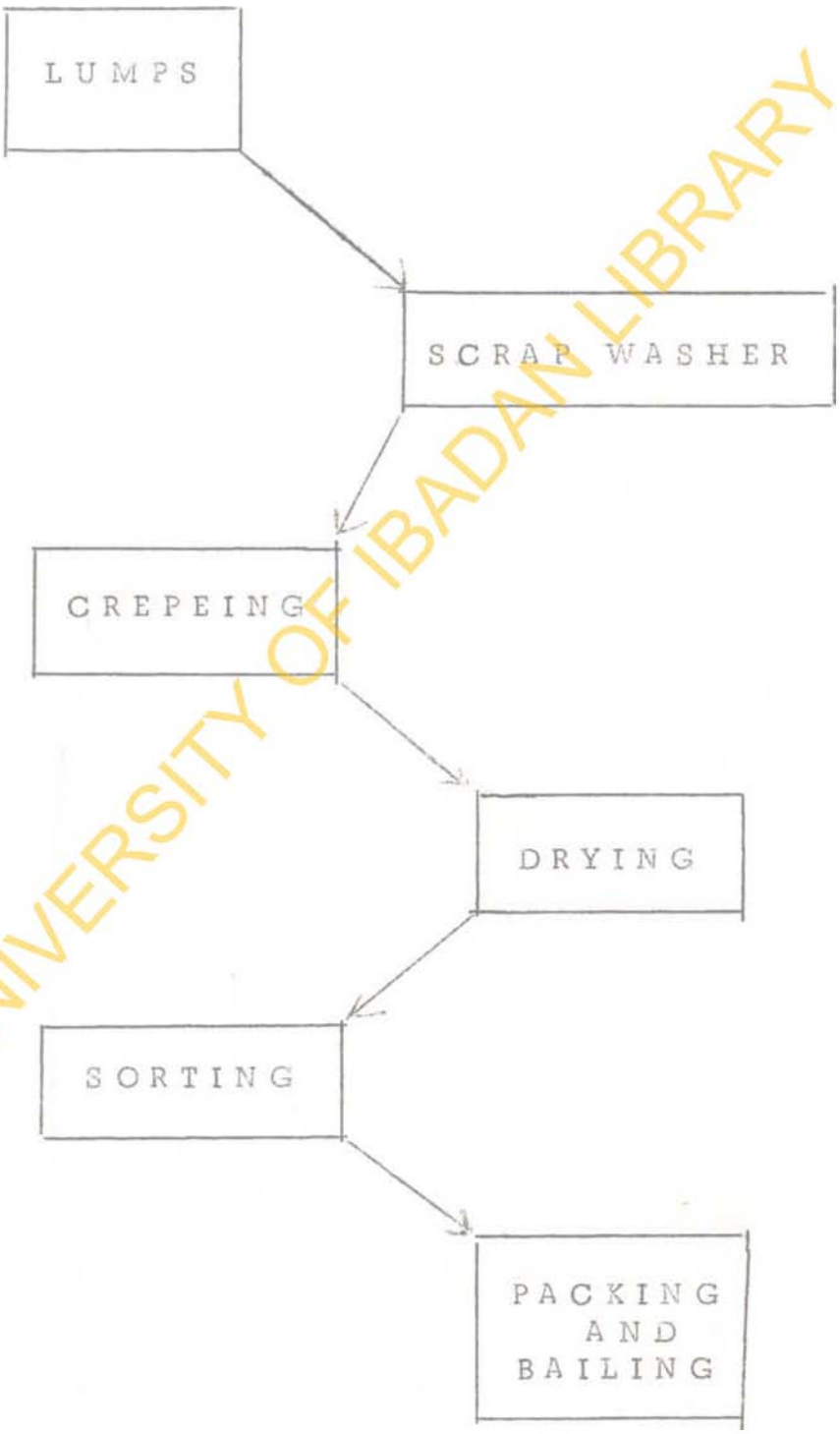
The cleansed rubber is taken to the crepeing machines after some 15 to 30 minutes. The wet rubber is now fed into the granulator where the rubber is turned into a continuous blanket. Water is at all times passed over the crepe blanket.

The processing is further continued on the macerator. The crepe blanket is passed through the macerator repeatedly 4 - 6 times after which it is taken to the smoothers where a crepe blanket of required thickness is produced. For the flow chart on crepe processing, see chart II.

Drying of crepe rubber

Crepe rubber is never smoked. It is air dried. It has less non-rubber constituents than sheet rubber and hence it is less susceptible to mould and smoke preservation is not required. It should however be

Figure II : Chart showing crepe rubber processing



thoroughly dried and stored in a dry place. Drying is carried out in special drying houses either by ventillation or a combination of both ventillation and heat. If no heat is applied, the drying takes about 4 weeks. A normal drying period in a heated drying house is about 8 - 12 days. The temperature measured between the crepe in a created drying house must not exceed 36^{oC} (97^{oF}).

Drying houses

A normal drying house consists of a large space divided into two or more drying floors, composed of hardwood laths with round tops. The usual vertical distance between the drying floors is 4 metres with about 50cm space between the lower drying floors. Heating of the drying houses is brought about by a number of radiators heated by steam. The radiators are mounted under a perforated floor at the bottom of the drying house. The drying houses are built in such a way as to have ventillators in the walls through where ventilation air enters the heating spaces.

Sorting Packing and Baling

Light brown crepe are sorted out and packed together. The dark brown ones which are of lower grades are also packed separately.

These are baled and markings are put on the outside of each bale to differentiate the grades.

Processing of Rubber Crumbs

Crumb rubber can be made from wet rubber sheets and wet crepe blanket. The wet crepe and sheets are milled as described earlier. These are taken to the chipping machine which chips the sheets and crepe into crumbs. The wet crumbs are later put in aluminium baking pans and subsequently placed in the unidrier.

The Unidrier

The unidrier consists of a large oven and a compartment lying along the length of the oven. Heat is supplied to the oven from the compartment. The oven is provided with a pulley device with chain wheels on which the baking pans are placed. This allows for a smooth movement from one end of the oven to the other. The movement of the baking pans over the pulley device is automated. Heat supplied to the oven is regulated through the whole length. The effective drying of the crumbs takes about 4 - 6 hours. The crumbs come out in different grades with wet rubber sheets coming out in higher grades.

Weighing and Packing

The dry crumbs are later weighed into specified standard weights before they are taken to the pressing machines. The pressing machines compress them into very compact sizes. They are then packed in

cellophane bags after which they are put in big crates ready to be shipped. See Chart III.

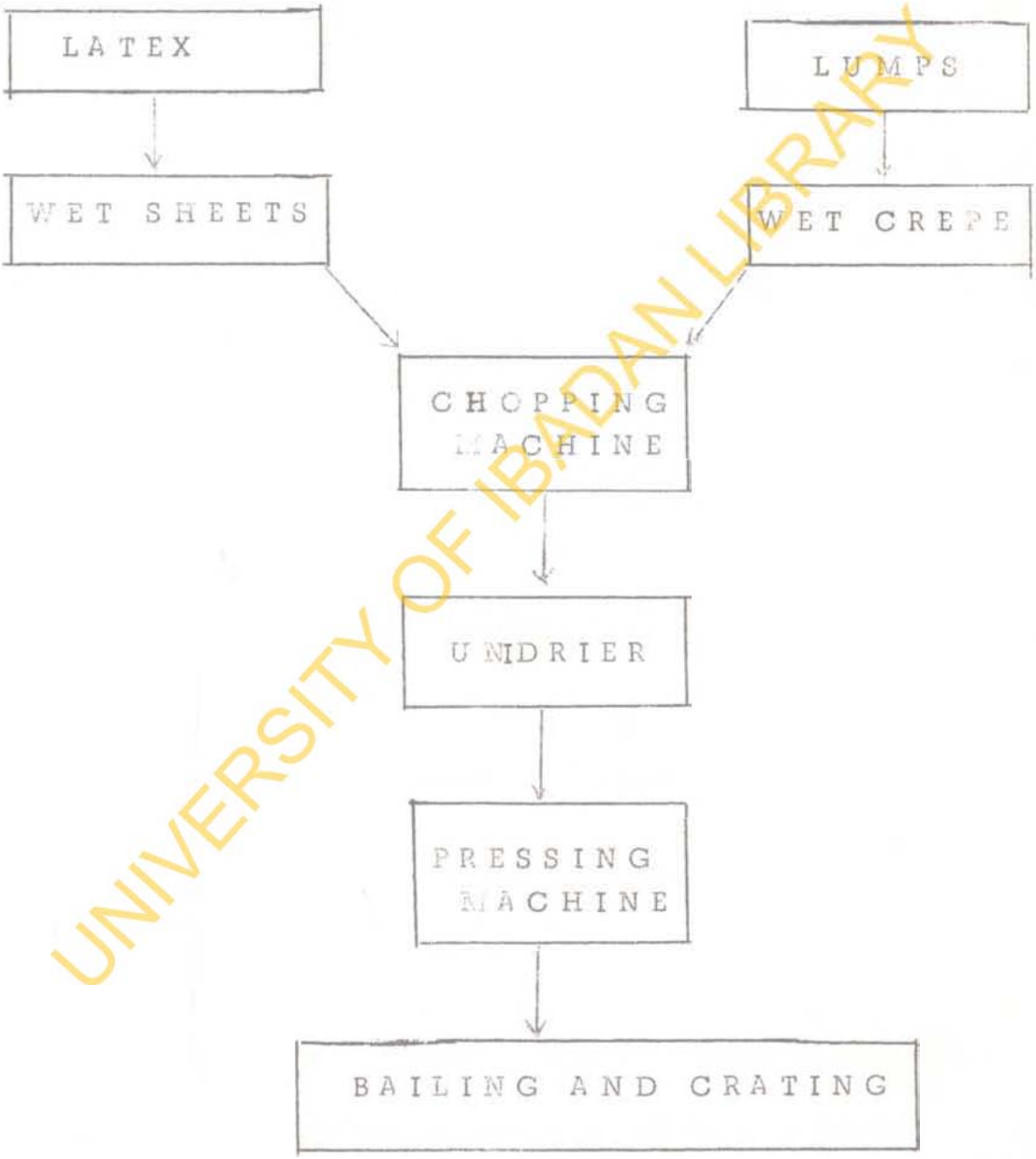
F. Marketing and distribution of products

Rubber is one of the principal export crops over which the Nigerian Produce Marketing Board has no statutory marketing control and responsibilities. Since 1950, the government has been trying to promote co-operative marketing organization among the small-holders in order to enable them secure for themselves a larger share of the price paid by the final consumer.

Recently, the government decided to create through decrees, Commodity Boards for all the major export crops of this country. This means that a Rubber Commodity Board will for the first time come into being. The board will in essence perform all the marketing functions connected with natural rubber.

Rubber sheets, crepe and crumbs are either consumed locally or exported. Over 90% of the country's annual rubber output is exported, whereas only 5 - 10 per cent is consumed locally. It has been pointed out by L.K. Laurent in his study that, prior to the Nigerian civil - war, the country exported about 72,000 tons of natural rubber, whilst only 7 percent of this were consumed locally. However, after the civil war, as a result of newly established rubber manufacturing firms, the local consumption of rubber can be expected to have increased.

Figure III : Chart showing the processing of Crumb Rubber



A full account of the marketing and distribution of rubber was given by Okereka, although lots of changes have taken place within the industry after his work. Natural rubber unlike in the pre-civil war era is no more dependent upon by many for their livelihood. The finished products are distributed by exporters and processor-exporters. Almost all the processors have direct contact with the world market. Some have marketing agents based in London. These agents feed them with the necessary information concerning rubber international market situations. They also perform on their behalf all the marketing functions such as contracting and shipping arrangements. Rubber processors who do not have agents abroad sell through local agents.

Table 3.12 summarizes our findings on the factors determining rubber prices. Prices are set by the world market forces and the quotations are sent down by the overseas agents to local processors. In certain instances, prices may be determined by an agreement between the exporters and the processors.

Local markets

The products of the rubber processing industry are intermediate products which are used by some agro-allied firms for further manufacture into final goods such as tyres and tubes, bags, car mats, and other

Table 3.12 : The setting of rubber prices

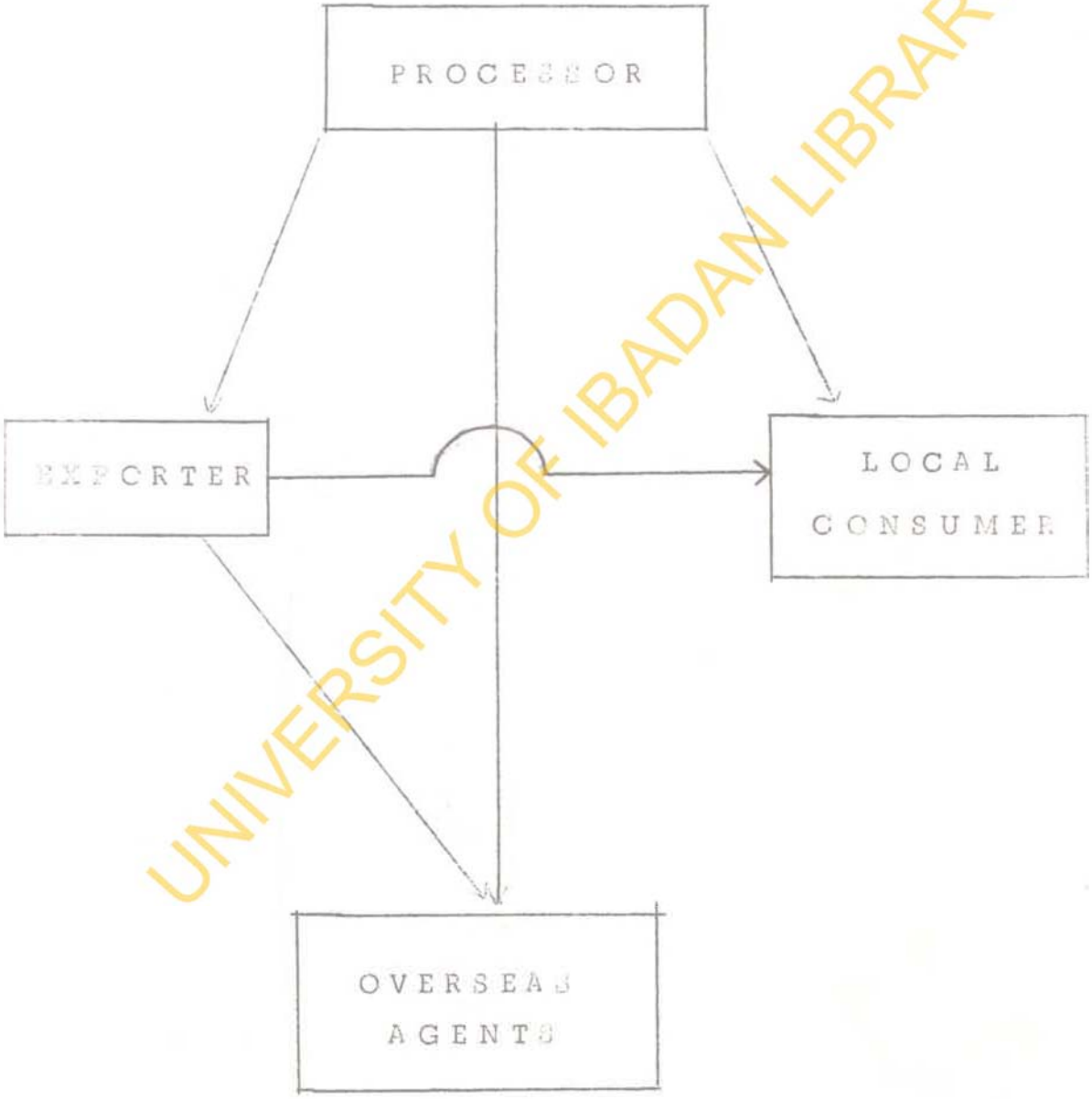
Factors	No. of Firms	%
Prices set by Overseas buyers only	10	62.5
By Overseas and local buyers	2	12.75
Set by local buyers	3	18.75
Set by local buyers and processor	7	43.75
Others	-	-

Source : Field work 1976

wearing apparels. The firms get their supplies directly from the processors and local exporters. A few large firms like Bata, Mitchelin and Dunlop have their own rubber plantations. Figure IV shows the marketing and distribution channels of the processed products.

The processors identified rising cost of marketing in relation to returns as the main marketing problem. Lack of capital to finance the marketing functions was also mentioned by the respondents. None complained about the lack of demand for their products whilst many

Figure IV : Chart showing the marketing and distribution channels of rubber



processors even claimed that they could not meet the demand for their products due to the lack of raw materials. This further confirms the fact that many of the processors are operating below their installed capacity.

CHAPTER IV

COST AND RETURNS ANALYSIS IN RUBBER PROCESSING

The objective of this chapter is to analyse the costs and returns involved in rubber processing business. Such an analysis is quite useful in determining the present level of profits in the rubber processing industry. The unfolding structure of costs should make it possible to advise plant managers on the best way to minimize operating costs.

A. ANALYSIS OF COSTS

Theoretical Considerations

The budgetary technique has been adopted in economic analyses of crops, livestock and other agribusiness enterprises in both developed and developing countries. Bradford and Johnson[15] defined a budget as a written plan for future actions. A budgeting process for a given period converges on two figures; one of these is total revenue for the period, the other figure is total expenses for the same period. The difference between these two figures is called net profits or net returns if revenue exceeds costs. All other parts of budgets are regarded as details leading up to the derivation of net returns.

The principles underlying budgeting are essentially the same whether it is made for a small farm, a large plantation, an industrial firm or a government venture. An industrial firm's budget can then be

defined as a plan about different kinds of financial and technical structures of a processing firm to determine its relative profitability for a given period of time. The types of technologies to budget for in a mill will be determined on the basis of available financial resources, capital assets, types of products and management capability.

In budgeting, all expected costs and returns are laid out and the quantities of input and final outputs are estimated. Then comes execution in which management uses is broken down into month by month operations and the achievements are compared with estimates. Where very serious adverse variances occur, management must seek the reason and take immediate corrective action. In this way, the budget prevents irrational spending by over-zealous managers.

For accurate budgeting, it is necessary to know the quantities and prices of inputs and outputs. Thus, by calculating the various costs and examining the revenues in existing rubber firms, it will be easy to guess the future needs of similar firms in future. A careful examination of the cost structure will make it possible to suggest ways to minimize costs and thus maximize profits.

All the firms visited were encouraged to provide information on their major cost items, their total input and output as well as their

selling prices for the various grades of processed rubber. Suffice it to say however that some of the data obtained were subject to certain errors since some of the information obtained from the questionnaires might not be correct. Care must therefore be taken in interpreting the analysis that follows.

Methodology

As mentioned earlier, individual interviews were held with each of the processing firms. The questionnaires prepared for this purpose were used. The products of the industry are rubber sheets, crepe rubber and crumbs. The output figures for the 1974 and 1975 production periods were obtained for each firm. Also recorded were total quantity of products shipped and the volume of sales for the specified period.

The factory size for each firm ranged between 5 to 25 hectares. Land was obtained either by outright purchase, lease or donation. In case of lease, the annual rents paid on the land were obtained.

Labour is another very important input of the industry. The total expenses on labour can be separated into salaries and wages. Salaries refer to payment to the senior staff including items such as Directors fees, while wages are payments made to other categories of workers.

The maintenance of all types of fixed assets is of paramount

importance to the smooth running of each processing firm. The costs of maintaining these fixed assets were therefore included in the analysis. Cost of raw materials which are principally latex and lumps were also included. The costs of other materials for those firms producing sheets and crumbs were also obtained. In most cases, the value of the raw materials employed by mills which obtained their raw materials from other rubber estates were computed by multiplying the quantity of raw materials by the prevailing prices.

Gross margin for each firm was obtained by subtracting the total operating cost from the gross receipts. The net returns in turn was obtained by finding the difference between the gross margin and total depreciation charged on the fixed assets including interest charges on borrowed funds.

Cost of rubber processing

The cost elements involved in rubber processing can be divided into variable costs and fixed costs. Variable costs are defined as those cost items which change with changes in the level of output. The fixed costs are those costs which do not vary with increase or decrease in the level of output. The cost outlay got from individual firms were computed from the records provided and the results obtained are presented in tables 4.1 and 4.2.

In this analysis variable costs include items such as cost of raw materials, water, power and energy, cost of labour and transportation expenses. Other variable cost items are selling and shipping expenses which also include excise duty, sales tax and the harbour dues. Lastly also included are cost of repairs and maintenance, as well as miscellaneous expenses. The latter consists of administrative and welfare charges.

Fixed costs include items such as Depreciation charges on fixed assets as well as interests on borrowed fund. In most cases, the depreciation on fixed assets had been calculated and presented in form of annual records of each firm, but in a few cases, the depreciation had to be estimated by the author. Where the latter situation prevailed, the straight line method was used to depreciate all the fixed assets in the mills. This method is relatively simple to compute and perhaps this explains its popularity among many workers. The two sets of depreciation currently employed by auditors auditing the accounts of the processors are given below.

The charges on borrowed capital depend on the sources since the interest charges vary from institution to institution.

In 1974, the total cost ranged between ₦149,168 and ₦2,326,110 with an average of ₦868,838 and in 1975, the total cost ranged between

ITEM	A		B	
	Rate (%)	Life span (years)	Rate (%)	Life span (years)
Residential and factory Building	5	20	4	25
Plant and Machinery	10	10	$12\frac{1}{2}$	8
Bridges and Fences	2	50	$1\frac{1}{2}$	66
Motor vehicles	25	4	$33\frac{1}{3}$	3
Furniture and Fittings	10	10	$12\frac{1}{2}$	8

Source : Firms records during field survey.

₦155,552 and ₦1,696,776 with an average of ₦628,079. Tables 4.3 and 4.4 show the comparative percentages of the various cost items in 1974 and 1975.

Ranging from 33.3% to 83.0%, the raw materials cost constitutes on the average the highest percentages of the operational costs in both years. Other major items of cost are labour cost, selling expenses and fixed costs. These major cost items are discussed in details below:

Cost of raw material

The raw materials costs for the two years under study can be seen in tables 4.1 and 4.2. It ranged between ₦85,792 to ₦1,350,525 in 1974 and between ₦56,135 to ₦912,707 in 1975. The percentages of costs of raw materials are presented in tables 4.3 and 4.4. The high cost of raw materials can be attributed to the fact that the rubber processing industry depends solely on latex as principal raw materials. The cost of latex has been rising for the past five years. In addition, other raw materials such as formic and acetic acid are also expensive. The basic characteristic of the industry is that unlike other industries, rubber processing has no by - products since all natural rubber is turned to intermediate products such as sheets, crepe and crumb which are further manufacture into final goods.

Labour cost

The rubber processing industry can be described as being relatively capital intensive. The industry like most modern industries depends on modern technology. A lot of automation has been acquired in the processing firms. All the units are equipped with different types of processing machines and implements. Although, the processing machines are power driven, the mills engage labour to operate these machines. All categories of labour, unskilled, semi-skilled and skilled were employed.

The intensity of labour use in the industry was measured by comparing the cost of labour (in terms of salaries and wages) with the total cost. The results for the two years 1974 and 1975 are presented in tables 4.5 and 4.6. The percentages of labour cost with respect to total cost ranged between 3.21% to 15.71% with an average of 9.07% in 1974, and in 1975 it ranged from 5.67% to 31.67% with an average of 13.89%. The cost of labour in 1975 could be seen to have almost doubled the cost of labour in 1974. The phenomenal rise in labour costs is attributed to the Udoji salary award which was paid towards the end of 1974. This award substantially increased labour costs and ultimately the total cost of processing rubber. In addition, the award led to scarcity of labour in the agro-industrial sector since most unskilled labourers got better paying jobs in the other sectors of the economy, especially the constructions industry.

It is also remarkable that labour costs were generally the highest in government owned processing units. Based on the employment data in these establishments labour tends to be under utilized.

Selling and shipping expenses.

This is another major cost item identified by all processors as constituting a drain on their returns. It ranks relatively high in some of the processing firms. The selling and shipping expenses for all the processing

firms for 1974 and 1975 are presented in tables 4.9 and 4.10. It ranged from 0.25 percent to 24.55 percent with an average of 8.81 percent in 1974 and between 0.21 percent to 18.92 percent with an average of 5.78 percent in 1975.

Selling expenses varied from firm to firm. The high cost of selling was mainly due to the shipping operation characteristic of rubber exports. In fact, almost all the processing firms have direct contact with overseas buying agents - to whom these products are shipped and sold. The selling expenses include such items as sales tax, excise duty, harbour dues and marine insurance. The decrease in the percentages of the selling and shipping expenses between 1974 and 1975 is due to the abolition of sales tax on rubber. This cost item is very low in some firms who engaged in little or no shipping abroad since the bulk of their products are sold within the country.

Fixed costs

These cost items include depreciation on all fixed assets such as residential and factory building, motor vehicles, plants and machineries, furniture and fittings. Fixed cost also include charges on borrowed funds.

The high cost of these fixed items can be attributed to the high interests charged on borrowed capital by the commercial institutions as well as high rates of depreciation allowed to processing firms under accelerated depreciation allowances of government.

Tables 4.11 and 4.12 show the fixed cost items and their percentages in 1974 and 1975 with respect to the total cost outlay. The depreciation charges ranged between 0.35 percent to 15.41 percent with an average of 5.23 percent in 1974 and from 0.58 percent to 14.75 percent with an average of 5.80 percent in 1975. While charges on borrowed capital ranged between 0.09 percent to 8.04 percent with an average of 1.49 in 1974 and from 0.12 percent to 6.95 percent with an average of 1.96 percent in 1975.

The borrowing of capital is common among the indigenous entrepreneurs within the industry. Also, many of these entrepreneurs got their capital from financial institutions to buy over the processing firms following the indigenization decree.

B. Returns Analysis

The returns to the rubber processing industry are obtained by finding the product of the output and the unit prices of these products. There is no single product price which can effectively represent the price of the various grades of sheets, crepe and crumbs. Besides, prices of rubber fluctuate from week to week depending on supply and demand conditions in international market.

The Gross receipts which are also referred to as volume of sales

Table 4.1 : Cost outlay for the rubber processing firms in 1974 (₦)

Firm Code	Variable Cost							Fixed Cost				Total Cost
	Raw Material (₦)	Fuel, Gas Water and Electricity (₦)	Salaries And Wages (₦)	Building and Machinery Maintenance (₦)	Transport Expenses (₦)	Selling and Shipping Expenses (₦)	Miscellaneous Expenses * (₦)	Depr. on Building (₦)	Depr. on all Plant and Machinery (₦)	Interest on Borrowed Capital (₦)	Other** Fixed Cost (₦)	(₦)
A01	1,098,664	27,560	87,208	7,077	18,436	31,979	117,500	6,435	4,195	68,682	12,526	1,480,262
A02	846,244	11,668	85,588	11,705	23,542	76,814	105,867	7,427	41,830	17,771	10,486	1,238,938
A03	85,792	14,368	24,968	5,117	7,052	9,835	7,074	2,212	1,597	14,209	4,463	176,687
A04	1,284,268	16,319	53,325	19,560	6,178	260,909	113,077	3,752	351	-	1,764	1,659,503
A05	385,345	11,940	137,306	15,889	3,402	2,519	49,478	3,814	4,200	6,601	1,423	521,917
A06	1,350,525	125,579	189,505	132,138	75,513	299,215	37,671	23,259	47,052	30,740	17,213	2,328,410
A07	874,263	29,939	76,416	58,919	1,117	70,362	33,863	6,572	17,011	1,000	3,801	1,173,263
A08	1,096,679	66,433	109,712	25,479	15,020	32,437	26,099	26,781	27,996	87,497	4,727	1,518,860
A09	295,344	40,149	60,122	10,522	4,848	136,240	49,685	7,886	17,198	658	12,333	634,985
A10	177,928	20,007	61,667	14,065	9,916	119,361	8,267	11,658	36,062	-	27,169	486,100
A11	176,292	12,876	64,785	9,687	6,853	63,119	20,253	22,300	9,682	-	26,603	412,450
A12	194,728	3,906	40,017	27,966	24,005	72,713	197,963	8,086	8,809	-	6,942	585,135
A13	252,488	2,235	18,841	1,942	908	25,530	13,190	5,985	-	3,670	-	322,789
A14	254,944	34,297	50,042	13,652	-	36,200	37,106	49,389	-	-	-	475,630
A15	112,767	1,450	15,553	12,405	2,944	542	979	815	1,223	-	490	149,168
A16	464,198	55,085	106,860	39,362	8,022	1,839	10,638	51,314	-	-	-	737,318
Average	559,404.30	29,488.18	67,619.68	25,342.81	12,984.68	77,475.87	45,544.37	14,855.31	13,575.38	14,426.75	8,121.25	868,838.44

* Miscellaneous expenses are detailed out in Tables 4.3a and 4.4a.

** Other fixed cost includes Depreciation on Jetty, Vehicles, Fences, Bridges, Furniture and Fittings.

Source : Field survey (November - December) 1976.

Table 4.2 : Cost Outlay for the Rubber processing firms in 1975 (₦)

Firm Code	Variable Cost							Fixed Cost				Total Cost
	Raw Material (₦)	Fuel, Gas Water and Electricity (₦)	Salaries and Wages (₦)	Building and Machinery Maintenance (₦)	Transport Expenses (₦)	Selling & Shipping Expenses (₦)	Miscellaneous (₦)	Depr. on Building (₦)	Depr. on All Plant and Machinery (₦)	Interest on Borrowed Capital (₦)	Other** Fixed Cost (₦)	(₦)
A01	701,811	22,960	95,900	18,504	21,774	84,228	61,112	5,649	6,935	59,212	12,427	1,090,512
A02	624,264	15,422	83,343	21,498	18,878	36,038	129,595	7,984	35,472	18,934	14,869	1,010,297
A03	83,865	16,504	30,316	2,493	5,695	7,073	10,722	2,101	403	9,604	4,017	172,793
A04	912,707	21,819	61,850	8,156	6,706	56,536	17,489	3,950	390	-	1,960	1,091,563
A05	176,761	9,721	34,019	7,372	2,621	15,227	47,130	3,538	3,360	6,409	1,134	307,292
A06	893,601	115,774	231,593	147,228	71,909	53,648	49,418	23,259	53,927	34,062	22,359	1,696,776
A07	558,440	15,566	80,497	27,289	2,450	73,837	35,126	31,929	11,469	30,049	7,056	873,708
A08	206,543	23,190	65,392	18,999	2,436	17,194	20,793	28,874	36,299	31,475	1,651	452,849
A09	362,208	47,438	72,827	15,773	5,029	138,654	41,021	9,040	29,443	862	10,738	733,033
A10	56,135	19,060	62,645	18,182	14,998	5,058	9,419	6,108	5,885	-	317	197,807
A11	208,482	14,908	69,256	9,579	7,752	59,054	42,559	8,286	1,278	-	4,493	425,647
A12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
A13	96,800	224	26,461	1,250	975	4,734	13,033	9,036	-	3,019	-	155,552
A14	192,488	29,294	71,529	25,172	-	30,755	51,453	62,878	-	-	-	463,569
A15	91,670	2,615	9,714	8,115	2,207	588	1,024	1,118	1,677	-	435	119,171
A16	289,662	72,484	134,000	73,047	6,029	1,313	10,166	43,912	-	-	-	630,613
Average	363,695.80	28,465.27	75,290.8	26,843.80	11,297.27	38,929.13	36,004.00	16,510.8	12,702.40	12,908.4	5,430.40	628,078.80

* Miscellaneous expenses are detailed out in Table 4.3a and 4.4a. Sources : Field survey (November - December) 1976

** Other Fixed cost includes Depreciation on Jetty, Vehicles, Fences, Bridges, Furniture and Fittings.

N.A. - not available.

Table 4.3 : Cost Outlay for the rubber processing firms in percentages 1974

	Variable Cost							Fixed Cost		
Firm Code	Raw Material	Water Power Energy	Labour Cost	Repair and Maintenance	Transport Expenses	Selling and Shipping Expenses	Miscellaneous Expenses	Interest on Loan	Depreciation on Building, Equipment and Other fixed Cost	Total Cost
A01	74.22	1.86	5.89	0.48	1.25	2.16	7.94	4.64	1.56	100
A02	68.30	0.94	6.91	0.94	1.90	6.20	8.54	1.43	4.82	100
A03	48.56	8.13	18.95	2.90	5.57	3.97	3.99	8.04	4.68	100
A04	77.39	0.98	3.21	1.18	0.37	15.72	0.79	-	0.35	100
A05	73.83	2.29	7.15	3.04	0.65	0.48	9.48	1.26	1.82	100
A06	58.00	5.39	8.14	5.58	3.24	12.85	1.62	1.32	3.76	100
A07	74.51	2.55	6.51	5.02	0.10	6.00	2.88	0.09	2.33	100
A08	72.20	4.37	7.22	1.68	0.99	2.13	1.72	5.76	3.92	100
A09	46.51	6.32	9.47	1.66	0.76	21.45	7.82	0.10	5.89	100
A10	36.60	4.11	12.69	2.89	2.04	24.55	1.70	-	15.41	100
A11	42.74	3.12	15.72	2.35	1.66	15.30	4.91	-	14.20	100
A12	33.28	0.67	6.84	4.78	4.10	12.43	33.83	-	4.07	100
A13	78.22	0.07	5.84	0.60	0.28	7.91	4.09	1.17	1.82	100
A14	53.60	7.21	10.52	2.87	-	7.62	7.80	-	10.38	100
A15	75.60	0.97	10.43	8.32	1.92	0.36	0.66	-	1.69	100
A16	62.96	7.47	14.49	5.34	1.09	0.25	1.44	-	6.96	100
Average	61.03	3.53	9.07	3.11	1.52	8.81	6.20	1.49	5.23	100

Source : - Computed from Table 4.1

Table 4.3a Miscellaneous cost outlay in 1974 (₦)

Firm Code	Auditor's Fees Legal Charges & Professional Charges (₦)	Office Expenses Telephone, Postages, Entertainment fees and Advert (₦)	Insurance and Housing Scheme (₦)	Medical Expenses and N.H.F. (₦)
A01	4,274	5,035	1,052	6,910
A02	2,578	2,486	2,720	669
A03	1,390	1,219	888	1,941
A04	1,206	980	2,570	1,900
A05	2,000	561	1,142	33
A06	2,000	965	19,338	15,368
A07	10,728	4,902	5,263	1,607
A08	2,099	3,800	7,559	1,024
A09	4,436	6,970	20,471	15,835
A10	1,200	1,149	2,553	3,344
A11	1,200	3,555	2,345	13,153
A12	1,200	1,616	5,765	16,020
A13	2,000	886	896	1,398
A14	3,000	9,251	14,826	6,839
A15	-	233	-	746
A16	-	1,875	7,049	1,714

Source :- Field survey (November - December) 1976.

Table 4.3 : Cost outlay for processing fires in percentage (%)

Firm Code	Variable Cost %							Fixed Cost %		
	Raw Material	Water Power and Energy	Labour Cost	Repair and Maintenance	Transport Expenses	Selling and Shipping Expenses	Miscellaneous Expenses	Interest on Loan	Depreciation on Building Equipment & Other Fixed Cost	Total Cost
A01	64.36	2.11	8.79	1.70	2.00	7.72	5.30	5.43	2.29	100
A02	61.79	1.53	8.25	2.13	1.87	3.57	12.33	1.67	6.17	100
A03	48.53	9.55	17.54	1.44	3.30	4.09	6.21	5.56	3.77	100
A04	63.61	2.00	5.67	0.75	0.61	5.18	1.50	-	0.58	100
A05	57.52	3.16	11.07	2.40	0.85	1.96	15.34	2.09	2.61	100
A06	52.66	6.62	13.65	8.68	4.24	3.16	2.31	2.01	5.87	100
A07	63.92	1.78	9.21	3.12	0.28	8.45	4.02	3.44	5.77	100
A08	45.61	5.12	14.44	4.20	0.54	3.80	4.39	6.95	14.75	100
A09	49.41	6.47	9.94	2.15	0.69	18.92	5.30	0.12	6.70	100
A10	28.38	9.64	31.67	9.19	7.58	2.56	4.76	-	6.22	100
A11	48.98	3.50	16.27	2.25	1.82	13.87	10.00	-	3.30	100
A12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
A13	63.23	0.14	17.03	0.83	0.63	3.04	8.58	1.94	5.8	100
A14	41 52	6.32	15.43	5.43	-	6.63	11.10	-	13.56	100
A15	76.92	2.19	8.15	6.81	1.85	0.49	0.86	-	2.73	100
A16	45.93	11.49	21.25	11.58	0.96	0.21	1.61	-	6.96	100
Average	55.42	4.79	13.89	4.18	1.81	5.78	6.36	1.96	5.80	100

Source : Computed from Table 4.2

N.A. Not available

Table 4.4a Miscellaneous cost outlay in 1975 (₦)

Firm Code	Auditor's fees Legal Charges and Professional Charges (₦)	Office Expenses Telephone, Postages, Entertainment fees and Advertisement (₦)	Insurance and Housing Scheme (₦)	Medical Expenses and N.P.F. (₦)
A01	3,265	4,112	7,015	3,200
A02	3,400	1,417	1,866	914
A03	1,830	989	4,439	2,080
A04	2,172	786	2,154	2,739
A05	2,000	627	894	437
A06	2,000	1,376	24,790	21,252
A07	3,323	3,935	7,713	2,245
A08	1,564	2,878	3,400	663
A09	5,000	6,993	13,514	13,970
A10	1,200	1,227	2,176	4,191
A11	1,200	4,652	2,224	16,588
A12	n.a	n.a	n.a	n.a
A13	2,000	1,292	1,172	1,519
A14	4,000	13,158	25,590	5,674
A15	-	344	-	680
A16	-	714	7,267	2,185

Source : Field survey (November - December) 1976

N.A. Not Available

Table 4.5. Labour cost in relation to total cost in 1974

Firm Code	(a) Labour Cost (₦)	(b) Total Cost (₦)	(a) as % of (b)
A01	87,208	1,480,262	5.89
A02	85,588	1,238,938	6.91
A03	24,968	176,685	14.13
A04	53,325	1,659,503	3.21
A05	37,306	521,917	7.15
A06	189,505	2,328,410	8.14
A07	76,416	1,173,263	6.51
A08	109,712	1,518,860	7.22
A09	60,122	634,985	9.47
A10	61,667	486,100	12.69
A11	64,785	412,450	15.71
A12	40,017	585,135	6.84
A13	18,841	322,789	5.84
A14	50,042	475,630	10.52
A15	15,553	149,168	10.43
A16	106,860	737,318	14.49
Average	67,619.68	868,838.44	13.89

Source: Field survey (November - December) 1976.

Table 4.6 Labour cost in relation to total cost in 1975

Firm Code	(a) Labour Cost (₦)	(b) Total Cost (₦)	(a) as % of (b)
L01	95,900	1,090,512	8.79
L02	83,343	1,010,297	8.25
L03	30,316	172,793	17.54
L04	61,850	1,091,563	5.67
L05	34,019	307,292	11.07
L06	231,593	1,673,517	13.84
L07	80,497	873,708	9.21
L08	65,392	452,849	14.44
L09	72,827	733,033	9.94
L10	62,645	197,807	31.67
L11	69,256	425,647	16.27
L12	n.a.	n.a.	n.a.
L13	26,481	155,552	17.03
L14	71,529	463,569	15.43
L15	9,714	119,171	8.15
L16	134,000	630,613	21.25
Average	75,290.8	628,078.80	9.07

Source : Field survey (November - December) 1976.

N.A. Not Available

Table 4.7 : Raw materials cost in relation to total cost in 1974

Firm Code	(a) Raw material Cost (₦)	(b) Total Cost (₦)	(a) as % of (b)
A01	1,098,664	1,480,262	74.22
A02	846,244	1,238,938	68.30
A03	85,792	176,685	48.56
A04	1,284,268	1,659,503	77.39
A05	385,345	521,917	73.83
A06	1,350,525	2,328,410	58.00
A07	874,263	1,173,263	74.51
A08	1,096,679	1,518,860	72.20
A09	295,344	634,985	46.51
A10	177,928	486,100	36.60
A11	176,292	412,450	42.74
A12	194,728	585,135	33.28
A13	252,488	322,789	78.22
A14	254,944	475,630	53.60
A15	112,767	149,168	75.60
A16	464,198	737,318	62.96
Average	559,404.30	868,838.44	61.03

Source : Field survey (November - December) 1976.

Table 4.8: Raw materials cost in relation to total cost in 1975

Firm Code	(a) Raw Material Cost (₦)	(b) Total Cost (₦)	(a) as % of (b)
A01	701,811	1,090,512	64.36
A02	634,264	1,010,297	61.79
A03	63,865	172,793	48.53
A04	912,707	1,091,563	83.61
A05	176,761	307,292	57.52
A06	893,601	1,673,517	53.40
A07	558,440	873,708	63.92
A08	206,543	452,849	45.61
A09	362,208	733,033	49.41
A10	56,125	197,807	28.38
A11	208,482	425,647	48.98
A12	n.a	n.a	n.a
A13	96,800	155,552	62.23
A14	192,488	463,569	41.52
A15	141,970	169,463	76.92
A16	289,662	630,613	45.93
Average	363,695.80	628,078.80	55.42

Source :- Field survey (November - December) 1976

N.A. Not Available

Table 4.9. Selling and shipping expenses in relation to total cost in 197[illegible]

Firm Code	(a) Selling and Shipping Expenses (₦)	(b) Total Cost (₦)	(a) as % of (b)
A01	31,979	1,480,262	2.16
A02	76,814	1,238,938	6.20
A03	9,835	176,687	5.57
A04	260,909	1,659,503	15.72
A05	2,519	521,917	0.48
A06	199,215	2,328,410	12.85
A07	70,362	1,173,263	6.00
A08	32,437	1,518,860	2.13
A09	136,240	634,985	21.45
A10	119,361	486,100	24.55
A11	63,119	412,450	15.30
A12	72,713	585,135	12.43
A13	25,530	322,789	7.91
A14	36,200	475,630	7.62
A15	542	149,168	0.36
A16	1,839	737,318	0.25
Average	77,475.86	868,838.44	8.81

Source: Field survey (November - December) 1976.

Table 4.10 : Selling and shipping expenses in relation to total cost in 1975

Firm Code	(a) Selling and Shipping Expenses (₦)	(b) Total Cost (₦)	(a) as % of (b)
A01	84,228	1,090,512	7.72
A02	36,038	1,010,297	3.57
A03	7,073	172,793	4.09
A04	56,536	1,091,563	5.18
A05	15,227	307,292	4.96
A06	53,648	1,696,776	3.16
A07	73,837	873,708	8.45
A08	17,194	452,849	3.80
A09	138,654	733,033	18.92
A10	5,058	197,807	2.52
A11	59,054	425,647	13.87
A12	n.a	n.a	n.a
A13	4,734	155,552	3.04
A14	30,755	463,569	6.63
A15	588	119,171	0.49
A16	1,313	630,613	0.21
Average	38,929.13	628,078.80	5.78

Source:- Field survey (November - December) 1976.

N.A. Not Available

Table 4.11: Fixed costs in relation to the total cost in 1974

Firm Code	(a) Charges on Borrowed Capital (₦)	(b) Depreciation on Fixed Assets (₦)	(c) Total Cost (₦)	(a) as % of (c)	(b) as % of (c)
A01	68,682	23,156	1,480,262	4.64	1.56
A02	17,771	59,743	1,238,938	1.43	4.82
A03	14,209	15,346	176,687	8.04	4.68
A04	-	5,867	1,659,503	-	0.35
A05	6,601	9,437	521,917	1.26	1.82
A06	30,740	87,524	2,328,410	1.32	3.76
A07	1,000	27,384	1,173,263	0.09	2.33
A08	87,497	59,504	1,518,860	5.76	3.92
A09	658	37,417	654,985	0.10	5.89
A10	-	74,889	486,100	-	15.41
A11	-	58,585	412,450	-	14.20
A12	-	23,837	585,135	-	4.07
A13	3,670	5,985	322,789	1.17	1.82
A14	-	49,389	475,630	-	10.38
A15	2,528	-	149,168	-	1.69
A16	-	51,314	737,318	-	6.96
Average	14,426.75	36,836.06	868,838.44	1.49	5.23

Source : Field Survey (November - December) 1976

Table 4.12: - Fixed costs in relation to the total cost in 1975

Firm Code	(a) Charges on borrowed capital (₦)	(b) Depreciation on all fixed Assets (₦)	(c) Total Cost (₦)	(a) as % of (c)	(b) as % of (c)
A01	59,212	25,011	1,090,512	5.43	2.29
A02	18,934	62,325	1,010,297	1.87	6.17
A03	9,604	6,521	172,793	5.56	3.77
A04	-	6,300	1,091,563	-	0.58
A05	6,409	8,032	307,292	2.09	2.61
A06	34,062	99,543	1,673,517	2.01	5.87
A07	30,049	50,454	873,708	3.44	5.77
A08	31,495	66,824	733,033	0.12	6.70
A09	862	49,221	452,849	6.95	14.75
A10	-	12,310	197,807	-	6.22
A11	-	14,057	425,647	-	3.30
A12	n.a	n.a	n.a	n.a	n.a
A13	3,019	9,036	155,552	1.94	5.8
A14	-	62,578	463,569	-	13.56
A15	-	3,230	119,171	-	2.73
A16	-	43,912	630,613	-	6.96
Average	12,908.4	34,643.6	628,078.80	1.96	5.80

n.a. = The record for 1975 is not available.

Source:- Field survey (November - December) 1976.

are therefore calculated by taking a product of prices and different quantities and types of rubber product. In some cases where the volume of sales is not clearly recorded, the gross receipts were computed from either the output or the quantity of rubber shipped plus local sales at the average prevailing price.

The results of the returns analysis are presented in tables 4.13 and 4.14 for the two years under review. The result of the analysis shows that in 1974, twelve firms representing 75 percent of the total number of firms studied recorded positive returns and in 1975, eleven firms representing over 70 percent of all firms studied recorded positive returns. Also in 1974, the positive net returns to the firms ranged between ₦18,095 to ₦828,505 while in 1975, it ranged between ₦25,288 to ₦638,989.

From the analysis, it can be observed that some firms recorded negative net returns. In fact, four out of the total number of firms studied recorded negative net returns in 1974 while the number was also four in 1975. The negative net returns recorded in 1974 ranged between ₦527,449 to ₦46,994 and from ₦483,444 to -₦74,893 in 1975.

Tables 4.15 and 4.16 present the comparative analysis of gross receipts, total cost and net returns for the industry in 1974 and 1975.

Table 4.13 Gross receipts total cost and net revenue in 1974

Firm Code	Gross Receipts (₦)	Total Cost (₦)	Net Revenue (₦)
A01	1,540,918	1,480,262	60,655
A02	1,301,838	1,238,938	62,900
A03	233,157	176,685	56,472
A04	1,132,054	1,659,503	-527,449
A05	540,612	521,917	18,695
A06	3,156,915	2,328,419	828,505
A07	891,112	1,173,263	-282,151
A08	1,810,978	1,518,860	292,118
A09	981,695	634,985	346,710
A10	439,106	486,100	-46,994
A11	339,850	412,450	-72,600
A12	898,229	585,135	313,094
A13	470,880	322,789	148,091
A14	881,537	475,630	405,907
A15	258,558	149,168	109,390
A16	820,678	737,318	83,360

Source : - Field survey (November - December) 1976.

Table 4.14 : Gross receipts, total cost and net revenue in 1975

Firm Code	Gross Receipts (₦)	Total Cost (₦)	Net Revenue (₦)
A01	607,068	1,090,512	-483,44
A02	1,035,585	1,010,297	25,288
A03	208,117	172,793	35,324
A04	1,210,255	1,091,563	118,692
A05	338,885	307,292	31,593
A06	2,335,985	1,673,517	662,468
A07	598,596	873,708	-275,112
A08	339,432	452,849	-113,417
A09	850,483	733,033	117,450
A10	122,914	197,807	- 74,893
A11	558,653	425,647	133,006
A12	n.a	n.a	n.a
A13	206,195	155,552	50,643
A14	679,400	463,569	215,831
A15	151,315	119,171	32,144
A16	663,459	630,613	32,846

Source : Field survey (November - December) 1976.

N.A. Not Available

Table 4.15 : Gross receipts , cost and net returns for the processing firms in 1974

Firm Code	Gross Receipts (₦)	Variable Cost ₦	Fixed Cost ₦	Total Cost ₦	Net Returns ₦
A01	1,540,918	1,388,424	91,838	1,480,262	60,656
A02	1,301,838	1,161,424	77,524	1,238,938	62,900
A03	233,157	147,130	29,555	176,685	56,472
A04	1,132,054	1,653,636	5,867	1,659,503	-527,449
A05	540,612	505,879	16,038	521,917	18,695
A06	3,156,915	2,210,146	118,264	2,328,410	828,505
A07	891,112	1,144,875	28,384	1,173,263	-282,151
A08	1,810,978	1,371,859	147,001	1,518,860	292,118
A09	981,695	596,910	38,075	634,985	346,710
A10	439,106	411,211	74,889	486,100	- 46,994
A11	339,850	333,865	58,585	412,450	- 72,600
A12	898,229	561,298	23,837	585,135	313,094
A13	470,880	313,134	9,555	322,789	148,091
A14	881,537	426,241	49,389	475,630	405,907
A15	258,558	146,640	2,528	149,168	109,390
A16	820,678	686,004	51,314	737,318	83,360

Source :- Field survey (November - December) 1976.

Table 4.16: Gross Receipts, Cost and Net Returns for the Processing Firm in 1975

Firm Code	Gross Receipts ₦	Variable Cost ₦	Fixed Cost ₦	Total Cost ₦	Net Returns ₦
A01	607,068	1,006,289	84,223	1,090,512	-483,444
A02	1,035,585	929,038	81,259	1,010,297	25,288
A03	208,117	156,668	16,125	172,793	35,324
A04	1,210,255	1,085,263	6,300	1,091,563	118,692
A05	338,885	292,851	14,441	307,292	31,593
A06	2,335,985	1,563,171	133,605	1,696,776	638,989
A07	598,596	792,530	98,299	452,849	-275,112
A08	339,432	354,550	80,503	873,033	-117,450
A09	850,483	682,950	50,083	733,033	117,450
A10	122,914	185,497	13,310	197,807	-74,893
A11	558,653	411,590	14,057	425,647	133,006
A12	n.a	n.a	n.a	n.a	n.a
A13	206,195	143,497	12,055	155,552	50,643
A14	679,400	400,691	62,878	463,569	215,871
A15	151,315	115,941	3,230	119,171	32,144
A16	663,459	586,701	43,912	630,613	32,846

Source :- Field Survey (November - December) 1976.

From these tables, it can be observed that there was a general decline in net returns to these firms in 1975 in comparison with those of 1974. This decline is attributable to many factors. These factors include non-availability of raw materials (which in turn reduced the volume of sales). Also, lack of raw materials led some mills to operate below optimum capacity.

Another factor which led to lower net returns in 1975 is the Udoji salary award which in a way reduced the output of the industry because many workers went on strike for months whilst production expenses rose astronomically. This constituted a double drain on the profits of processors.

Finally, table 4.17 shows the net return per tonne of processed rubber in all the processing firms in 1974 and 1975. This can be used in comparing the economic performance of all the firms within the processing industry. It also shows how efficient the firms are. The performances of all the firms in 1974 were higher than the performances in 1975. All the factors that are responsible for this generally poor economic performance by all the firms were mentioned earlier.

Table 4.17 : Net returns per tonne of processed rubber in all the processing firms in 1974 and 1975

Firm Code	Net Return Per Tonne	
	1974	1975
A01	12.52	-290.70
A02	15.37	8.08
A03	81.02	61.97
A04	-121.48	21.31
A05	10.28	33.36
A06	106.00	95.29
A07	72.29	-119.72
A08	52.72	- 92.58
A09	145.68	47.94
A10	-41.37	-187.23
A11	-51.27	-137.54
A12	174.62	n.a
A13	185.68	76.27
A14	101.43	135.23
A15	117.75	82.58
A16	33.45	14.39

N.A. Not Available

CHAPTER V

COST FUNCTIONS FOR RUBBER PROCESSING INDUSTRY

A. Preliminary considerations

During the last decade, a number of scholars have carried out some work on cost functions in Agricultural production. One of such studies is by Drs. Oni and Olayemi on the cost and returns in cocoa production in the Western state of Nigeria.(45) In that study, the authors attempted to derive a functional relationship between cocoa acreage and unit cost of production. They assumed a perfectly competitive resource market and applied the quadratic equation to obtain the minimum point of average cost. This point of minimum average cost was said to represent the long-run equilibrum size of cocoa holding. The authors however, presumed that the result would be of limited empirical value for two reasons: firstly, the derived equilibrum size was based on the assumption of the static concept of perfect competition and secondly, there was a marked heterogeneity in the farm population being studied.

Another relevant study was carried out by Akinwumi in 1970(5). This study was concerned with the Economics of Maize Production in Oyo division in Western State of Nigeria. The author estimated the cost-output relationships for both early and late maize by fitting five functions namely; Linear,

Double-log, Inverse Semi-log, Quadratic and square root. The results obtained showed that there was little or no correlation between output of early maize and total cost because the coefficients of multiple determination (R_s^2) were very low. This low correlation was attributed to the ommission of some important explanatory variables in the model as well as the inherent errors of measurements on the field.

A more recent work was that of Adeniyi,(3) which focussed on the Economics of Irrigated rice production in Bida division, North Western State of Nigeria. This study estimated some cost-output relationships for irrigated rice production in Nadeggi and Edozhigi local government areas of Niger State. The approach and findings of this study were similar to those of Akinwumi since the coefficients of multiple determination (R_s^2) were generally low (probably due to ommission of some important factors).

All three studies dealt with on-the-farm agricultural production cost functions in different parts of the country. The major objective of this chapter is to estimate the cost functions for an agro-allied industry - the rubber processing industry.

Certain assumptions have to be made in this analysis. The assumptions are as follows:-

(a) That in all the rubber processing firms studied, all the cost items are similar for the same kinds of operations. Thus the

same equipment, raw materials etc. are used to varying levels for producing rubber sheets in each firm which produced sheets etc.

(b) That based on the above assumption, the cost functions derived should be similar for all firms.

(c) That cost functions derived should be valid.

(d) That the period of two years (1974 and 1975) being analysed in this study is too short to permit major changes in the sizes of plants. This means that short-run analysis is more relevant.

B. The Basic model

Cost-output relationship

In the empirical estimation of cost functions for the rubber processing firms, the cost (C) which was specified in this study as (i) Total variable cost and (ii) Total cost was related to processed output (Q). For each relationship i.e. Total variable cost against Total output and Total cost against Total output, the following six functional forms were tried.

E.Q. (1) $C = bo + b_1Q$ ---------- Linear

E.Q. (2) $\text{Log } C = bo + b_1 \text{log} Q$ ----------Cobb-Douglas

E.Q. (3) $\text{Log } C = bo + b_1Q$ ---------- Exponential

E.Q. (4) $C = bo + b_1 \text{log} Q$ ----------Semi-log

E.Q. (5) $C = bo + b_1Q + b_2Q^2$ ----------Quadratic

E.Q. (6) $C = bo + b_1Q + b_2Q^{\frac{1}{2}}$ ----------Square root.

Where C represents either the Total variable cost or Total cost and Q the total output of processed rubber.

C. Data sources and empirical results

The data were collected from 16 firms for two years period - 1974 and 1975, a period too short for the industry or each firm to change its scale of production. The six functions as stated earlier were fitted separately to each of the two yearly data and the empirical results obtained for total average cost against total output are summarized in tables 5.1 and 5.2 while that of Total cost against total output are presented in tables 5.3 and 5.4.

Considering the results of the six fitted equations for the two separate cost-output relationships, the total variable cost results have been chosen as the cost functions for the rubber processing industry mainly for the following reasons;

(i) the period of study is regarded as a relatively short period during which the firms could not have made significant changes in their scale of production,

(ii) the value of the coefficients of multiple determination (R^2)

(iii) the significance of the regression coefficients as increased by F - test.

(iv) the relationship between the regression coefficients and their

standard errors of estimate (a rule of thumb is that the regression coefficient must at least be one and half times greater than their standard errors of estimate), and whether or not the equations contradict a priori expectations with reference to signs of the parameters.

The Cobb-Douglas and semi-log functions are linear and so it is not possible to derive an optimum level of output. Therefore, the quadratic function, which also performed reasonably well has been selected as the lead equation.

The lead equation (Quadratic) for the total variable cost against total output in 1974 is prevented below.

$$\text{E.Q. (7)} = 201.496 + \underset{(0.02733)}{0.0380Q} - \underset{(0.0000017)}{0.0000028Q^2}$$

$$R^2 = 0.425$$

F-Value = 1.480**

Note in brackets = Standard error

** = F-Value significance at 10%

For 1975, the lead equation (Quadratic equation) is presented below.

$$\text{E.Q. (8)} \quad C = 386.173 + \underset{(0.009034)}{0.01105Q} - \underset{(0.0000005)}{0.0000009Q^2}$$

$R^2 = 0.331$, F-value = 0.741

Note in bracket = standard error

Table 5.1 : 1974 Cost functions for Rubber Processing Industry TVC/Q

EQUATION	Dependent Variable	Constant Term	Regression Coefficient		R^2	F-Ratio
LINEAR	TVC	239.857	0.00957Q (0.00640)		0.327	1.675*
EXPONENTIAL	TVC+	2.365	0.0002Q (0.00001)		0.366	2.164*
SEMI-LOG	TVC	6.947	77.346Q+ (47.3198)		0.400	2.672*
DOUBLE LOG COBB-DOUGLAS	TVC+	1.947	0.1465Q+ (0.0782C		0.448	3.507*
QUADRATIC	TVC	201.496	0.0380Q (0.02733)	$-0.00000028Q^2$ (0.00000A)	0.425	1.480*
SQUARE ROOT	TVC	86.525	0.04297Q (0.04672)	5.980Q (5.251)	0.433	1.502*

Figures in brackets represent standard errors of the coefficients

Note * = Significant at 10%

\+ = log of the variable

Table 5.2 : 1975 Cost functions for rubber processing industry TVC/Q

EQUATION	Dependent Variable	Constant Term	Regression Coefficients		R^2	F-Ratio
LINEAR	TVC	402.620	0.02858Q (0.02292)		0.327	1.555*
EXPONENTIAL	TVC+	2.585	0.00004Q (0.00002)		0.458	3.447 *
SEMI-LOG	TVC	698.141	113.636Q+ (113.173)		0.264	0.974
DOUBLE-LOG (COBB-DOUGLAS)	TVC+	3.023	0.16420Q+ (0.10468)		0.399	2.460*
QUADRATIC	TVC	386.173	0.0011059Q (0.009034)	$-0.0000009Q^2$ (0.0000005)	0.331	0.741
SQUARE ROOTS	TVC	320.801	0.6625Q (0.01204)	$+3.831240Q^{\frac{1}{2}}$ (1.200726)	0.338	0.775

In bracket = standard error

\+ = log of the variable

* = Significant at 10%

Table 5.3. 1974 cost functions for rubber processing industry TC/O

EQUATION	Dependent Variable		Regression Coefficients X(Q)		R^2	F-Ratio
LINEAR	TC	267.872	0.0000051Q (0.0000023)		0.225	0.749
EXPONENTIAL	TC$^+$	2.410	0.0000028Q (0.0000009)		0.286	1.248
SEMI-LOG	TC	-88.455	56.087Q$^+$ (53.539)		0.270	1.097
DOUBLE-LOG (COBB-DOUGLAS	TC$^+$	1.696	0.11215Q$^+$ (0.08237)		0.342	1.854*
QUADRATIC	TC	-	-		-	-
SQUARE ROOT	TC	64.864	-0.00001Q (0.00002)	0.08487Q$^{\frac{1}{2}}$ (0.012707)	0.286	0.583

In brackets = Standard error

$^+$ = log of the variable

* = Significant at 10%

Table 5.4 : 1975 cost functions for rubber processing industry TC/Q

EQUATION	Dependent Variable	Constant Term	Regression Coefficient X(Q)	r^2	F-Ratio
LINEAR	TC	413.751	-0.000001Q (0.000001)	0.473	3.745*
EXPONENTIAL	TC+	2.61136	0.0000012Q (0.0000008)	0.568	6.190*
SEMI-LOG	TC	1159.811	-123.806Q+ (75.314)	0.415	2.702*
DOUBLE-LOG COBB-DOUGLAS	TC+	3.627	-0.16847Q+ (0.8127)	0.498	4.297*
QUADRATIC	TC	-	-	-	-
SQUARE ROOT	TC	382.582	-0.000002Q . 0.0308$Q^{\frac{1}{2}}$ (0.000004) (0.16657)	0.473	1.750

In brackets = Standard Error

\+ = Log of the variable

* = Significant at 10%

It would be seen from table 5.1 that the coefficients of multiple determination (R^2s) were generally low (ranging from 0.327 in linear to 0.448 in the Cobb-Douglas equation for 1974). Also in table 5.2, the values of R^2 ranged from 0.264 in semi-log function to 0.458 in Exponential equation. This in essence indicates that for 1974, between 33 percent and 45 percent of the variability in the total variable cost could be explained by output of processed rubber alone whereas in 1975, between 26 percent and 46 percent of the variability in cost was explained by variation in processed rubber output. The low values of coefficients of multiple determination (R^2s) which in fact are not peculiar to this study could be explained. Other factors such as management capability, institutional arrangements, varying levels of capacity utilization which were not incorporated into this model also affect the total variable cost outlay for the industry.

Optimum point of production

One important optimizing behaviour for the rubber entrepreneur is to operate at its optimum point with respect to a given plant size. However, as far as the industry is concerned, the optimum point to produce is the point where the total variable cost is minimum. Given the various cost functions, what will be the optimum point of operation for each rubber

processing firm? In order to answer this question, the first derivative of the lead equation (Quadratic) was equated to zero and solved for Q. Then the second derivative was examined for its sign, since when it is positive, a minimum point is established but when it is negative, a maximum point is reached on the curve.

The following results obtained for the two years are presented below.

For 1974

$$TVC = 201.490 + \underset{(0.02733)}{0.0380Q} - \underset{0.0000017)}{0.0000028Q^2}$$

$$\frac{dTVC}{dQ} = 0.0380 - 0.0000056Q$$

$$0.0380 - 0.0000056 = 0$$

$$0.0000056Q = 0.0380$$

$$Q = \frac{0.0380}{0.0000056}$$

$$= 6785.71 \text{ tons}$$

Taking the second derivative, we obtain:

$$\frac{d^2TVC}{dQ^2} = - 0.0000056$$

This is negative and confirms that a maximum has been obtained. Thus in 1974, the optimum output at minimum total variable cost for maximum profit is given above as 6785.71 tons. When compared with the mean output value of the whole industry for the same year (which was

2050 tons). It would be seen that in 1974, the firms in the industry were working far below the optimum capacity. The reason for this may be due to lack of raw materials as well as lack of sound management practice.

In order to compare the optimal output for the two years under review, the optimum output for 1975 was also estimated

In 1975

$$TVC = 386.173 + \underset{(0.009034)}{0.0115Q} - \underset{(0.0000005)}{0.0000009Q^2}$$

$$dTVC = 0.01105 - 0.0000018Q$$

$$0.01105 - 0.0000018Q = 0$$

$$0.0000018Q = 0.01105$$

$$Q = \frac{0.01105}{0.0000018}$$

$$Q = 6138.89 \text{ tons}$$

Taking the second derivative, we obtain

$$\frac{d^2 TVC}{dQ^2} = -0.0000018$$

In 1975, the optimum output of 6138.89 tons was also very much higher than the mean operating output of 2912 tons. The optimal outputs for the two years appear quite close which in essence shows that no changes

actually occured in terms of physical investments and processing technologies in plants between 1974 and 1975. The rising variable costs explain in part the drop in optimal output.

In conclusion, the processors in most cases mentioned lack of raw materials and the adverse effects of the Udoji salary award as the main reasons for operating far below the optimum capacity.

CHAPTER VI

FACTORS LIMITING THE EXPANSION AND ECONOMIC PERFORMANCE OF THE RUBBER PROCESSING INDUSTRY

A. Factors Limiting Expansion

The growth and expansion of the industrial sector of the economy have always been given top priorities by the Federal Government of Nigeria. Towards these ends, the Federal Government has embarked on certain schemes and policies. These policies include: (i) income tax relief (ii) Import duties relief (iii) Custom Duties (dumped and subsidized goods) act (iv) Company tax and (v) Double taxation relief, to mention a few. These policies protected the young indigenous companies from fierce competition coming from well established overseas manufacturers.

The rubber industry like many other industries in the country has experienced considerable fluctuations in size and growth over the years. In the early part of this century, the number of firms in the industry was quite few. Between 1950 - 1965, (a period which could be regarded as the peak growth period), the number of rubber processing firms increased substantially. However, this number dropped in the late sixties following the outbreak of the civil-war. Some firms folded-up due to shortage of raw materials. Even after the civil-war, the situation still remained the same

and could even be regarded as worsening. Instead of expanding, the processing industry within the country is in fact now contracting in number of firms. Why is this so?

During the field survey, an effort was made to find out the cause of this apparent decline in the number of firms. The processors were asked to indicate their assessment of the entire industry in Nigeria. They were asked to rank those factors limiting their growth and expansion from the following list of factors.

(i) Lack of capital

(ii) Lack of demand for finished products

(iii) Shortage of raw materials

(iv) Restriction on importation

(v) Shortage of technical staff

(vi) Shortage of management personnel

(vii) Shortage of equipment, and

(viii) Shortage of spare parts.

All the sixteen firms studied responded enthusiastically to this section of the questionnaire. Besides ranking the factors, some firms gave additional information which though not listed above could enhance a rapid expansion of the industry. The results of the ranking obtained

from all the firms have been summarized in table 6.1. These results were subject to a non-parametric statistical test in order to determine the degree of association among the ranking.

Non-parametric statistics is based on the order of the observations and does not depend on a specific distribution of the data in question. Such a statistics is called a distribution-free statistic. Apart from being a relatively simple statistical technique to compute, it allows the analysis of data which may not be numerically precise but which throw light on the order of importance of the statements being analysed. There are many non-parametric techniques such as the Spearman Rank correlation, the sign test, Kendall coefficient of concordance (W) etc. The most suitable technique for this study is the Kendall coefficient of concordance (W) because it can cope with many rankings without signs.

Apart from being very reliable, this technique gives a measure of the degree of association among a number of observers or judges. Also, in a unique way, it provides a simple measure of agreement among several statements in order of rankings. The mathematical notation used in this analysis is shown below:

R_i = Sum of Ranks (statements)

$\leq R_i$ = Total sum of Ranks (statements)

$\frac{\leq R_i}{N}$ = Mean of sum of Ranks

$(R_i - \frac{\Sigma R_i}{N})$ = Deviation from rank mean

$S = \Sigma(R_i - \frac{\Sigma R_i}{N})^2$ = Sum of squares of deviation from rank mean

$W = \frac{12\,S}{K^2(N^3 - N)}$ = Coefficient of concordance

where

N = Number of stated statements

K = Number of Judges (processors)

Using the rankings, the eight statements ranked by the processors are presented in the magnitude of the various sums of ranks (R_i) in table 6.1. The most important statements were given the smallest numerical values. The analysis of ranks were derived and presented in table 6.2

The agreement as to the ranking of the statements among the processors is expressed by W = 0.439. For a meaningful interpretation of the results of this analysis, the test of significance of the calculated value of (W) was carried out by finding X^2 as given by the formula below

$$X^2 = \frac{S}{1/12 KN(N+1)}$$

As a rule, when N (the number of statements is larger than 7 as in this study, the above expression is approximately distributed as chi-squared with N - 1 degrees of freedom.

Table 6.1 : Ranks assigned to the factors affecting the Expansion of the rubber processing industry in order of importance

STATEMENTS

Firm Code	I	II	III	IV	V	VI	VII	VIII
A01	1	3	8	7	5	6	2	4
A02	1	8	3	7	5	4	2	6
A03	8	7	3	5	6	1	4	2
A04	3	8	1	7	6	5	4	2
A05	1	3	6	8	7	5	4	2
A06	3	8	7	5	4	6	1	2
A07	1	3	6	8	7	4	5	2
A08	1	8	3	7	5	6	4	2
A09	4	3	6	8	7	5	1	2
A10	1	8	3	7	5	6	4	2
A11	1	8	3	7	5	6	4	2
A12	8	7	3	4	5	2	1	6
A13	3	8	7	5	2	6	1	4
A14	4	8	7	5	6	3	2	1
A15	1	8	3	7	5	6	4	2
A16	1	6	3	8	7	5	4	2
	42	104	72	105	87	76	47	43

Source: - Field survey 1976

Table 6.2 : Analysis of ranks assigned to the eight statement by sixteen rubber processors

STATEMENT / FIRM	I	II	III	IV	V	VI	VII	VIII
R_i	42	104	72	105	87	76	47	43
$R_i - \frac{\sum R_i}{N}$	-30.00	32.00	0.00	33.00	15.00	4.00	-25.00	-29.00
$(R_i - \frac{\sum R_i)^2}{N}$	900.00	1024.00	0.00	1089.00	225.00	16.00	625.00	841.00

From table 6.2, the following statistics were computed

$$\sum R_i = 576$$

$$\frac{\sum R_i}{N} = 72$$

$$N = 8$$

$$K = 16$$

$$S = \sum (R_i - \frac{\sum R_i}{N}) = 4720.00$$

Given the above information, we can now compute the coefficient of concordance using the formula

$$W = \frac{12\,S}{K^2(N^3 - N)}$$

Substituting the calculated statistics, we obtain,

$$W = \frac{56640}{129024} = 0.439$$

which is tested by reference to table A in appendix II of Yates.

If the value of X^2 computed from above expression exceeds the tabulated figure for a particular level of significance and a particular value of df = (N - 1) then the null hypothesis (H_o) that the (K) rankings are unrelated is rejected at that level of significance.

In this study, it was found that W = 0.439 and the significance was determined by applying the expression below:

$$X^2 = K(N - 1)W$$

$$= 16(6 - 1)\ 0.439$$

$$\chi^2 = 49.166$$

The tabulated X^2 value is 18.48 at 1% level of significance i.e. the calculated X^2 is greater than the tabulated X^2 showing that there is significant difference.

In concluding, since calculated χ^2 exceeds the tabulated χ^2 value, the coefficient of concordance is statistically significant at one percent level, thus indicating a rejection of the null hypothesis that the rubber processors rankings are unrelated to each other. Therefore, there is an agreement in the ranking of the statements by the processors.

Interpretation of the Results

The significance of the calculated (W) leads to the careful observation of the order of the magnitude of the various sums of ranks (R_1). The results

of the chi-square and the significance of the coefficient of concordance (W) indicate that the ordering of the statements by the processors are relatively uniform. The least sum of ranks corresponds with the most important statement among all the statements. The highest sum correspond with the least importance factor affecting the expansion of the industry.

Following the above ranking procedure, the order of importance of the eight statements as made by the processors are as follows:

(i) Lack of capital

(ii) Shortage of spare parts

(iii) Shortage of equipment and repairs men

(iv) Shortage of raw materials

(v) Shortage of management staff

(vi) Shortage of technical staff

(vii) Lack of demand for finished products

(viii) Restriction on importation.

On going through the above ordering of the statements as ranked by the processors, one could easily see that lack of capital with the least sum of ranks is regarded by most processors as the most limiting factor affecting their expansion. Next to this are shortage of spare parts, repair and maintenance workers and shortage of raw materials. The two least important factors are lack of demand for finished products and

restrictions on importation.

It should be emphasized however that the significant value of (W) and the result of chi-square do not necessarily mean that the pooled orderings observed by the processors are correct and exact. Infact, there are other factors not listed above but which have considerable ratings among each processor. Such factors however vary from one processor to the other and it was admitted by many processors that once the first three or four limiting factors have been taken care of, others would automatically be solved.

B. Factors limiting the economic performance of the rubber processing firms

The above factors found to have affected the expansion of the industry were also limiting the economic performance of the existing firms. Though we accept in principle the ordering of the factors as given by the analysis, the present processing operation is afflicted by a number of problems. These problems invariably limit the profitability of the rubber processing firms. These problems include lack of capital, shortage of spare parts and maintenance workers, shortage of raw materials and labour.

(i) Lack of capital

The major problem confronting the rubber processing firms is the lack of adequate capital. This problem is rampant in most developing

countries. In recent times, Nigeria is gradually overcoming this with the mass production of crude oil. The rubber processing industry is relatively capital intensive. The current shortage of capital as claimed by most processors also lead to scarcity of raw materials since most processors need operating capital to purchase latex or other raw materials. As a whole, rubber industry demands a substantial amount of working capital to meet operating expenses such as purchase of raw materials, labour and other inputs. Also, for a steady supply of rubber lumps, the processors have to make contracts with local rubber lump contractors and pay these contractors in advance. Besides, a lot of fund is spent on wages, plant and machinery repairs and maintenance.

Another important aspect is that the large amount of capital is necessary to purchase new equipment since most of the machines are old and obselete. The processors desire to purchase new sets of machines which can process good quality crumbs.

However, not all the processors are equally affected by the lack of funds. Some processors such as government owned mills, corporation owned mills and some processing firms with government and foreign investors are not in short of fund. The indigenous processors are mostly affected by lack of fund since they find it difficult to loan funds from commercial Banks.

(ii) Shortage of spare parts and maintenance workers

The second limiting factor is the shortage of spare parts for processin machines and equipment. This problem is however not peculiar only to the rubber processing industry. It is infact a nation-wide one affecting most industries. All the equipment and machines used in rubber processing are imported. In some cases, processors purchased old but reconditioned machines. These machines breakdown quite frequently and require a large stock pile of spare parts to keep them in operation. Since these spare-parts are also imported, it usually takes months before they are made available to the processors. The delay is often attributed to the port congestion and bureaucracy involved in obtaining the licences from the Federal Ministry of Trade and Industry. In addition, difficulties arise in securing good maintenance technicians as repair workmen.

(iii) Shortage of raw materials

This is also a major problem facing the processing industry. Natural rubber in terms of latex lumps and scraps form the bulk of material input of the processing firms. The continuous shortage of raw materials commenced during the war. This condition has persisted long after the civil war as a result of the following reasons.

(A) Low yield of rubber trees

The old age of the existing rubber plantations and those of small-holdings has been responsible for the decline in latex yield. This age factor coupled with unselected species cultivated by most smallholders, the prevalence of root diseases culmilate in poor yield for the rubber trees. Many of the smallholdings were cultivated in the early part of this century and thus overdue for rehabilitation.

(B) Lack of labour for tapping

Another major attribute for the shortage of raw materials is the lack of labour to tap the rubber trees. Since the out-break of the civil war in 1967, when the tappers who were mostly Ibos had to leave, the industry has been faced with non-availability of good rubber tappers. According to a report by a working party on rubber production in Bendel state as a result of shortage of raw materials, five crepe factories out of the existing eighteen mills which were located in the state had to close down between 1967 and 1968.

Also, the returns to the smallholders have been too low when compared with returns from alternate employment opportunities. For example, the tappers prefer to work as garderners in the "oil boom area" rather than stay as smallholder rubber farmers. Thus, during and after the civil war, the job of tapping has been virtually left for women and boys whilst

the itinerant tappers have been employed elsewhere.

It should however be noted that the raw material shortage situation is lighter where shortage of tappers is not acute since the tappers are rated like their counterparts in other government owned establishments. Inspite of this attractive renumeration, some rubber plantations are still short of tappers and hence the mills have to work at low capacity.

With regards to non-plantation mills which depend solely on the smallholders, the lack of latex supply has led to the folding up of some of the establishments.

(iv) Labour problem

Another problem which is though not regarded as a major problem is labour. This is perhaps the industry is relatively less labour intensive. Instead of labour shortage, what is common within the industry among the unskilled labour force is frequent absenteeism and short stay periods by workers. This is attributed to better opportunities outside the rubber processing industry. Due to the prevailing adverse condition in terms of profits to the processors, many could not pay wages that would make them stay in the industry. There is a general shortage of technical and management staff. As a result of the indigenization decree the top posts in the industry

are manned by Nigerians. As presented earlier in table 3.6 of chapter three, it could be seen that there were only nine Expatriate in the industry in 1974 and by 1975, this was reduced to eight. They held top management posts in the industry. The shortage of unskilled labour is being experienced on rubber plantations, estates and small holdings.

(v) Marketing problem

Lastly, the processors however stated there is always demand for their finished products which further confirms the mutual exclusiveness of synthetic rubber and natural rubber. But the frequent fluctuations in and low prices of natural rubber make the processors to be cautious in making contract for their products. Infact, some processors have direct contact with the overseas buyers while many sell through local marketing agents.

CHAPTER VII

AN ANALYSIS OF FINANCIAL STATEMENTS AND ESTIMATION OF PROFIT FUNCTIONS OF THE RUBBER PROCESSING INDUSTRY

A. Preliminary Consideration

This chapter examines the financial statements and estimates some profit functions for the rubber processing firms. In the first part of the chapter, some financial ratios are computed for those firms which submitted their Balance Sheets and Income statements for the period of 1974 and 1975. In the second part, some empirical estimates of the profit functions are made. In deriving the profit functions least square multiple regression techniques were adopted.

B. Financial ratios and their use in business management

The term "Financial Ratios" is used to describe significant relationships which exist between two pieces of financial data. These ratios serve many purposes: they can be used to evaluate the financial condition and performance of a business organization. They can assist management in its basic functions such as forecasting and planning. In indicating the economic performance and level of efficiency of the business concerned, they can be used to improve the efficiency or raise the level of profits of the business organization.

A number of reasons account for the wide use of ratio analysis. Firstly, the ratios are easily calculated given all the accounting records. The second reason is that these ratios allow easy comparison between similar firms within an industry. Such a comparison gives insight into the relative financial conditions and performances of the firms. They are also readily understood by various interested parties within and outside a firm. In many cases, not all members of the management team are financially oriented and ratios can provide a basic overview for heads of departments, the general manager and the Board of Directors.

Finally, the ratios are helpful in showing the true picture of the firms financial position to all interested parties outside of management. These include creditors who are interested primarily in the liquidity of a firm. Their claim on the firm's assets is short term and the ability of a firm to pay their claim is best judged by means of a thorough analysis of its liquidity. Also the shareholders whose claim may be long-term are interested in the cash-flow and the firm's ability to service debt over the long run. The shareholder may evaluate this ability by analysing the capital structure of the firm, the major sources and uses of funds, its profitability over-time and projections of future profitability.

Other interested parties include bankers, suppliersof basic inputs

and the government. The firm may also use ratios as part of an analysis to determine its own credit worthiness. Above all, in order to bargain more effectively for outside funds, the management of a firm should be interested in all aspects of financial analysis that outside suppliers of capital use in evaluating the firm. An adverse trend in the ratio calls for immediate corrective action.

Types of financial ratios

A group of financial ratios designed over the years to measure economic performance and efficiency in certain areas of a business organization may be presented under the following headings: Profitability, Liquidity and Solvency. Profitability and solvency are ratios computed from income statement and sometimes from both the income statement and the balance sheet. Liquidity ratios are mainly computed from balance sheet. It should be noted that no one ratio can give sufficient information by which to judge the financial condition and performance of the firm. Only a combination of these ratios can lead to reasonable judgements. In each of these categories, we have several ratios but for this study only those ratios which can be derived from the available data will be discussed.

I. Profitability Ratios

These are a fundamental measure of how efficiently a business

organization is being run and managed. Profitability ratios are of two types: those showing profitability in relation to sales and those showing profitability in relation to investment. Efficiency within the rubber processing industry is measured in this study by:

(a) The rate of return on operating capital; the higher this ratio is, the better.

(b) ratio of fixed cost to total revenue: this is expected to be small.

(c) rate of return on volume of sales: there are acceptable, reasonable levels.

(a) Rate of return on operating capital

This is defined as net return divided by total operating cost for the period under review. The rates of return on operating capital are derived for the various firms and the results presented in table 7.1. From the table, it can be observed that in 1974, four firms had over 50 percent rates of return on operating capital while four firms also recorded negative rates of return on operating capital. In 1975, no single firm recorded a rate of return that was higher than 50 per cent whilst four firms recorded negative rates of return. The rates of return ranged from -31.90 per cent to 95.22 percent

Table 7.1 : Rates of return on operating capital
1974 - 75

Firm Code	Rate of Return (in %)	
	1974	1975
A01	4.37	-48.04
A02	5.42	2.72
A03	38.38	22.55
A04	-31.90	10.94
A05	3.69	10.18
A06	37.49	40.87
A07	-24.64	-34.71
A08	21.29	-31.99
A09	58.08	17.20
A10	-11.43	-40.37
A11	-20.52	32.23
A12	55.78	d.n.a.
A13	47.29	35.29
A14	95.22	5.39
A15	74.44	27.72
A16	12.15	5.60

Source:- Calculated from firms' records.

with an average of 22.82 percent for 1974 and for 1975 they ranged from -48.04 percent with an average of 3.75 per cent. The sudden post Udoji increases in labour costs and the attendant disruptions in operations account for the generally poorer performances in 1975.

(b) Ratio of fixed cost to total revenue

This ratio gives an indication of how efficiently the fixed assets are being used. The ratio is defined as total fixed cost divided by total revenue for the specified accounting period. The ratios are also expressed in percentages and the results derived for the various firms are presented in Table 7.2. The table shows that in the estimated ratios ranged from 0.52 per cent to 17.24 whilst in 1975, the range was from 0.51 percent to 20.97 percent. These derived efficiency ratio serve two purposes: firstly, in both years it could be seen that some firms were more efficient than others. The most efficient firms had smaller ratios while the least efficient ones had larger ratios. Secondly, when we compare how efficient the industry was in 1974 with that of 1975, it is seen that the industry was less efficient in 1975 for the same reasons presented under profitability analysis.

Table 7.2 : Ratios of fixed cost to total revenue

Firm Code	Ratios of fixed cost to total revenue (in %) 1974	1975
A01	5.96	13.87
A02	5.95	7.85
A03	12.66	7.75
A04	0.52	0.51
A05	2.97	4.26
A06	3.75	5.72
A07	3.19	13.45
A08	8.12	28.97
A09	3.88	5.89
A10	17.05	10.00
A11	17.24	2.52
A12	2.65	n.a
A13	2.05	5.85
A14	5.60	9.25
A15	0.98	2.13
A16	6.25	6.62

Source: Calculated from the firms' records

(c) Rate of return on volume of sales

The ratio of net earnings to volume of sales is another measure of profitability. This ratio is usually defined as net earnings divided by value of sales within an accounting period. It demonstrates the effectiveness with which working capital was employed. Some business are slow selling but have high profit margins while others compensate for small per unit margins by the large volume of sales. In each case, the aim is to attain a reasonable level of profit. The calculated ratios presented in table 7.3 indicated that returns on volume of sales were generally low for the two years. The divergence between net earnings and value of sales is a reflection of high operating expenses incurred by the various firms in the industry. Secondly, the low level of capacity utilization raises unit costs of processing and thus reduced the profit margin.

II. LIQUIDITY RATIOS

Liquidity ratios are used to judge a firm's ability to meet short-term obligations. From then, much insight can be obtained into the immediate solvency of the firm and its ability to remain solvent in the event of adversities. One of the most universal and most frequently used of these ratios is the current ratio.

Table 7.3. Rates of returns on volume of sales

Firm Code	Net earnings on volume of sales (in percentages	
	1974	1975
A01	4.0	79.6
A02	4.8	2.4
A03	24.2	17.0
A04	46.6	9.8
A05	3.5	9.3
A06	26.2	27.4
A07	31.7	46.0
A08	16.1	33.4
A09	35.3	13.8
A10	10.7	60.9
A11	21.4	23.8
A12	34.9	31.9
A13	31.4	24.6
A14	46.0	31.8
A15	42.3	21.2
A16	10.2	4.9

Source : Calculated from the firms' records

$$\text{Current ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

A somewhat more accurate guide to liquidity is the quick ratio or acid-test ratio. This is defined as

$$\text{acid-test-ratio} = \frac{\text{current assets - Inventories}}{\text{current liabilities}}$$

This ratio is the same as the current ratio except that it excludes inventories - presumably the least liquid portion of current assets from the numerator. The ratio in fact concentrates on cash, marketable securities, and receivables in relation to current obligations and thus provides a more penetrating measure of liquidity than does the current ratio.

Due to non-availability of data, the acid test ratio could not be calculated for this study. However, for those firms which provided the necessary data, the calculated current ratios are presented in table 7.4. The higher the ratio, the more is the chance that a firm will be able to meet its immediate obligations and stay bouyant. Firms with a ratio of 1 1 or less cannot be regarded as having a comfortable liquidity status. A close look at this table reveals that for the two years under review, only two firms representing 12.50 percent of all the firms studied could be regarded as being in a good financial condition. This is a reflection of rather poor financial management on the part of the firms. In essence, it implies that most of the firms will have to borrow in order to meet their

Table 7.4. Liquidity ratios of some firms in the rubber processing industry

Firm Code	Liquidity Ratios 1974	1975
A02	0.29:1	0.37:1
A03	0.99:1	0.28:1
A04	0.98:1	0.51:1
A05	-	0.29:1
A06	1.03:1	1.02:1
A07	-	0.21:1
A08	5.7:1	4.66:1
A09	0.71:1	0.45:1
A11	-	0.86:1
A14	4.39:1	4.75:1

Source : Calculated from the firm's financial statements

most immediate financial obligations.

III. SOLVENCY RATIOS

A business organization is said to be solvent if it can meet its immediate and long-term financial obligation and commitments. Infact, the solvency ratios reflect the position of a business capital requirements which is being supplied by the owners. These ratios are very useful and employed by people both within and outside the business concern. From lender's point of view, solvency measures indicate the kinds of problems the lending body would encounter in recovering their money in the event of business failure. The ratios can therefore have considerable impact on the availability of outside capital to the business. The solvency of a business organization can be estimated using the following formulae·

(a) $\text{Solvency} = \frac{\text{Net worth}}{\text{Total net assets}}$

(b) $\text{Solvency} = \frac{\text{long term debt}}{\text{Capitalization}}$

The net worth/total net assets ratio gives an indication as to how a business concern can cope with its immediate financial needs, while long term debt/capitalization ratio shows the ability of the firm to meet

its future financial needs. This is called ultimate solvency.

Also, solvency ratios may lead to questions as to who is controlling the firms since as creditors supply more and more capital and thereby assume more risk, they can impose restrictive covenants on managerial independence. On the other hand, solvency ratios may indicate that the firm should consider borrowing more money with a subsequent opportunity of increasing returns on their investment. For this study, due to data limitations, only one of the two formulae was employed in measuring solvency ratios. The computed solvency ratios are presented in table 7.5.

Table 7.5 : Solvency ratios of some selected firms in the rubber processing industry

$$\text{Solvency} = \frac{\text{Net Worth}}{\text{Total Net Assets}}$$

Firm Code	Solvency ratio in percentages 1974 (Sr)	1975 (Sr)
A02	80.49	-
A05	92.09	-
A06	88.76	89.84
A07	57.72	-
A08	65.32	68.45
A14	79.14	92.00

Source: Calculated from the firms financial statements

The ratios expressed in percentages are derived for some selected firms that made available their financial statements. The net worth/total net assets in addition to a firm's ability to meet its immediate financial obligations further tells us the amount of capital the owners contributed to the business during the years under review. All the firms show that owner's equity capital accounted for over 50 percent of the capital required by the firms to support their net assets. These ratios thus further confirm the dependence of the various firms on personal sources as their major source of capital to finance the mills. It should not normally be difficult for the firms to obtain additional funds from commercial lending houses. However, the results must be interpreted with caution since the items making up net worth and/or total net assets may be in appropriately valued.

In summary, three points should be noted with respect to this financial analysis: firstly, there is considerable disparity in the rates of profits accruing to the rubber firms. While some firms had negative net returns, others are characterized by substantial positive returns. This variation in the rate of return may well be a good index of efficiency among the firms.

The second point concerns the liquidity positions of the rubber

processing firms. For the two years under review, less than 13 percent of the firms were in favourable liquidity positions, thus majority of the firms would have to borrow to meet their immediate financial obligations. This situation is not always tolerated by most businesses.

The third point to note is that some of the processing firms obtain funds from mainly personal sources. Thus reliance on personal savings rather than credit institutions limit their plant expansion.

C. Analysis of Factors Influencing Profits in the Rubber Processing Industry

The costs and returns in rubber processing have been dealt with in details in chapter three. From that chapter, it was clearly shown that net returns were not only highly variable but they were dependent on several factors. Furthermore, the profits in the industry appeared rather low. For instance, in both 1974 and 1975, about 25 per cent of the firms made negative returns. In both years none of the processors made profits up to one million naira. Besides, large variation occured in the net returns of the firms. This large variation made it quite difficult to reach concrete conclusions about the trend of net returns.

In order to meaningfully assess the determinants of net profit, a regression analysis was carried out. Four factors were selected as determinants of net profits. These factors were volume of sales, cost of labour, cost of raw materials, and the amount of selling expenses.

(i) Volume of sales:- This is the total naira value of all transactions resulting in sales during the accounting period. In this study, it mainly consists of the sales of all types of finished rubber products such as crepe, sheets and crumbs.

At times, some firms sold scrap rubber to other processing firms but such sales were not taken into consideration because the rubber had not undergone any processing before they were sold.

(ii) Labour cost - This comprised of salaries and wages paid to all categories of workers. It ranged from Director's fees to unskilled workers' wages. Also included in labour cost are fees paid to owners of mills and wages paid to casual workers who are usually engaged for a short time during peak period. As mentioned earlier, the industry is fairly capital intensive although it still engaged a lot of labour. The percentage of labour cost relative to total cost for the two years in the firms have been presented in Tables 4.3 and 4.4.

(iii) Cost of raw materials - The major raw materials consist of rubber lumps, latex and scraps. Other materials are coagulants mainly used by rubber sheets and crumbs processors. Raw materials form the bulk of the total cost in all the processing units as were shown in Tables 4.3 and 4.4.

(iv) Selling and Shipping Expenses - The finished products are mainly exported to overseas countries. The marketing of these products involve a lot of transactions resulting in considerable expenses. Selling expenses consist of items such as port charges,

(Harbour dues), marine insurance, shipping (freight) expenses, custom duty and sales tax: although sales tax was abolished recently by the Federal Government.

I. The basic model

A profit function for the rubber processing industry can be represented implicitly as follows:

$$\overline{\Pi} = f(X_1, X_2, X_3, X_4, U) \text{ ----------(EQ 1)}$$

where $\overline{\Pi}$ = Net profit in Naira,

X_1 = Volume of sales in Naira,

X_2 = Labour cost in Naira,

X_3 = Raw material cost in Naira,

and X_4 = Selling expenses in Naira

The explicit form of equation one can be written in linear form as follows:-

$$Y = bo + biXi \text{ ---------- } + U \text{ ---------(EQ 2)}$$

where $i = 1 \ldots\ldots\ldots\ldots k$, Y = Dependent variable (Net profit in Naira)

bo = the intercept

bi's = Regression coefficients

and Xi's = Explanatory variables

Putting it more clearly, we have

$$Y = bo + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4$$

where the variables are as defined above.

bo = The intercept determines the proper level of profit throughout the entire equation

and bi - b_4 = represent the effect on net profit of a one-unit change of each of the Xs.

The explicit forms of the profit functions actually estimated included the linear and power forms and the empirical results are presented in the latter part of this chapter.

Hypotheses

The variables used in the regression analysis and the expected effects of each selected factor on net profits are as follows:

(i) Volume of sales - It is hypothesized that volume of sales and net profit would be directly correlated.

(ii) Labour cost - An inverse relationship is expected to exist between net profit and labour cost.

(iii) Cost of raw materials - An indirect relationship was expected to exist between net profit and cost of raw materials.

(iv) Selling expenses :- It was believed that a negative relationship should exist between the two variables.

II. Estimating Procedure

In deriving the profit functions for the rubber processing industry, two equations namely linear and Cobb-Douglas functional forms were fitted to data obtained for 1974 only. The 1974 data were chosen for the following reasons: 1975 was regarded by most of the processors as the worst year in all aspects. Also, the Udoji salary award had a double negative effect on profits by raising the operating costs and simultaneously curtailing total output and revenue accruing to each firm. In fact, in 1975, there were series of strike actions by factory workers and such strikes invariably led to the closure of some mills for several months. In consequence, there were conspicuous reductions in the volumes of outputs from various rubber processing firms with an ultimate fall in net profit margins. Also, following the Udoji award, many tappers decided to leave the rubber industry for other sectors of the economy where wages were more attractive. This aggravated the perennial problem of shortage of raw materials for the processing industry.

III. Empirical results

The results of both linear and power functions fitted for 1974 data are presented in Table 7.6. It can be seen from the results that all the coefficients of multiple determination (R^2) are generally high. Infact, R^2 ranged from 0.92 to 0.97. This indicates that in 1974 between 92 percent and 97 percent of the variability in net profits could be accounted for by the selected factors. Also, whilst volume of sales had positive relationship with net returns, other factors had negative relationships since infact the net profit decreases as they increase.

Based on its high explanatory power and the test of significance, the linear equation has been selected as the lead equation for the whole rubber processing industry. This linear equation has been presented in equation 3 below.

EQ. 3 $$\overline{\Pi}+ = 15135.80 + \underset{(0.06230)}{0.9488X} - \underset{(0.0857)}{0.978X_2}$$

$$- \underset{(0.04897)}{2.82054X_3} - \underset{(0.4007)}{1.06221X_4}$$

$$R^2 = 0.97$$

$$F - value = 80.44^*$$

* = Signigicant at 1% level of probability

Figures in brackets = standard error.

Table 7.6 : 1974 Profit Functions for Rubber Processing Industry

Equation Type	Dependent Variable	Constant term	Regression coefficients					
			X_1	X_2	X_3	X_4	R^2	F-Value
Linear	II	15135.00	0.9488 (0.06230)	-0.973 (0.0857)	-2.8205 (0.4697)	-1.06221 (0.4007)	0.9699	80.44
Power (Cobb - Douglas)	II+	-13.170	16.939 (2.4360)	-10.489 (1.6154)	-4.6375 (1.5211)	-0.2096 (0.598)	0.9168	13.176

+ = log form

Figures in brackets are standard error

In the linear equation stated above, the test of significance for the regression coefficients showed that all the variables (X_1, X_2, X_3, and X_4) were significant at the 1% level of probability. Also, the result of the linear equation in no way contradicted all the stated hypotheses with reference to signs of the parameters.

Because of the possibility of auto-correlated errors in some of the selected variables the zero-order correlation matrix was derived and presented in Table 7.7.

Table 7.7. Correlation matrix for the selected factors affecting profits

	II	X_1	X_2	X_3	X_4
II	1.000				
X_1	0.6456	1.0000			
X_2	0.4728	0.8483	1.0000		
X_3	0.1473	0.8183	0.6230	1.0000	
X_4	0.0497	0.4118	0.2702	0.5236	1.0000

It could be seen that there is a close association between volume of sales and cost of raw materials on one hand and volume of sales and labour cost on the other hand. The table thus indicates some

presence of auto-correlated errors. This led the author to a rerun of the model after deleting one of the two variables that were closely associated. The statistical trial is described in detail in the next section.

Eliminating autocorrelated errors from the model

Realising that when explanatory variables are highly correlated, the regression coefficients cannot be meaningfully interpreted; an effort was made to eliminate the effects of auto-correlation from the profit functions. This was done through a stepwise regression in which the auto correlated variables were dropped in turn from the basic equation. Thus, the following equations were fitted and examined for their ability to explain the relationship between profit level and the factors believed to affect it.

Eq. 4: $\Pi = bo + b_1X_1$

Eq. 5: $\Pi = bo + b_1X_1 + b_4X_4$

Eq. 6: $\Pi = bo + b_2X_2 + b_3X_3$

Eq. 7: $\Pi = bo + b_2X_2 + b_3X_3 + b_4X_4$

where all the variables are as specified earlier.

Both linear and Cobb-Douglas were fitted to each model and the Empirical results are as shown below.

Empirical results of the adjusted model

The relationships between net profits and volume of sales are presented in tables 7.8 and 7.9'. In the linear function, it was observed that the coefficient of multiple determination (R^2) is relatively high. It is 0.65 and shows that in 1974, 65 percent of the net profits could be explained by the volume of sales alone. Also, the F-value is significant at 10% thus indicating the overall significance of the model.

Table 7.9' presents the results of the combined effects of volume of sales and selling expenses on net profits. These two are grouped together because they did not show any close association. Using the linear function, the coefficient of multiple determination was reasonably high (0.786). This shows that about 78 percent of the variability in net profits in 1974 could be explained by the volume of sales and selling expenses. Also, the F-value is significant at 10%.

Table 7.10 has been included to show the degree of association between the variables namely net profits, volume of sales and selling expenses. The table shows the absence of auto-correlation in this model.

Table 7.8. Profit functions for rubber processing industry, 1974

EQUATION	Dependent Variable	Constant Term	Regression Coefficient X_1 (VS)	R^2	F-Value
LINEAR	$\overline{\Pi}$	-153946.325	$0.27698X_1$ (0.09086)	0.646	9.292*
COBB-DOUGLAS	$\overline{\Pi}$	-16.297	$3.44042X_1$ (1.62077)	0.507	4.506*

$\overline{\Pi}$ = $f(X_1)$ volume of sales.

In brackets = standard error

* = Significant at 10%

Table 7.9 Profit functions for rubber processing industry in 1974

EQUATION	Dependent Variable	Constant Term	Regression Coefficient		R^2	F-Value
			X_1 (VS)	X_4 (SE)		
LINEAR	Π	-303851.691	$0.26237X_1$	$0.29703X_4$	0.776	5.613*
			(0.07831)	(0.12538)		
COBB-DOUGLAS	Π	-30.28989	$3.80833X_1$	$(-2.14779X_4$	0.689	4.972*
			(1.42805)	(0.96320)		

$\Pi = f(X_1, X_4)$

In brackets = standard error

* = Significant at 10%

Table 7.10 : Correlation matrix for some of the selected factors

	Π	X_1	X_4
Π	1		
X_1	0.44563	1	
X_4	0.48088	0.0787	1

The results of the combined effects of labour cost and raw material cost on net profits are presented in Table 7.11 From the linear equation, it can be observed that the coefficient of multiple determination (0.28) is rather low. This means that only 28 percent of the variability in net profits in 1974 could be accounted for by the combined effect of labour cost and raw material cost. The F-value was also not significant at 10% of probability.

When selling expenses factor was added as a third variable to labour cost and raw material cost, there was an improvement in the coefficient of multiple determination (0.55). This is to say that the three variables accounted for about 55 percent variability

Table 7.11 Profit functions for rubber processing industry in 1976

EQUATION	Dependent Variable	Constant Term	Regression Coefficients		R^2	F-value
			X_2(LC)	X_3(RC)		
Linear	$\bar{\pi}$	-15896.445	0.29013 X_2 (0.51053)	0.19415 X_3 (0.24375)	0.28	0.523
Cobb-Douglas	$\overline{\ln \pi}$	-8.229257	-0.29257 X_2 (1.62896	2.42205 X_3 (1.69673)	0.382	1.03

$\bar{\pi} = f(X_2 X_3)$

In brackets = standard error

Table 7.12 . Profit function for rubber processing industry in 1971

EQUATION	Dependent Variable	Constant Term	Regression Coefficients			R^2	F-Value
			X_2(LC)	X_3(RC)	X_4(SE)		
LINEAR	Π	-68747.541	$2.76413X_2$ (1.41105)	$-0.12655X_2$ (0.28138)	$-1.55088X_4$ (0.83508)	0.547	1.570
Cobb-Douglas	Π	-7.732	$-0.51242X_2$ (2.40917)	$2.40436X_3$ (1.77615)	$-0.15404X_4$ (1.19601)	0.385	0.636

$\Pi = f(X_2\ X_3\ X_4)$

In brackets = Standard error.

in the net profits. But the F-value test showed that the estimating equation was still not significant at 10% level. The detailed results are presented in table 7.12.

Also for the combined effect of these three factors on net profits. The correlation coefficient matrix is presented in table 7.13. This table shows an absence of any close association between the variables.

Table 7.13 : Correlation matrix for the selected factors excluding volume of sales

	II	X_2	X_3	X_4
II	1			
X_2	0.1778	1		
X_3	0.2355	0.0895	1	
X_4	0.0459	0.4114	0.1699	1

In summary, it has been shown in the latter results that volume of sales and selling expenses are the two major factors affecting profit in the industry. The former empirical results were spurious and invalidated by auto correlation. In general, one percent increase

in sales volume is expected to lead to about 3.8 percent increase in net profit while a one-percent increase in selling expenses would lead to a decrease of about 2.14 percent in net profit. These findings have serious implications on the policy prescription for the improvement in the economic performance of the rubber processing industry.

CHAPTER VIII

SUMMARY AND CONCLUSIONS

Summary of major findings

This study was undertaken to examine the performance of an agro-allied industry in Nigeria. Rubber processing industry has been selected because of its high contribution to Nigeria's economy. For instance, before the advent of crude oil, natural rubber was the major source of revenue to the Bendel State Government and it ranked fourth as a foreign exchange earner for the country. An economic appraisal of the rubber processing industry is necessary at this time when the industry is facing a continuous yearly decline in output. The problems of declining rubber output are attributable to a number of factors among which are shortage of raw materials and a suspected poor performance of rubber processing firms. In addition an economic appraisal of this industry is likely to reveal the major operational and management problems with respect to the existing processing firms. This is the rationale behind this study.

In chapter one, the economic importance of rubber in the economy was shown. Its contributions to the GNP and its role as means of livelihood to many Nigerians were fully discussed. Many Nigerians are gainfully employed in the rubber processing industry, especially

in the Bendel State where over 85% of Nigerian rubber output is produced.

The country's rubber exports had increased over the years and her position in the world market was ranked sixth up till 1963. Thereafter the position has been declining. As one of the major agricultural export crops of Nigeria, rubber accounted for about 8% of the country's total export earnings up to 1964.

Also, in terms of employment generation, about 12 - 15 percent of the active population of Bendel State are engaged in the rubber industry. The industrial survey carried out by the Federal Office of Statistics in 1972 showed that about 8000 people (representing 4.7 percent of the country's total industrial labour force) were employed by rubber processing industry. Other secondary benefits include the provision of various infrastructures in the rural areas particularly in plantations and rubber estates.

The second part of chapter one considered the historical development of rubber processing establishments in Nigeria. The origin of rubber and the various processing stages were fully discussed. Government efforts in encouraging rubber production during the early part of this century were welcomed with a great enthusiasm around Bendel and Delta areas of Nigeria. The first sets of people to establish

rubber plantations and subsequently rubber processing establishments in the country were in Bendel State. Among these people are Jo Thomas and the Millers Brothers. These pioneers were followed by many enterprising Nigerians as well as foreigners and State governments.

The old Western region in order to demonstrate the gains from factory rubber processing, established within the region some co-operative rubber processing mills. Between 1950 and 1967 the rubber attracted a lot of processors. As a result of the outbreak of the civil war during which most people had to leave, many factories had to fold up and up till now some of them have not resumed operations.

A brief review of some previous studies concerning the rubber industry was undertaken in chapter two. It was found that most of these previous research work focussed on development programmes concerning the rubber industry. None actually concentrated on the economic appraisal of rubber processing firms.

In terms of research methodology, the area of study included Bendel, Ogun and Ondo States of Nigeria. These three states were selected primarily for three reasons. Firstly, Bendel State is the major rubber producing state in the country and should have the

greatest number of rubber processing firms. Secondly, the three states (i.e. Bendel, Ogun and Ondo including Oyo State and some parts of Lagos State) comprised the former Western Region. In that wise, they would all have many common policies, especially in respect of agriculture. Also due to limitations of funds and time more states could not be covered. The addresses of all the processing firms in the three states were obtained from the Federal Office of Statistics. The data used for the study were collected with the aid of questionnaires distributed to the processing firms, and from Federal Office of Statistics and other government institutions.

In chapter three, some background information of the selected firms were presented. These include the pattern of ownership, the amount of capital investment and sources of these capital. The analysis revealed that some of the firms are owned by private Nigerian entrepreneurs while others are jointly owned by the government and some foreign investors.

Sources of capital include personal savings, loans from commercial banks, government sources and funds from foreign agencies. It was observed that quasi-government credit establishments such as NIDB, NAB and NBCI had not contributed much capital to the development of the rubber processing industry.

In terms of manpower, all categories of labour were engaged in the industry. These include skilled labour, unskilled labour, technical staff, managerial staff and operatives. As in some other industries, the rubber processing industry is more capital intensive than labour intensive. A lot of capital is invested in the purchase of the processing machine and equipment. Also, it is noted that the expartriates in the industry are relatively few. The industry is currently experiencing a shortage of both technical and managerial personnel. There is no shortage of unskilled labour, although there are cases of frequent absenteeism among this category of workers.

The raw materials consist of rubber latex, lumps and scraps. Firms that process latex into sheets need a lot of coagulant such as formic acid or acetic acid. Other major inputs include water, fuel and electricity. Considerable amount of water is used in the processing of crepe rubber whilst all the processing machines are power driven.

The chapter also discussed the different technological processes involved in rubber processing. The technology involved in the processing of sheets differs from that of crepe, whilst that of crumb rubber combines both methods in addition to the drying process.

Unlike some agricultural export commodities, marketing of processed natural rubber at the time of our field work was not undertaken by the Federal or State Government. The processor marketed their products either through local marketing agents or directly to the international market through their overseas marketing agents.

A detailed analysis of costs and returns in the selected firms within the rubber processing industry was given in chapter four. It was noted that in all the processing firms all cost items were similar for the same kinds of operations. Detailed items of costs were analysed and it was revealed that the most important cost item was raw material. Other significant cost items in decreasing order of magnitude are labour cost, selling expenses and cost of all maintenance.

The gross receipts were represented by the volume of sales. The profit levels varied considerably from plant to plant and were generally low. About 25 percent of the firms recorded negative returns in both years. Also, the net returns in 1975 were lower than those of 1974. This decline can be attributed to many factors. These include non-availability of raw materials (which in turn reduced the volume of sales). Also, lack of raw materials led some mills to operate below optimum capacity. Another factor which led to lower net returns in 1975 is the Udoji Salary Award which in a way reduced

the output of the industry because many workers went on strike for months whilst production expenses rose astronomically thus constituting a double drain on the returns to processors.

In chapter five, cost functions for the rubber processing industry were estimated. Six functional forms namely: linear, Cobb-Douglas, Semi-log, Exponential, Quadratic and Square root were fitted to two cost-output relationships. These are total variable cost against Total output and Total cost against Total output. The Total variable cost against total output was more relevant to this study since the period of two years (1974 and 1975) being analysed in this study was too short to permit major changes in the sizes of plants.

Although, they fitted the data better, the Cobb-Douglas and Semi-log functions are linear and so it is not possible to derive an optimum level of output from them. Therefore, the quadratic function which also performed reasonably well was selected as the lead equation and was used in deriving the optimum plant size. It was observed that for the two years, the industry was operating far below optimum level of production.

The analysis of some factors affecting the expansion and

economic performance of the processing industry was carried out in chapter six. Eight major factors were ranked by each processor as affecting the expansion and economic performance of the industry. A non-parametric technique (the Kendall coefficient of concordance) was used in ranking these statements.

The result of the analysis showed lack of capital as the most important factor. Next to this are shortage of spare parts, repair and maintenance, workers and shortage of raw materials. In the last part of the chapter, some explanations were made on these rankings. The lack of capital was attributed to the prevailing shortage of raw materials which made the industry to work below optimum capacity thereby lowering their net returns.

A detailed financial analysis of the rubber processing firms was carried out in chapter seven. Financial ratios and their uses in business and management decisions were considered, Profitability ratios, liquidity ratios and solvency ratios were calculated for the firms which provided the necessary data. Due to the limitations and inadequacy of data, not all the ratios could be estimated.

The major findings from the analysis are:

(i) there is considerable disparity in the rates of profits accruing to the rubber firms. This variation in the

rates of profits may well be a good index of efficiency among the firms.

(ii) For the two years under review, less than 13 percent of the firms were in favourable liquidity positions, thus a majority of the firms would have to borrow to meet their immediate financial obligations. This situation is not always tolerated by most business.

(iii) Lastly, several of the processing firms obtained funds mainly from personal sources. This reliance on personal savings rather than credit institutions tended to limit their plant expansion.

The second part of chapter seven was concerned with the empirical estimation of profit functions for the industry. A multiple regression analysis involving four selected factors that influenced the returns was carried out. Two functions, namely linear and Cobb-Douglas were fitted. The linear equation performed very well and it was chosen as the lead equation. Though, the results showed that all the hypotheses postulated were valid, there was correlation between volume of sales and labour cost on one hand and volume of sales and cost of raw materials. Then by deleting some of the variables, the author fitted again the same two functional forms.

The results showed that, volume of sales and selling expenses are the major factors affecting profits in the industry.

Limitations of the Study

The major limitation of the study concerns the poor quality of some data collected from various sources. Paucity in data coupled with the attitude of some unco-operative processors called for caution in the interpretation and application of the results.

This study has established that the rubber processing industry is in a poor economic state. The poor economic state of the industry would be guaged from the financial state of each processors. All of which stemmed from the lack of raw materials and the subsequent under-utilization of existing capacity. The output of the industry has been drastically reduced while production expenses have been increasing. Given this situation, it is important to find out what should be our policy recommendations in our campaign to improve the economic performance of the rubber processing industry. The following specific recommendations are presented for consideration.

The attitude of the processors could be understood for the present state of affairs with regards to shortage of their basic agricultural raw material concerning the industry.

Also, this is a cross-sectional study of the industry which covered only a two-year period, assumption regarding no changes in the physical investments on the industry could be valid.

Despite all these limitations, the study has managed to appraise the economic position of the rubber processing industry. This appraisal might be useful to individual prospective investors, to the Nigerian rubber institute, the newly created rubber commodity Board, all the Tree Crop Divisions of the States Ministries of Agriculture and Natural Resources.

General Policy Recommendations and Conclusions

The various major findings in this study have great implications for the rubber processing industry. There is a need to find ways of improving the present poor economic state of the industry. In dealing with these problems which are mainly :-

(i) Lack of capital, (ii) shortage of both technical and management personnel.

(iii) Shortage of spare parts and (iv) shortage of raw materials, both the rubber processors and the government have important roles to play.

The processors

There is need on the part of the processors to improve their individual economic performance. They need to upgrade their management capability. The lack of highly skilled personnel has been reflected in the poor economic efficiency of most of the mills studied. Such personnel will look into some key factors such as labour, management, all types of purchases made by the firms, selling and all marketing matters and the day to day activities of the firms. Also, in the light of the prevailing situation in the whole rubber industry, rubber processors who hope to make reasonable profits must consider ways to increase their capacity utilisation. They must find ways of getting regular supply of natural rubber. In fact, at this stage they need not attempt to expand their plants. They should repair and maintain the existing facilities and make better use of them.

Since capital is the major problem facing the processing firms, the processors must find ways of improving their poor capital position. This can be done by improved relationship with the lending institutions especially government credit institutions. Also, they can improve the situation through sales of shares to interested people and public institutions. Finally, efforts should be made to effect a continuous

strict financial control with regards to accounting practices of some firms.

Steps to be taken by the government

The newly created rubber commodity Board should set up a rubber processing committee to look into the present state of affairs in the processing industry. This committee should be made up of rubber technologists, rubber marketing experts, production economist and some representatives of rubber processors. Such a committee must include a member of the rubber commodity board and should examine all aspects of rubber processing including lumps production and marketing of the processed rubber.

Government should also look into the possibility of establishing rubber lumps marketing centres. The location of such centres should be around existing processing factories. This must be followed by the standardization of rubber lumps into grades. These steps will eliminate the surpluses made by rubber lump contractors over the rubber smallholders. Since returns to smallholders will be based on the quality of lumps produced, rubber lump producers will aspire to produce better quality and therefore earn renumerative revenue.

Furthermore, such establishment will eliminate the practice where by rubber lumps are heavily adulterated to increase their weight

in order to make more money. Subsequently, high quality processed rubber will be produced and the frequent breakdown of processing machines caused by foreign particles in these lumps would be reduced.

Above all, the Rubber Commodity Board which will now control the marketing of rubber in the country should try to erase the poor image already formed by the processors towards the defunct Nigeria Produce Marketing Board by making sure that steady returns get to the natural rubber producers at all levels, especially the processors who have been exposed to the rubber international markets. The Board can through the Federal government explore new markets for the Nigerian rubber in the socialist countries and the third world not only for reasons of exports stability but also for reasons of market expansion. For this purpose, the Board can use bilateral, multilateral and other contractual agreements to penetrate these new markets.

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APPENDIX I

An Economic Appraisal of the Rubber Processing Industry in Bendel, Ogun and Ondo states of Nigeria

Questionnaire

General

1. (a) Name of establishment ----------

(b) When was it established? ----------

(c) Total area (acreage) owned by firm ----------

(d) How did you acquire the land for the site? ----------

By lease ----------

Outright purchase ----------

Inherited ----------

Others (specify) ----------

(e) Name other branches (if any) owned by the firm and location ----------

Form of Ownership

2. Sole Proprietorship ----------

Partnership ----------

Private or Public Limited Company ----------

Government ----------

Co-operative ----------

Statutory Corporation ----------

Others (specify) ----------

Location

3. Why did you select this site for your business ?

Cheap labour ----------

Close to source of raw materials ----------

Availability of electricity and water ----------

Good roads , rail and seaport ----------

Where land is available ----------

On Government recommendation ----------

An industrial estate ----------

Others (specify) ----------

Investment Pattern

4. (a) Initial total investment ----------

(b) Current total investment ----------

(c) Present paid up capital ----------

(d) Sources of Capital investment ----------

Government ----------

Personal saving ----------

Cooperative members ----------

Foreign investor ----------

Credit Corporations ----------

Commercial banks ----------

Building And Equipment

(a) How many buildings do you have at the site ?

(b) Name type of building

Processing house ----------

Bailing room ----------

Store ----------

Office ----------

(c) Give an account of the equipment used in your processing

Unit ----------

(i) ----------

(ii) ----------

(iii) ----------

(iv) ----------

(v) ----------

Labour

6. (a)

Category	Number		Wages and Salaries	
	1974	1975	1974	1975
(i) Nigerian Professional administrative and managerial				
(ii) Non-Nigerian Professional administrative and managerial.				
(iii) Clerical and other office workers				
(iv) Technical				
(v) Operative and Unskilled workers				

(b) Other benefits to workers

N.P.F. Contribution ----------

Private Pension scheme ----------

Medical Benefits ----------

Housing scheme ----------

Others (specify) ----------

(c) What are the main problems you have with labour in this business

Shortage of skilled workers ----------

Frequent resignation ----------

Strike action ----------

Low productivity ----------

Others (specify) ----------

Raw Materials And Finished Products

7. Raw materials

(a) State your major raw materials and sources

Type	Source	Quantity Purchased	
		1974	1975
(i)			
(ii)			
(iii)			
(iv)			

(b) Finished products

Type	Quantity Produced		Sales	
	1974	1975	1974	19 5
(i)				
(ii)				
(iii)				
(iv)				

Marketing

8. To whom do you sell your products ?

(a) Domestic buyers

Government ----------

Other companies ----------

Distributors ----------

Appointed Agents ---------- --

Others (specify) ----------

(b) Foreign buyers

Countries

(i) ----------

(ii) ----------

(iii) ----------

(iv) ----------

(v) ----------

(c) What have been your major marketing problem ?

No capital to expand ----------

No demand for products ----------

Rising cost of production ----------

Lowering selling price ----------

Government product price controls ----------

Monopoly by larger mills ----------

Others (specify) ----------

9. Managerial Factors

(a) Any market research Department ?

Yes ---------- No ----------

(b) Any form of advertisement ?

Yes ---------- No ----------

(c) If yes, state brief the impact of advertisement on your business.

(d) Do you consult any firm or business consultants ?

(e) Have you organised any in-service-training for your employees ?

(f) What are the basic goals and objectives of your business ?

(g) Is your business cooperating with any other firms in the industry with regards to

(i) Procurement of raw materials

(ii) Joint processing

(iii) Marketing each others products

(iv) Staff exchange

(h) Are you affected by the indigenization decree ?

Yes ---------- No ----------

If yes, what have been your problems since the decree came to effect ?

(i) (i) What are the main problems facing your business expansion ?

(j) In your opinion, is the rubber industry contracting expanding ?

(k) State briefly what you think the government can do to sustain and effect better expansion of the industry.

APPENDIX II

TABLE I : TABLE OF CRITICAL VALUES OF CHI SQUARE*

df	Probability under H_o that x^2 = chi square													
	.99	.98	.95	.90	.80	.70	.50	.30	.20	.10	.05	.02	.01	.001
1	.00016	.00063	.0039	.016	.064	.15	.46	1.07	1.64	2.71	3.84	5.41	6.64	10.83
2	.02	.04	.10	.21	.45	.71	1.39	2.41	3.22	4.60	5.99	7.82	9.21	13.82
3	.12	.18	.35	.58	1.00	1.42	2.37	3.66	4.64	6.25	7.82	9.84	11.34	16.27
4	.30	.43	.71	1.06	1.65	2.20	3.36	4.88	5.99	7.78	9.49	11.67	13.28	18.16
5	.55	.75	1.14	1.61	2.34	3.00	4.35	6.06	7.29	9.24	11.07	13.39	15.09	20.52
6	.87	1.13	1.64	2.20	3.07	3.83	5.35	7.23	8.56	10.64	12.59	15.03	16.81	22.46
7	1.24	1.56	2.17	2.83	3.82	4.67	6.35	8.38	9.80	12.02	14.07	16.62	18.48	24.32
8	1.65	2.03	2.73	3.49	4.59	5.53	7.34	9.52	11.03	13.36	15.51	18.17	20.09	26.12
9	2.09	2.53	3.32	4.17	5.38	6.39	8.34	10.66	12.24	14.68	16.92	19.68	21.67	27.38
10	2.56	3.06	3.94	4.86	6.18	7.27	9.34	11.78	13.44	15.99	18.31	21.16	23.21	29.59
11	3.05	3.61	4.58	5.58	6.99	8.15	10.34	12.90	14.63	17.28	19.68	22.62	24.72	31.26
12	3.57	4.18	5.23	6.30	7.81	9.03	11.34	14.01	15.81	18.55	21.03	24.05	26.22	32.91
13	4.11	4.76	5.89	7.04	8.63	9.93	12.34	15.12	16.98	19.81	22.36	25.47	27.69	34.53
14	4.66	5.37	6.57	7.79	9.47	10.82	13.34	16.22	18.15	21.06	23.68	26.87	29.14	36.12
15	5.23	5.98	7.26	8.55	10.31	11.72	14.34	17.32	19.31	22.31	25.00	28.26	30.58	37.70

Table I is abridged from Table IV of Fisher and Yates' Statistical tables for biological, agricultural, and medical research, published by Oliver and Boyd Ltd., Edinburgh, by permission of the authors and publishers.