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CHARCOAL MARKETING AND PRODUCTION ECONOMICS IN BLUE NILE

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SUMMARY

In this study financed by the Sudan Renewable Energy Project, all aspects of the charcoal industry (marketing, production economics and distribution) in the Blue-Nile are analysed. Both records survey and analysis were used to furnish the necessary information.

Discussion of the marketing environment covers the analysis of producers, traders, marketing process, distribution channels and institutional aspects. The analysis reveals the following:

- Charcoal production in the Blue-Nile is a highly commercialized activity comparable to agricultural production both in terms of scale and money involved.
- It is a well organized industry with a high level of competition which is reflected in the conduct, performance and development of the industry.
- Marketing process and distribution show a long, complex chain. Compared to an ideal distribution system, the existing system is very poor (sphagetti structure), perhaps mainly due to the very low trade margins characterizing the trade in the industry.
- Generally on average, of charcoal produced on the kiln site 20% is sold on site (packed or unpacked), 29% finds its way immediately to Khartoum and Gezira markets, 14% is transported to local markets in the Blue-Nile, 34% is stored in storage areas in the Blue-Nile in anticipation of high price periods and 3% is left on site for the next season.
- Charcoal production since the 1960's is a salvage operation that bears no or very little relevance to forest management practices. Of all the charcoal produced in the Blue Nile in the 1984 season, 84.5% was from commercial production zones, defined as areas allocated to agriculture in the future.

The economic analysis of the industry dealt with production economics, prices, price development, investment charcateristics such as profile, profitability (or return on investment) and employment generation. Analysis of these factors indicated that:

- Of all the production and marketing costs, labour and transportation are the highest. The latter however can prove to be a limiting factor for production. Even with high labour costs - labour exploitation is a salient feature of

the industry.

- Prices are stable and show a distrint pattern of low and high price periods. Collusive practice and price rings are rare and very much less than most accusations tend to suggest.
- Charcoal investment is based on an initial revolving capital concept. The initial capital is estimated to be 16% ± 8 of total production and marketing costs.
- Returns on investment are generally high and averaged for the producers analysed in this study 85% ± 48. This is based on returns on initial capital.
- In terms of finance the industry is dependent on a traditional finance system typical of rural agriculture in the Sudan, referred to as the sheit system. Although it has so many drawbacks it is expected to continue to dominate. Very little bank financing is expected to be seen within the industry.
- The industry is a valuable employment generator. In the production phase alone 65,856 man-months employment opportunities were available during the 1984 season.

The future of the industry is constrained mainly by the diminishing forest resource. The supply gap is expected to widen while charcoal demand is projected to rise. Afforestation and demand management policies rate very high in securing the future of the industry. With inadequate wood supplies no technical prescription can provide the charcoal needed.

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1- INTRODUCTION

- Objectives of the Study
- Methodology
- Historical Development

1-1 Objectives of the Study:

The main purpose of this study is to look into the various issues of charcoal marketing and production in the Blue Nile Province. The following are the main issues covered by the study:

- Structure, conduct and performance of the charcoal industry.
- Charcoal concessions, size of operations, control systems and institutional set-ups.
- Economics of the industry and sources of finance within the industry.
- Marketing channels and distribution.
- Future prospects and constraints.

1-2 Methodology:

The study basically covered the Blue Nile Province as one of the main charcoal production areas in the Sudan. Analysis of the charcoal trade in Khartoum Province was also attempted. Both primary and secondary data were compiled and analyzed.

Primary data were made available by producer and trader questionnaires. The survey covered a sample of 25% of the producers and about 80% of resident traders. Non-resident traders who are composed of a large number of lorry owners were not included. The phenomenon of lorry owners as charcoal traders has gained momentum recently and represents today a sizable portion of the trade.

Secondary data were collected from local forestry department records.

The province was divided into ten working centres for the purpose of data collection. Table 1-1 gives details of these areas.

Table 1-1

Working Areas for Data Collection in Blue Nile Province

Area	Producers Sampled	Traders Sampled
Sennar	7	9
Abu Hugar	6	2
Wad El Neil	8	-
Haroon	3	-
Eldamazine	2	1
Roseries	3	-
Diwa	3	-
Karkug	4	3
Dinder	9	4
El Suki	1	6
T O T A L S	46	25

The questionnaire in Khartoum covered a 25% sample of the registered charcoal traders in the five main charcoal distribution centres (zaribas) in existence. Fifteen traders were interviewed out of a total number of sixty. A large number of brokers has recently dominated the trade in Khartoum. These were not covered by the questionnaire.

1-3 Historical Development of the Charcoal Industry in the Blue Nile:

Charcoal production in the Blue Nile as a commercial operation began in the early thirties. At the time the area of operations was limited to the northwest of Sennar town. Production areas since then continued to shift southward and are now concentrated in Haroon range 140 Km. from Sennar.

During the forties another area for commercial charcoal production was opened for concessions around Elgousi town in the Dinder range. This area also experienced a southward shift and is now at least 120 Km. from Elgousi. In the sixties all concessions in these areas were withheld. By 1967 charcoal production area was officially confined to the south of the Roseries dam in areas expected to be flooded by water. The second development in the charcoal production areas allocation is connected with agricultural expansion and in particular mechanized farming.

These two developments became the sole determinants of forest policy in designating charcoal production areas. Consequently, production was no longer a controlled forest management activity. It became a salvage operation. Throughout the sixties and up to the present charcoal production as a salvage operation continued to be the underlying policy. The forestry authorities lost the initiative to the mechanized farming planners. Mechanized farming itself witnessed an unprecedented expansion during the last two decades. Expansion occurred at a much faster rate than the absorptive capacity of the charcoal industry for the wood raw material. These events coincided with an era of cheap petroleum products. Gradual charcoal substitution continued to gain acceleration with the blessing of the forest authorities.

Financial constraints, low investment and institutional instability characterized the forestry sector in the seventies and eighties. The outcome of these limitations was reflected in meagre reservation activities and continuous

asset liquidation. The latter resulted from overcutting in response to local authorities' pressure for revenue and also due to wrong forestry practice.

It is within this setting that the country was trapped into the energy crisis in 1973. With oil prices escalating rapidly, substitution trends were reversed and charcoal demand experienced a sudden jump. By the eigthies the fuelwood supply gap had already precipitated.

The charcoal industry itself developed into an integrated well-organized business. Economies of scale were efficiently exploited. Within the industry production relations remained the same, with labour as the main means of production. Labour costs continued to rise, but labour exploitation still remains a salient feature of the industry. Recent developments in this respect is the formation of labour cooperatives among some groups of charmen. These cases are rare and in the absence of a credit system will remain insignificant.

Charcoal transportation, like all other forest produce, shifted completely to road transportation. Traditionally all forest products were hauled by rail to consumption centres. This explains the presence of all storage depots along railway stations. At the time rail tariffs were viewed as a subsidy and set especially low on tonnage basis irrespective of distance. The reliability of the system was assured by assigning special trains for charcoal transportation. During the last decade rail tariffs increased and the system's reliability deteriorated to its lowest. In addition charcoal demand and supply increased immensely. Gradually the use of lorries and trucks as transport modes dominated the industry. Large producers acquired their own transport fleet.

Raw material cost expressed in terms of royalties experienced a basic change as charcoal production became a salvage operation. Conceptually royalties in the thirties were designed as a conservation measure. Compared to production costs they used to form the major cost component. Today royalties do not represent more than 9% of productio

costs.

In the field of production technology very little changes if any were experienced throughout the industry. Traditional earth kilns of various names and sizes continued to characterize the industry. These traditional methods were perfected and highly skilled charemen run the production process today. Conversion factors as high as 25-30% are common in the industry.

2- MARKETING ENVIRONMENT

- The Producers
- Charcoal Trade & Traders
- Marketing Process & Distribution
- Institutional & Policy Issues

2-1 THE PRODUCERS

A total number of 185 producers was recorded by the forest authorities for the year 1983/84. This figure is based on counting the concessions granted by the forestry department. There are instances where more than one small producer applies for one concession (each concession is for 15,000 sacks) to avoid each paying the 100 pounds concession fees. There are cases where one big producer has more than one concession under different names to avoid income tax. In the final analysis it is believed that the 185 figure covers more than 90% of the producers in the Blue Nile today.

2-1-1 Period in the Business:

When classified by the period in the business the survey indicated the degree of ease with which newcomers enter the business. Of the producers surveyed 46% have been in the business for less than five years. These represent the newcommers. Those who have 6-10 years represented only 17% while 37% have been in the business for more than ten years. In terms of quantities produced, the latter (more than 10 years) produced 50% of the 1983 total production in the region.

Table 2-1
Classification of Charcoal Producers
by Period in the Business

Period	% of total producers	Number of producers	Estimated production in sacks 1983
Less than five years	46	85	1071328 (34)
5 - 10 years	17	32	504155 (16)
More than ten years	37	68	1575483 (50)
Total	100	185	3150966 (100)

Source: Own calculations - producers survey 1983.

Note: Figures in brackets denote percent of total production.

2-1-2 Inheritance of the Business:

The charcoal industry in the Blue Nile Province was traditionally a family business handed from father to son. This trend gradually gave way as charcoal production areas became more disperse and moved further southward. New entreprenuers in numbers ventured into the industry. The newcomers are generally local merchants or traders from villages in the vicinity of charcoal production zones. Some of the old producers constrained by financial and liquidity limitations were unable to cope and deserted the business. Today the industry is dominated by new investors whose families had no previous engagment in the industry. This basic change is reflected both in the toal number of producers as well as in the quantities produced.

Table 2-2
Inheritance of the Charcoal Business

Subject	% of total producers	Total no. of producers	Estimated production 1983
Inherited the business	17%	31	567174 (18)
Ventured on their own	83	144	2583792 (82)

Source: Own Calculations - 1984 producers survey.

Note: Figures in parentheses denote percent of total production.

2-1-3 Business Attachments:

Historically charcoal production was the only business attachment for the majority of producers. But as the business became dominated by new investors the situation changed. These new investors were recruited from other businesses, mainly trade. They entered the charcoal production industry as a side activity. These now represent 88% of the total producers. In general those who have charcoal as their only business attachment are on the decline and they are limited to those who were in the business for more than ten years. They established themselves as big

producers with integrated production and marketing activities.

Table 2-3
Business Attatchments in the Charcoal Industry

Item	% of total no. of prod	number of producers	Estimated production in sacks
Charcoal only	22	41	976799
Charcoal & Agriculture	54	100	
Charcoal & Trade	22	41	2174167
Charcoal & Others	2	3	
Totals	100	185	3150966

Source: Own calculations - 1984 producers survey.

2-1-4 Regional and Inter-regional Activities:

Producers operate in only one region in a season. Inter-regional movement from one region to another rarely occurs. Of the producers surveyed only about 7% shifted their production activities from the Eastern region to the Blue Nile.

2-1-5 Scale of Production:

Based on production figures for the last three seasons producers are classified as shown in the table below:

Table 2-4
Classification of Charcoal Producers by Size of Production

Production class 000 sacks	% of total producers 1980/81	81/82	82/83	Average	Production in sacks
0-5	33	31	21.5	28.5	126039 (4%)
6-10	23	29	36	29	378115 (12%)
11-20	21	21	12	18	504155 (16%)
22-30	15	9.5	21.5	15	630193 (20%)
31-50	0	0	22	1	126039 (4%)
50-100	8	9.5	5	7.5	882270 (28%)
above 100	0	0	2	1	504155 (16%)
Totals	100	100	100	100	3150966(100%

Source: Own Calcultations 1984 Producers survey.

Table 3-2 above warrants the following comments in so far as the producers are concerned:

Firstly:

The degree of variation present in the industry from the very small size producers to the very big ones.

Secondly:

The bulk of the producers fall within the range of 5-20 thousand sacks/year production class. (75.5%) However these producers in 1983 season produced only 32% of the total production.

Thirdly:

Although there is a general trend towards large production classes above 20000 sacks/season, inconsistencies are common. These inconsistencies are triggered mainly by delays in the charcoal season during periods of good agricultural harvest.

Fourthly:

The decade of the seventies witnessed a boom in the industry that attracted large producers, e.g. Sharaf International. The business as integrated production and marketing concern was firmly established.

Fifthly:

Producers above the 31000 sacks represented only 9.5% of the total number of producers. However production-wise they supplied 48% of the total charcoal produced in the Blue Nile.

The structure of the charcoal producers as revealed by the survey, shows a well-organized industry. The degree of competition has been maintained high enough to balance its development. This structure was clearly reflected in the conduct and performance of the industry particularly in as far as the utilization of economics of scale and returns on investment is concerned. The structural impact on these aspects will be reviewed in more detail in later sections.

2-2 CHARCOAL TRADE & TRADERS

Active charcoal trading constituted a profitable business both in the Blue Nile (producing centre) and Khartoum Province (consuming centre). The survey carried out covered the majority of traders in the Blue Nile but for Khartoum only 25% of registered traders have been covered. Unregistered traders or brokers who now dominate the trade in Khartoum were not covered.

Khartoum represents the final link in the charcoal marketing chain for the bulk of the Blue Nile produce.

In the twenties Khartoum charcoal needs were relatively low and were met completely from surrounding areas. At the time animate power (donkeys & cammels) was used for transportation of charcoal. Charcoal trading itself as a business was mainly a direct consumer-producer trade. Few retailers were also observed. With increased charcoal demand supply areas shifted further south and northwards deep into the Nile province, north of Shendi town. As supply areas became rather distant, the Nile river transport began to assume a leading role in charcoal transportation. Producers and consumers were further apart and the need for wholesalers and retailers both at the production areas and the consumption centres became an important element in the charcoal trade. Kassala and the Blue Nile were assigned by the policy in 1932 as the charcoal supply areas of Khartoum. Provision of railroad facilities was deemed necessary for policy implementation. Rail transport by the early forties assumed the leading role in charcoal transportation. It is during this era when charcoal production areas became even more distant that the charcoal trade where wholesalers and retailers were involved became firmly established. By the sixties and seventies rail transport gave way to road transportation. This had an impact on the charcoal trade.

The most important effects are:

- Development of the charcoal trade as an integrated business where traders acquired their own transport fleet and were also involved in financing charcoal production to secure supplies.
- Recently both lorry drivers in the production areas and brokers in the consumption centre began to form an increasingly important link in the marketing chain.

Through its history charcoal production, trade and marketing remained essentially a private sector activity. The role of the public sector was confined to the allocation of production zones and controlling movement of the produce across the country. However up to 1973, the Forest Department traditionally kept strategic charcoal reserves in its Soba depots in Khartoum. These reserves were used to overcome scarcity periods and used also as a market buffer. After 1973 this policy was abandoned. By then Khartoum provincial authorities and the Ministry of Trade assumed the responsibility of the charcoal trade in the capital.

2-2-1 Structure of the Charcoal Traders in Khartoum:

Charcoal traders in the capital as revealed by the questionnaire were found to have a well-balanced competitive structure that managed to keep the flow of charcoal into the capital continue uninterrupted.
Results of the analysis were shown in tables 3-5 & 3-6.

Table 2-5

Characteristic Features of Charcoal Traders in Khartoum

Character	No. of traders	% of total traders	% of total trade
1. Inheritance of the Business			
- Inherited the business	16	27%	29%
- not inherited	44	78%	71%
2. Producer-trade Customer relations:			
- deals with specific producers & consumers	23	38%	49%
- Have no specific producers or consumers	37	62%	51%
3. Producer Financing			
- Involved in financing producers	7	12%	16%
- No financing is attempted	52	87%	68%
- Own production	1	1%	16%

Source: 1984 Khartoum Traders Survey.

2.2.2 Supply Source to Khartoum:

Traditionally eastern and middle regions were the sole suppliers of Khartoum. The seventies, however, witnessed north Kordofan as an active supply source to the detriment of the relatively fragile resource base. Results of the survey have shown the Blue Nile Province as the leading supplier for 1983/84 season. Of the 19 traders surveyed, 16 identified Blue Nile as their supply area. In terms of quantities traded in the sample this is 90% (see table 2-7). Although the Blue Nile is the main supplier the 90% figure should be taken with caution. The survey did not include brokers and lorry drivers who ship consignments directly from source to retailers or consumers. As we will see in chapter 4, Blue Nile production covers 46% of the consumption of Blue-Nile, Gezira and Khartoum. This is based on NEA per capita consumption figures of 2.59 sack/year and a 5.7 million population figure.

Table 2-6

Charcoal Supply Sources

Source of supply	No. of traders surveyed	Quantities in 10^3 sack	% of total trade
Blue Nile	13	319	90%
Other regions	3	23	10%

Source: Traders Survey - 1984

2.2.3 Trade in Blue-Nile:

The Blue Nile as a production centre is dominated by wholesalers as an important link in charcoal exportation to other regions. Resident traders (i.e. wholesalers) are relatively few who managed - throughout the history of the industry-to build a marketing base. However recently the trade is gradually being taken by non-resident traders. These are lorry and truck owners who during slack season pick charcoal trade as a business. The survey made covered only resident traders.

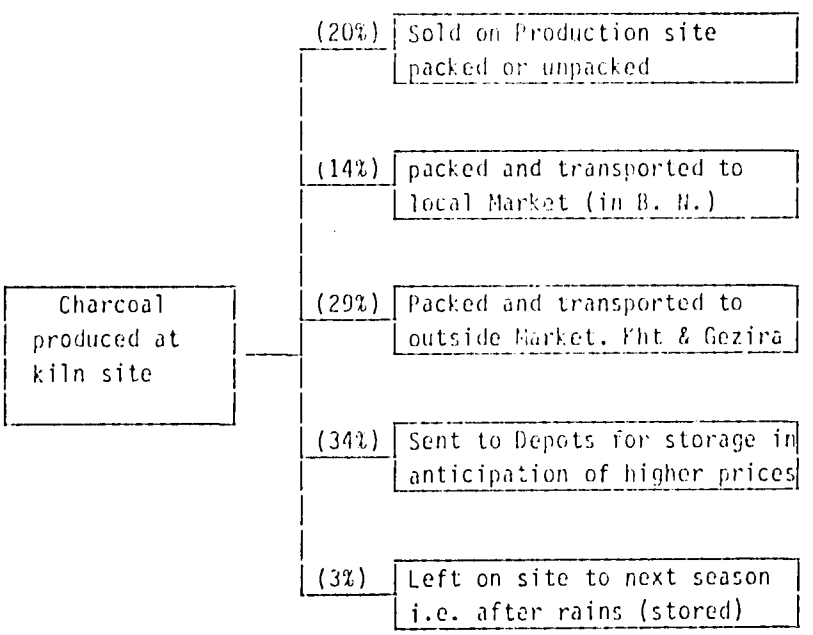
Wholesalers surveyed on average trade in sack/trader during the season. Wholesalers generally buy their supplies on town delivery basis. Occasionally cases exist where they buy on site of production and incur transport cost. They sell to consumers, local traders and outside traders (mainly in Khartoum). Distribution of trade through these channels as revealed by the survey are as follows:

Outside traders	72%
Local traders	13%
Consumers	15%

2.3 Marketing Process and Distribution

Charcoal produced in the Blue Nile passes through a long complex marketing process before it reaches the consumer. The schematic diagram below summarizes reuslts of the survey made:

Schematic Presentation of Charcoal Marketing Process in Blue Nile



Distributions channels are even more complicated. Compared with an ideal distribution system (see Fig 2-3) the existing distribution system is very abnormal, (spaghetti diagram) where producers, wholesalers, retailers and consumers are both directly and indirectly connected. This is perhaps a reflection of the relatively low trade margins within the trade (Chapter 4).

At the producer's level in terms of quantities produced, distribution to wholesalers, consumers, retailers, producers and brokers table 2-7 reveals the results of the survey carried out.

Table 2-7

Distribution of Charcoal Produced

Subject	Quantities channelled to as % of total production
Wholesalers	69%
Consumers	13%
Retailers	12%
Producers	4%
Brokers	1%

Source: Own calculation, Producers Survey 1984.

Ideal Distribution Channels

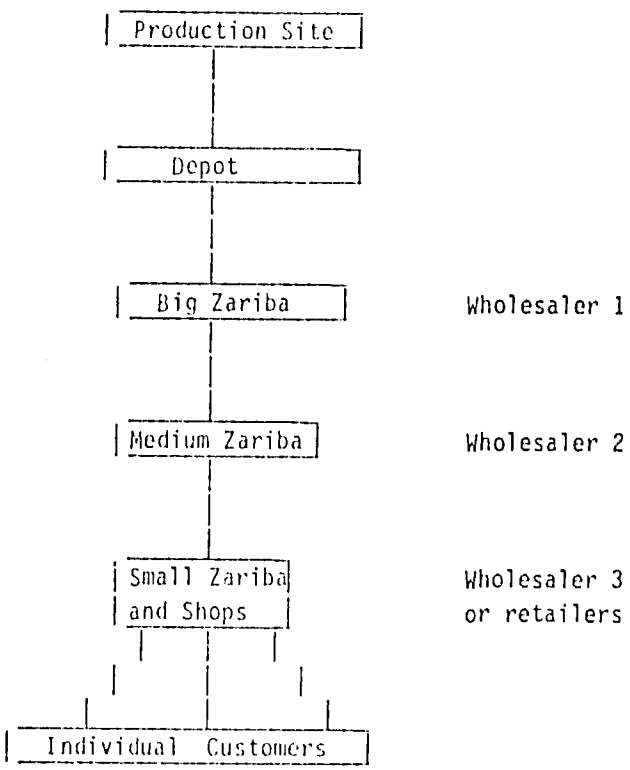


Fig 2-2

Actual Distribution Channel
In the Charcoal Industry

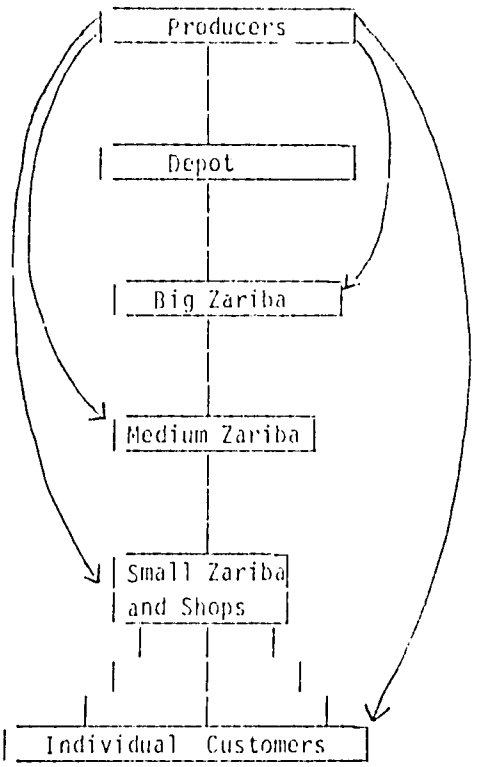


Fig 2-3 (a)

Schematic Representation of Charcoal Distribution Channels

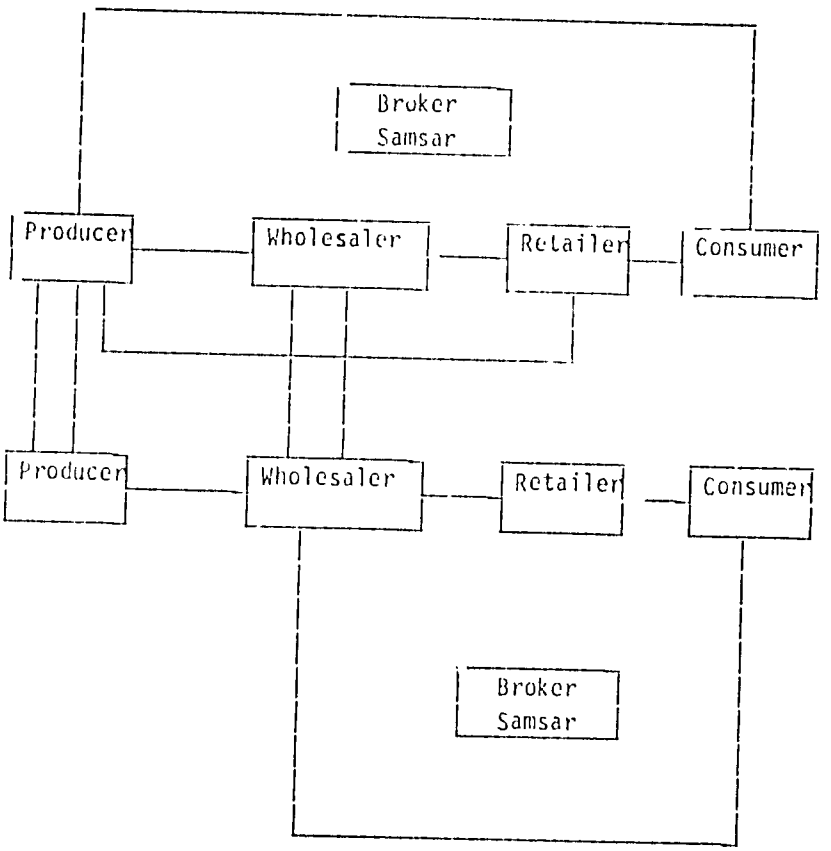


Fig 2-3 (b)

2-4 Institutional and Policy Issues

2.4.1 Charcoal Production Policy in Blue-Nile:

The national forest policy of 1932 identified the Blue Nile as one of two main charcoal supply areas. It is earmarked to supply both Khartoum, Gezira and Nile Provinces an area today of a total population of more than 5.1 million including BNP. The policy assumed a sustained yield management system of existing reserves on the one hand, and an active forest reservation on the other to widen the resource base as population increase. However as early as the 1960's a basic shift in that policy was forced upon the forest authorities. With high expansion rates of mechanized agriculture, charcoal production became a salvage operation. Areas for charcoal production are categorized as follows:

- Commercial Production Areas:
  These are areas that are planned for future mechanized agriculture.
- Mechanized Farms:
  These are areas already allocated for mechanized agriculture activities.
- Small Holdings (Bildat):
  These are small plots of 20 - 40 feddans allocated traditionally for families to crop their own needs.
- Forest Reserves:
  These areas remained outside charcoal production zones. Only recently has charcoal production been practiced in these areas. They in the recent future, will form the remaining areas for charcoal production.

In terms of percentage quantities produced as seen in table 2-8 below, commercial production zones played the biggest role (84.5% of total).

Table 2-8

Classification of Production by Category Areas (1983/84 Season)

Category Area	% of total	% total sack produced
1. already allocated Agric. schemes.	-	13.1%
- own schemes	0.5%	
- other people's schemes	12.6%	
2. Small Holdings Bildat	-	2.4%
3. Forest reserves	-	0%
4. Commercial Zones	-	84.5%

Source: Own calculations based on 1984 survey.

It must be stressed at this point despite the fact that almost all charcoal production activities are concentrated in mechanized crop expansion areas, yet vast resources are actually wasted being burnt into ashes prior to cropping. An example of such waste and its scale can be seen from two schemes which up to the year 1984 cleared 693,000 feddans by burning tree cover to ashes. Using a very low production figure of 30 sack/feddans, this means a total loss of 20.8 million sacks or an equivalent £ 145 million pounds. It is such activities during the last decade which accelerated the diminshing of the tree resource base. In the Blue Nile, Gaafar (1984) estimated complete clearance by 1987. (Paper submitted to National Energy Plan).

The main production locations in the Blue Nile are Haroon, Dinder and Wad-ElNeil as shown in table 2-9 below:

Table 2-9

Classification of Production by Location
Blue Nile 83/84 Season

Locality	No. of Producers working	% of total production in sacks
Dinder	67	28.5%
Wad El Neil	30	27.5%
Harron	44	29.0%
Roseries	30	7.9%
Abu-Hugar	14	7.1%
TOTAL	185	100

Source: Own calculations based on 1984 survey.

2.4.2 Charcoal Concessions Procedures

Charcoal production concessions are issued by forest authorities. Areas open for concessions are identified by forest authorities well in advance of the season and circulated to all producers.

On application producers are issued with concessions specifying area of operations, size and period.

The minimum size of concessions granted in commercial and mechanized farm production zones is 15,000 sacks. According to exisiting forest authorities' estimates, this covers an area of 500 feddans (30 sacks/feddan). A recent SREP study estimates the area, under existing Blue Nile conditions, to be only 250 feddans. A concession fee of £ 100/concession is collected. Instances when actual production

exceeds 15000 sacks another application for a concession must be filed and another £ 100 fee is due (i.e control by units produced and not area).

In forest reserves, (in very few instances) the crop is sold standing for concessionnaires and producers are asked to bid for already identified blocks.

Concessions for charcoal production in small agricultural holdings have a lengthy procedure where both local and forest authorities are involved. Each farmer needs to submit an application to the forest authorities augmented with necessary documents from local authorities related to land ownership. Once an application is filed, a forest ranger visits the site to estimate expected production. On the basis of this estimate the concession is granted after paying a nominal fee of £ 55. This system however has never been well administered. The two main constraints being:

- Unavailability of transport facilities to forest rangers.
- Nearness of these sites to villages

and consumption centres hence tendency of overproduction. These areas represent the main source of illicit charcoal production. Their production is heavily concentrated during the early periods of the season. To some extent, there is evidence that production from these areas tends to bring prices down during price peak periods to the dislike of other major producers. Increasing mechanization even in these small holdings, resulted in area increases and became another emplanned mechanized agriculture schemes. Concessions for such areas since 1984 season were withheld by a regional ministry directive.

Once production is over each producer needs to acquire removal passes to transport the charcoal he produces. Removal passes are issued showing quantities and destination of charcoal. A royalty fee of £ 0.30 is payed per sack for all charcoal produced irrespective of production zone (i.e. commercial, reserve or otherwise). Instances where charcoal

is to be stored in the various depots in the region a storage fee of £ 0.06 collected by the local authorities. The producers are bound by law to declare to forest authorities quantities stored and their location.

Check and control points along transportation routes are administered by forest authorities. This is besides the regular police routine checks along the main routes. Any charcoal transported without a removal pass according to forest laws is usually confiscated by courts.

The concession system as described above has been in operation since the early thirties. Despite the common claims of illegal production the system has performed reasonably well.

Reference to production area and product movements forestry records based on removal passes leaves so much to be desired. In this respect records from removal passes can be very misleading. Also, more so than not areas of production specified in the removal passes are not where production actually took place.

3- Economics of Charcoal Industry

- Production Costs.
- Marketing Costs.
- Total Costs
- Price and Price Development
- Investment Characteristics
- Investment Profile
- Sources of Finance
- Profitability and Income

3- Economics of Charcoal Industry

3-1 Production Costs:

Amongst the elements of production costs there is very limited variation from one area to another. These variations reflect differences in labour and burial requirements for sites where the soil texture is not suitable for earth kiln production.

Analysis of production costs as revealed by the producers survey undertaken gives the following averages:

Table 3-1
Average Costs of Production (1984)
LS/Sack Produced

Cost element	Cost in LS/Sack	% of total cost
Labour	1.510 ± 0.24	73
Water	0.220 ± 0.06	11
Foreman	0.170 ± 0.04	8
Agent*	0.106 ± 0.068	5
Burial**	0.070 ± 0.021	3
TOTAL	2.078 ± 0.429	100

Source: own calculations - Producers Survey 1984
* As a cost many small - medium producers actually do without.
** Appears as a cost in special site conditions.

Labour costs represents 73% of the total production expenditure - this does include both the costs of foreman and agent which can be considered as administrative costs. Such costs should not be taken as a high labour cost situation. As the analysis of returns on investment in the industry will show in later sections, labour exploitation within the industry is common practice.

The supply of labour is a function of the agricultural season. During good harvest years supply of labour is a constraint to the extent of delaying the starting of the charcoal season. In contrast, during bad agricultural seasons the season starts as early as September or October.

3-2 Marketing Costs:

Various cost elements fall under this heading namely:

- Royalty and local taxes,
- Transport costs,
- Packing and handling, and storage.

These cost elements however are not necessarily included in every situation. This is a function of the point of sale along the marketing chain. There are instances where the produce is sold on the kiln site unpacked (without sack). In such cases all the marketing costs including the royalty is levied on the buyer. Table 3-2 below gives average values for the marketing cost elements:

Table 3-2

Average Marketing Costs
LS/Sack 1984

Cost Element	Cost LS/Sack	% of total cost
Royalty & taxes	0.30 ± 0.140	9
Sack	0.558 ± 0.048	16
Packing & handling	0.296 ± 0.061	8
Transport to depot	0.440 ± 0.180	12
Guarding	0.630 ± 0.030	2
Losses & Depreciation	0.070 ± 0.006	2
Transport to Khartoum	1.800 ± 0.250	51
TOTAL	3.527 ± 0.535	100

The variations in the marketing cost elements with site is limited except for transport which constitutes up to 63% of the total marketing expenses. Transportation costs exhibit great variation with the distance of haul between the sale point and production site. With the charcoal production zone continually shifting southwards further away from consumption centres transport costs will continue to assume the biggest role in costs and can prove prohibitive. Its impact on prices will be discussed in section 3-4-2.

Royalties throughout the region are the same and are set generally low and have no relevance to replacement or resource costs. As charcoal production becomes a practice in forest reserves royalties will begin to assume higher values to reflect resource costs. The impact that this will have on prices is discussed in section 3-4-2.

Local taxes on the other hand varied extensively from as low as zero in some areas to values as high as LS 0.50/sack in others. This phenomenon has put some producers within the province at a great disadvantage. However this year the regional government directed all local councils to abandon all tax-laying practices in an effort to design a much more coherent and integrated tax system.

3-3 Total costs

Total costs are simply the summation of production and marketing costs. As the marketing costs vary with sale point various values of average total costs are compiled in table 3-4 to cover possible sale points existing within the industry today.

Table 3-3
Average Total Cost of Charcoal Production and Marketing (1984) LS/Sack

Point of sale	Production cost	Marketing cost	Total cost
Production site without sack*	2.078	0	2.078
Production site with sacks**	2.078	0.858	2.936
Local market or Depot***	2.078	1.298	3.376
Khartoum wholesaler	2.078	3.527	5.605

Source: Own calculations - 1984 Producers Survey.

* Even royalty in this case is paid by buyer

** Both royalty & sack are to be added. Often an extra 0.10-0.07 need to be added for packing.

*** An extra LS 0.06 needs to be added when produce is stored as a tax levied on storage.

3-4 Price and Price Development

The charcoal industry has developed an infrastructural base and organizational structure which help price stablization. In the Blue Nile the authorities had no reason to practice any intervention through price regulation. Price regulation however has been practiced by Khartoum provincial authorities sometimes at a disadvantage to the Blue Nile producers. Such intervention at times caused scarcity of charcoal in Khartoum. Regulated prices were also subject to continuous changes and now are almost abandoned or never administered.

3-4-1 Price Patterns:

Throughout the history of the charcoal industry, charcoal prices have shown a typical pattern of a period of low prices. (March - June) interchanging with a period of high prices (July-January)

Towards the end of the charcoal production season (March-June) producers forced by their urgent needs for liquidity to settle labour accounts bring more supplies to the market in excess of demand and the price gradually drops to reach its lowest during April - May.

As producers settle labour accounts they begin to store their produce for the higher price period. With the advent of the rainy season, prices start to rise again. Only producers and traders who have depots along accessible roads haul charcoal to the market, and demand grows gradually in excess of supply. By the end of the rainy season (October) when all roads become reasonably accessible more of the stored charcoal find its way to the market. However quantities stored are already running low and the new production is still two months

away. It is this period (November-January) when charcoal prices reach their peak.

Beyond these typical patterns changes are rare. To happen they are either triggered by distribution bottlenecks or delays in the charcoal production season. The latter results from longer labour engagement in agricultural harvesting and is usually reflected in the prolongation of the high price period deep into February and March.

Distribution bottlenecks are mostly attributed to transportation problems. During periods of petroleum unavailability the flow of charcoal to Khartoum is interrupted and a temporary scarcity situation develops. This is usually made worse by the fact that this always coincides with low supplies of Buta-gas. Price increases as high as 20-25% are common under the circumstances.

Collusive practice and price rings are shown by the survey to be rare and are definitely less than most frequent accusations tend to suggest. Easy entrance into the industry, the urgent need for liquidity and the revolving working capital (initial capital) characteristic of the investment are all working against any functional collusive practices.

Average selling prices as revealed by producers and Khartoum traders.

Surveys for 1983/84 season are given in table 3-4 below

Table: 3-4

Average Selling Prices
LS/Sack

Location and other Descriptions	Price in LS/Sack
1) Site of Production:	
- without sack	2.33 ± 0.20
- with sack	3.38 ± 0.15
2) Depot-Blue Nile	3.98 ± 0.40
3) Khartoum Province: (See Annex)	
- Abundancy Period to wholesaler 1	6.10 ± 0.14
- Scarcity Period to wholesaler 1	6.90 ± 0.10
- Weighted Average Price	6.28
- Average Price to retailer	6.71
- " " to consumer	7.50
- Official Price/sack "	7.00
- Average to consumer by Malwa	9.00

Source: own calculations based on 1984 producers and traders survey.

3-4-2 Transportation and Charcoal Prices

The rising trend in charcoal prices is generally attributed to increases in transportation costs. There is a strong relationship between charcoal prices and distance of haulage . In terms of sack/km costs values on average are LS. 0.007 for lorries, LS. 0.004 for trucks and LS. 0.003 for rail.

However as far as reliability is concerned trucks and lorries proved much more reliable than rail transport in recent years.

Table 3-5

Charcoal Transport Cost per sack per km in L.S.

Distance	Lorry	Truck	Rail
400	0.005	0.003	0.003
460	0.010	0.004	0.003
360	0.004	0.003	0.003
400	0.010	0.004	0.003

Source: Calculated from 1984 producers survey figures

NOTE: Lorry Load = 150-200 sacks
Truck Load = 500-600 sacks
Rail wagon load = 500-600 sacks

3-5 Investment Characteristics of Industry

The industry developed from a single man's operation, whose investment needs are only human effort and an axe, to a large-scale well-organized industry. In general it bears great resemblance to traditional rural agriculture but the two are far from identical.

The outstanding features of charcoal investment are its high labour intensity, short-life gestation, seasonality, revolving initial capital, systems of finance and high returns.

3-5-1 Revolving Initial Capital & Labour Relations:

Unique production relations exist between the investor and labour (means of production). At the start of the season the investor offer his labour an advance payment which is repaid as the latter begins to produce charcoal. The process of repayment and advances continues throughout the first two-thirds of the investment life (4-5 months). Towards the end of the investment life when production peaks, labours' credit from charcoal produced exceed the advances so far debited against him. Thus labourers shift from a situation of borrowers to lenders.

Throughout the investment life, as produce is sold returns are reinjected into the business. The investment can thus be described as self-financing where initial capital (working capital) is allowed to revolve through reinvestment of returns and mutual borrowing/lending between investor and labour all along the process. Despite all inherent drawbacks, this intricate system has been functioning all throughout the industry's history.

The investor's risk is at its highest at the beginning of the season when he advances labour their first credit. Labour desertion at this stage is one of the biggest concerns for investors. The system has generated various safeguards in the form of agents and foremen whose sole employment purpose is to minimize desertion. As production season progresses towards its peak; desertion risks are neutralized. Labour, the main risk element, becomes a creditor. A new element of risk has recently been observed at this stage and involves selling charcoal produced at the kiln site without investors' knowledge.

The initial investment required in the business averaged 16% + 6 of the total costs of production and marketing. Figures as low as 8% and as high as 30% are experienced. This is a function of scale economies but more so a function of labour productivity more labour needs to be recruited and thus more advances will be made. Table 3-6 summarizes the calculation of initial capital requirements for 16 producers.

Table 3-6

Calculation of Initial Capital Requirement

Produces No.	Total production	Total costs L.S.	Initial Capital Needs L.S.	Initial Capital as % of total costs
1	7500	15000	2000	13%
2	25000	76000	12250	16%
3	10000	60300	6400	11%
4	12500	44625	7350	16%
5	23000	93610	21330	23%
6	26500	84535	14996	18%
7	7500	24656	3275	13%
8	7021	22186	4488	20%
9	2000	11140	1968	18%
10	55000	297143	25600	9%
11	1500	4425	755	17%
12	21000	99170	7994	8%
13	5000	17900	5300	30%
14	72000	388080	117616	30%
15	8000	27920	3660	13%
16	37000	218300	17404	8%
				16 ± 8%

Sourc : Own calculation based on 1984 survey.

3-5-2 Investment Profile

The charcoal industry is seasonal with an average life of 8-12 months. The first eight-month represent the production cycle and the rest is the storage and marketing period. Marketing during the first eight months period is also very active. Table 3-7 below gives a general summary of the investment profile in the charcoal business.

Table 3-7

Charcoal Investment Profile

Period	Activity
November	- application for a concession submitted - concession granting - avail initial capital, advance labour to start - emphasis on small kilns
Fe.-March	- Early production from small kilns - immediate selling (high price period) - repayment & advances (reinvestment) continues as produce is sold.
April-May	- Peak production season - charcoal prices at their lowest - labour bills accumulate - pressure on investor for liquidity to settle labour accounts - approaching end of season - storage starts
June	- end of production - final settlement of labour bills - produce in excess of liquitidy needs hauled to depots for storage.
July-Nov.	- Rainy season - charcoal production virtually ceases - charcoal marketing continues
Nov-Dec.	- start of the next season

3-5-3 Sources of Finance

Sources of finance for the charcoal industry include basically the following main sources:

- Own financial resources
- Bank loans,
  and the Sheil system.

In general big producers depend either on their own resources or to a lesser extent on bank loans to finance their investment. Small - and medium-size producers on the other hand are dominantly financed through the Sheil system. Sheil is an arabic word meaning to carry. The system is traditionally used for rural agricultural investment financing all over the country and is not unique to the charcoal industry. Basically charcoal traders or wholesalers advance cash loans to producers (investers) in anticipation of payment in kind. The incentive for extending credit by wholesalers is the supply of charcoal during the peak production season when prices are at their lowest. The producer (investor) is further disadvantaged by selling the rest of his production to settle labour bills which usually accumulate towards the end of the season. In the final analysis producers' return on investment are lowered. In most cases potential storage in anticipation of higher price periods under such financial arrangements is a remote possibility. The system however continued to be viable under the absence of other credit facilities. Most producers prefer credit arrangements through the banking system. But in the absence of some form of collateral the Sheil system will persist as the most feasible source of finance.

Cases exist, rare they may be, where the Sheil system of finance is based on a posted price for the charcoal expected at the production site. Post prices quoted are often very low and hardly cover costs. This version of the sheil system is now almost abandoned. As charcoal became a scarce commodity posted prices started to assume higher values.

3.6 Profitability and Income Generation

Profitability within the industry can be expressed in terms of return on investment for producers and trade margins for charcoal traders.

3-6-1 Return on Investment

Investment generally refers to initial capital requirement. It is very rare that investment is ascribed to total costs. (See Investment characteristics 3-5).

In this context return on investment is generally very high. For the 16 producers in the survey where enough data has been given, on average returns are estimated to be 85 ± 48%. Variability between producers in this aspect is very high as can be seen from table 3-8. Such variability is due mainly to variations in labour costs, productivity and more so to the sale price. Because of the complicated distribution channels (see chapter two) various prices depending on the point of sale along the chain are built into the calculation of profitability.

When return on investment is expressed in terms of total costs it only reached 12% ± 5%. However this in the actual situation is very misleading since there is a continuous reinvestment of revenues as they are generated during the whole production season.

Table 3-8

Retur on Investment for a sample of Charcoal Producers lue Nile 83/84 season

Size of Production (sacks)	Investment Initial capital only	* LS. All costs	Net LS. Revenue	Return on Investment initial capital only	Return on Investment All costs
7500	2000	15000	3750	188	25
25000	12250	70000	11500	94	15
10000	6400	60300	4700	73	8
12500	7350	44625	5375	73	12
23000	21330	93610	7015	33	8
26500	14996	84535	8215	55	10
7500	3275	24656	1594	49	7
7021	4488	22180	3089	69	14
2000	1968	21980	2020	103	9
55000	25600	297413	20190	79	7
1500	755	4425	600	80	14
21000	7994	99170	16830	211	17
5000	5300	17900	2600	49	15
72000	117616	388080	63994	54	17
8000	3660	27920	2480	68	9
37000	17404	218300	12950	74	6
Averages	15774	93506	10431	84.5 ± 48	12 ± 5

Source: Own calculation based on 1984 producers survey

3-6-2 Trade or Profit Margins

Profit or trade margins are in general a function of purchase and selling prices. Both prices are affected by a number of factors that cause them to vary. The main factors are:

- Location of first sale.
- Extra costs incurred before selling
- Period during which transaction ocurs i.e. scarcity versus abundancy.
- Point along the distribution chain where the transaction occurs i.e. wholesaler I to II or I to consumer etc.

Based on tables 3-3 and 3-4 a spectrum of trade margins are calculated. (See table 3-9). The very large variations in these margins offers one explanation to the complexity of the distribution system that envolved in the trade away from an expected ideal distribution system.

Table 3-8 is calculated on the assumption of a wholesaler, (referred to as wholsaler I) buying charcoal from the producer at various locations (varying from production site to Khartoum). His profit margins along the actual chain 12 is then calculated. These margins along the chain varies from a loss to a maximum of 28%.

Table 3-9

Trade or profit margins in the charcoal trade as a percent

Location of 1st. transaction between producer and wholesaler I	Margin which wholesaler I sells to as %			
	wholesaler II	weighted* Average wholesaler II	Retailer	Consumer
1. Production site unpacked	4 - 18%	7%	14%	19 - 28%
2. " " packed	1 - 12%	4%	10%	16 - 24%
3. Depot	(-2%)-11%	4%	8%	13 - 21%
4. Khartoum	-	-	(-36%)-10%	1.5- 23%
5. Blue-Nile Trade	(See table 3-9)			

Source: Own calculation based on tables 3-3 & 3-4

*Note: wholesaler III is hypothetical and based on a weighted average calculated from actual trade in Khartoum.

Wholesalers in the Blue Nile on average reap compartively higher profit margins when compared to Khartoum. Whereas the weighted average for Khartoum is as low as 9%, for the Blue Nile the survey shows an average of 16%. Sennar wholesalers have shown the highest trade margins (19%) while Dinder trades the lowest (14%). The high margins for Sennar can be explained by the very high percentage of charcoal these traders deal directly with consumers (46% of their total trade).

Table 3-9

Analysis of Trade and Trade Margins in Blue Nile (Wholesalers)

Location	% Channel of Trade			Purchase price & extra costs LS.	Selling price	Profit LS.	Profit margin %
	Outside traders	Local traders	Consumers				
Sennar	40%	14%	46%	4.533	5.410	0.877	19
Suki	95%	5%	0	5.800	6.650	0.850	15
Dinder	80%	20%	0	5.140	5.875	0.735	14
Average	72%	13%	15%	5.158		0.820	16

Source: Own calculations based on 1984 Blue-Nile trades survey.

3-6-3 Income and Employment within the Charcoal Industry

Income within the industry and employment are generated right from production phase to the marketing and distribution phase. In this study we will attempt to throw some light on both parameters (income & employment) only at the production phase. Even at this phase the calculations are limited to the labour directly involved in the production process.

Labour involved in production during 1983 season in the Blue Nile are estimated to be 6[illegible]856 man-months (i.e 10976 employment opportunities for 6 months). This estimate is based on an average labour productivity of 287 sacks/labour/season and a total production of 3,150,000 sacks throughout the season. Other employment opportunities are provided in administration, supervision (overheads), handling and transport, storage, marketing and distribution.

Expressed in terms of gross income; an average labourer in charcoal production receives a total LS 429 ± 150 per season

(i.e 6 months). This is equivalent to an annual income for a labourer receiving minimum wage in government service today. The estimated gross income is equivalent to LS 1.49 labour cost/sack (figure compares very well with table 3-1 even though it is derived differently). Thus the total income accruing to labour in the Blue-Nile reached a figure of LS. 4.7 million in the 1983 season.

Investors' net annual income is estimated to be LS. 0.522 ± 0.19 per sack. For an average producer in Blue Nile producing 20003 (high varability ± 19946), this means an average net annual income of LS. 10,457. Total net annual income accrued to investors in 1983 based on these estimates is around LS. 1.6 million. It is thus very clear that charcoal production has always been a significant employer and income goverator for rural people in the Blue Nile.

4- FUTURE PROSPECTS

- Production Constraints
- Marketing Constraints
- Demand/Supply Balance
- Raw Material (wood) Requirement
- Future Price Trends
- Production Technology
- Conclusions

4- 1 Production Constraints

Charcoal production in the Blue Nile experienced a large scale growth during the last 40-50 years. During the last decade (1974 - 1983) production almost tripled from 1,184,228 sacks annually to 3,150,966 sacks. With diminishing resource base and increasing distances, formidable constraints are continually endangering the industry. Producers surveyed list the following as the most critical constraints under Blue Nile conditions:

- Labour desertion,
- Fuel supply at official prices,
- Soil texture and burial requirement.

The impace of these cosntraints is already showing in the continuous rise of charcoal prices (See Fig 4-1). These trends will continue to dominate the industry and future prices are expected to show rapid rises.

Both producers and forest authorities in Blue Nile expect these constraints to become continually more pressing with time. In a reply to charcoal production prospects, 61% of the producers sampled intend to shift to another business as soon as possible. 39% of the producers however still argue that charcoal is a good business and have no intention to desert the business.

Table 4-1

Charcoal Production Constraints in Blue Nile

Factor Constraint	No. of producers referring to constraint	Rating
1. Labour Desertion	21	+
2. Fuel supply at official price	14	+
3. Tree cover	14	+
4. Roads & infrastructure	13	+
5. Soil texture & burial problems	11	--
6. Water distance	5	0
7. Rail Transport Cost exclation	2	0
8. Pasturalists-Farmers conflict	4	--
9. Remoteness	4	0
10. Spare-parts costs	1	0
11. Abundance of agricultural crops and labour competition	5	-

Source: Own Analysis from questionnaire.

Note: + high

-- Medium and in specific areas (localized)

- Medium and general

o Low and in specific situations

4-2 Marketing Constraints

Fuel supply, roads, financing and price regulation are the most critical constraints of charcoal marketing in the Blue Nile. Other factors of limited applicability are also present.

Table 4-2

List of Marketing Constraints in Blue Nile

Major Constraints	Minor Constraints of Limited applicability
1. Fuel supply 2. Roads 3. Fiancing 4. Price regulation 5. Brokers 6. Distribution of Zaribas in Khartoum	1. Local taxes 2. Low price at production season. 3. Unavailability of rail transport. 4. Remoteness and distance from outlet. 5. Waiting for customers

Source: Charcoal Traders Survey, 1984.

Both price regulation and the relatively low trade margins will tend to push a lot of wholesalers (medium zaribas) out of the chain. Brokers (lorry owners-etc) are expected to assume an increasing role in the charcoal trade.

4-3 Demand/Supply Balance:

The demand supply balance in this case will be limited to the Blue Nile production areas and centres of consumption of the charcoal it produces. The main areas needed to be considered are thus limited to parts of the Blue Nile, Gezira and Khartoum Provinces. Table 4-3 below gives a summary of the charcoal balance projected to the year 2000. These calculated values were based on the following assumptions:

- 1983 population census figures are used. However in the case of the Blue Nile, only urban populations are included in the calculations.
- NEA (1983) per capita figures were used.
- 1983 production figure of 3150966 sacks is to remain constant to the year 2000.

Table 4-3

Charcoal Demand/Supply Balance for Blue Nile
1983 - 2000

Year	Blue Nile & Gezira Consumption	Khartoum Consumption	Total	Supply as% Demand
1983	1765827	5046437	6812264	46%
1985	1855222	5542523	7397745	43%
1990	2099014	7006705	9105719	35%
1995	2374841	8857685	11232526	28%
2000	2686915	11197645	13884560	23%

Source: Own calculations.
Note: Small quantities hauled to the Nile Province in the Northern region are not allowed for.

Thus supplies from the Blue Nile within the context of table 4-3 will continue to meet a declining percentage of projected demand (46% in 1983 & 23% by year 2000). If the 46% supply portion is to be maintained, Blue Nile production

targets must be raised from the existing 3.2 million sacks to 3.5, 4.2, 5.2, and 6.4 millions in the years 1985, 1990, 1995 and 2000, respectively. The impact of such targets on the resource base is the major concern of both charcoal producers and forest authorities.

2-4 The Raw Material Requirements:

Fuelwood supply in the long run is the most fundamental aspect in charcoal making. With assured supplies charcoal production becomes a technical and social management problem. In situations of inadequate wood supplies no technical prescription can provide the charcoal needed. Under existing conditions of the industry in the Blue Nile about 3 tons of wood are needed to produce a ton of charcoal. Using this conversion factor, forest reserves needed to maintain a 46% supply flow of charcoal for Khartoum, Gezira and some parts of the Blue-Nile are calculated in table 4-4. Estimated required area amounted to just over half a million hectares.

Table 4-4

Calculation of Resource Base Needs for Charcoal Production

Production target to maintain a 46% supply flow		= 4637690 sacks/year (average)
Conversion		= 1 cubic m. for three sacks.
Volume of wood needed	= $\frac{4637690}{3}$	= 1545897 cubic m.
Yield per feddan for A. seyal		= 20 cubic m.
Rotation		= 15 - 20 years (17.5 average)
Annual coupe	= $\frac{1545897}{20}$	= 77295 feddans 32466 hectares.
Total forest need to be reserved for sustained yield management	= 32464 x 17.5	= 568117 hectares.

Source: Own calculations.

Proper silviculture and management is an important element in reduction of land area to be committed for fuelwood needed for charcoal purposes. Studies along these lines and action programmes need to be urgently pursued.

Existing forest reserves (table 4-5) are only about 177217 hectares. This is only 31% of the total area calculated in table 4-4 to maintain 4.6 million sacks annually. Even within these reserved areas there is an area of 62560 hectares which needs urgent rehabilitation if it is to be used for charcoal production in the future.

Table 4-5

Forest Reserves in Blue Nile for Fuelwood Supply

Range of Area	Area in Hectares	Remarks
Pinder	8400	need rehabilitation
Sennar	54166	" " "
Damazine	68502	Well stocked
Suki	24375	" " "
Singa	21774	" " "

Source: Forest Dept. Records, Sennar Blue-Nile.

Outside the forest reserves the situation is not much better. A total area of 210000 hectares (½ million feddans) in Kurmuk (most southeastern part of Blue Nile) is the only remaining candidate area for commercial charcoal production. Intensive charcoal production is expected to become operational once the Sennar-Damazine road is completed in the next few years. This resource base is well stocked and can sustain the 4.6 million sacks annual targets for 6-7 years. It is of paramount importance that an intensive programme of reservation and afforestation be immediately initiated.

4-5 Future Price Trends

Charcoal prices are expected, as they did in the past, to exhibit continuous increases (See Fig 4-1). Various cost elements will contribute towards these increases. These mainly include:

- Labour costs
- Raw-material (wood) cost;
- Transportation costs
- General inflation

In this section an attempt will be made to discuss briefly raw material and transportation costs on future charcoal prices. A detailed analysis of future prices and projections are beyond the scope of this study and requires a set of data unavailable at the moment.

4-5-1 Raw Material or Wood Costs Impact on Future Prices

The impact of raw material cost has been relatively insignificant. It is treated almost as a free good as clearly implied by the very low royalty rates. This may continue to be the case as far as charcoal production is treated as a salvage operation in areas destined for clearing for agricultural expansion. These areas, however are continually becoming unable to meet existing production targets and there needs to be a shift to the forest reserves. It is here that raw-material costs are bound to rise significantly to values comparable to resource or replacement costs. The impact of rises in these costs will be softened under Blue Nile conditions, to some extent by the drop in transportation costs. Forest reserves are comparatively much closer both to charcoal depots and consumption centres.

Calculation of resource or replacement cost requires a set of cost data unavailable in existing forestry records. We must emphasize the need for such studies to determine proper charcoal and wood prices in the Sudan. Using available data calculation of break-even cost on per sack basis is shown in table 4-3 below:

Table 4-3

Estimation of Break-Even Royalty Value/Sack of Charcoal
A. Seyal Forest

Estimated Production per feddan in sacks	Interest model 10%	Zero interest model
60	3.72	0.86
30	7.44	1.72

Source: Own calculation based on Blue Nile 1983 records.

Note: Break-even cost is calculated as follows:

$$= \frac{\text{compounded cost/area}}{\text{Estimated charcoal production/area}}$$

The significance of these rough estimates can be seen clearly when they are compared with raw-material cost figures present today within the industry. The break-even figures (table 4-3) are 5 - 14 times the current LS 0.25 per sack royalty value. Expressed differently this means, assuming all other elements constant, an increase of charcoal prices in Khartoum ranging between 21% and 46%.

4-5-2 Transportation impact on Future Charcoal Prices

The increase in charcoal prices has always been closely correlated with transportation. As can be seen from experience the continual shift of charcoal production zones is reflected in price increases due mainly to transport. On average transport costs range between LS 0.003 - 0.007 per km per sack (table 3-5 section 3-4). Charcoal production zones in the very recent future are expected to move at least 100 km southwards and eastwards deep into Blue Nile. This when coupled with increasing oil prices can prove prohibitive. FAO (1980) and Earl (1975) estimate the maximum distance possible for charcoal haulage in the range of 800-100 km. A clear example of transport impact on prices can be seen in the Nile Province where the price of charcoal sack (35 kg) already passed the LS 30 mark.

2-5 Charcoal Making Process:

Charcoal production technology in the Sudan remained basically the same througout the life of the industry. Traditional earth kilns of various sizes and shapes are used. The smaller kilns are predominant at the begining of the season. Towards the end of the season big kilns are dominant.

Generally wood is allowed to dry for a period of three weeks after being cut. Filling the kiln developed into a skilled operation. The wood raw material is first separated by size into small, medium and big sizes. Various local nicknames were given to each size. Arrangement of wood inside the kiln is done in such a way that the inner-most layers are composed of the big size wood followed by medium sizes and small ones. The latter form the outer-most layer of the kiln. Once wood is arranged inside the kiln it is covered by hay and soil before it is lighted. Usually the carbonization process is allowed to continue for a period of 7-14 days depending on the size of the kiln. During this period continuous day and night monitering is the only concern of the chareman. When flames starts to show and smoke ceases the kiln is opened from the sidesand and allowed to cool before packing the charcoal in sacks begins.

All these processes are carried out by each chareman individually. However group participation does happen during the process particularly in transportation of large wood sizes to the earth kiln site.

In a response to the desirability of introducing new kiln types e.g. metal 41% of producers accepted the idea with reservation, 22% refused the whole idea and 37% could not say because they know very little of the new techniques. From the recent SREP studies in this area (see other SREP publications) existing techniques are expected to continue and seems to be more efficient than believed to be.

5- Conclusions

- General
- Marketing Environment
- Economics of Industry
- Future Prospects

5-1 General

- Charcoal production in the Blue-Nile is a highly commercialized activity. It is comparable to agricultural production both in terms of scale and money involved.

- It remains essentially a private sector activity right from production to marketing and distribution. With very few exceptions the role of the forestry department is limited to the control of operations and product movement.

5-2 Marketing Environment

- The structure of the charcoal producers as revealed by this study, shows a well organized industry. The degree of competition has been maintained sufficiently high to balance its development. This structure is clearly reflected in the conduct, performance of the industry and its development particularly in as far as the utilization of economics of scale and return on investment is concerned.

- Similarly charcoal traders surveyed showed a well organized structure. The trend towards the development of the charcoal trade as an integrated business where traders acquire their own transport fleet and also are involved in financing production operations to secure supplies, is well established. The most recent trend is the appearance of brokers and non-resident traders (lorry owners).

- Marketing process and distribution is long and comples. Generally at the production at the kiln site 20% is sold on site (packed or unpacked), 14% is transported packed and sold at local Blue Nile markets, 29% finds its way to outside markets in Khartoum and Gezira provinces, 34% is stored in depots in Blue-Nile awaiting peak prices and only 3% is left on site to next season. Compared to an ideal distribution program, the existing system is very abnormal (spaghetti diagram) where producers, wholesalers, retailers and consumers are both directly and indirectly connected. This is perhaps a reflection of the relatively low trade margins within the trade.

- The 1932 forest policy identified charcoal production as a forest management operation where sustained yield management is a pilot concept. The pillars of this system are identified

as continous afforestation of cleared areas and more reservation of natural stands to meet demand increases with time. However, as early as 1960 with the building of Roseries dam and expansion of mechanized rain-fed and irrigated agriculture, charcoal production shifted away from the realm of forest management to become strictly a salvage operation. Commercial production zones defined as areas planned for future mechanized agriculture now produce 84.5% of the charcoal in the Blue-Nile. Production in forest reserves is almost zero.

- Even with so much production from areas planned for agriculture, vast resources are actually wasted, being burnt directly into ashes prior to cropping. In two agricultural schemes by 1984,630,000 feddans of natural forests were burnt into ashes. This area was estimated to produce 20.8 million charcoal sacks valued at LS. 145 million using 1984 prices.

5-3 Economics of Charcoal Industry

- Of the total costs (production and marketing), labour and transportation assume a leading role. The latter will continue to increase and can become the limiting factor for charcoal production.
- Raw material (wood) as a cost element is very insignificant and is less than 9% of total costs. When viewed in terms of resource costs the royalty figure need rise from the existing LS. 0.25 to 3.72 - 7.44 per sack. Once charcoal production is practiced in forest resources these values will apply more and more.
- Charcoal prices, in general, are stable and show a distinct pattern. A period of low prices (March-June) interchanges with a period of high prices (July-January) with a peak occurring between November and January. Collusive practice and price rings are shown to be rare and are definitely less than most accusations tend to suggest.
- Investment in charcoal production is characterized by high labour intensity, short gestation period, seasonality, revolving initial capital and shell system of finance.
- Initial investment requirement is estimated to be 16% ± 6% of total costs (production and marketing). However figures as low as 8% and as high as 31% are experienced.
- Profitability expressed in terms of return investment is generally high. When based on initial capital needs returns as high as 85% ± 46% are estimated. When viewed in terms of total costs returns are found to be in the 12% ± 5 range.

- Trade of profit margins however are found to be generally low. This perhaps offers an explanation to the less-than-ideal distribution system in the industry - margins as high as 28% and as low as 8% are experienced.
- Employment generation within the industry is high. In the 1984 season in the Blue-Nile, 65,856 man-months (ie 10,976 employment opportunities in 6 months) were generated only in the production place. Other opportunities were also available in admmistration, handling, transport, storage, marketing and distribution.

5-4 Future Prospects

- Charcoal production in the Blue-Nile has experienced a large-scale growth during the last 40-50 years. During the last decade production almost trippled from an estimated annual production of 1,184,228 sacks to 3,150,966 sacks.
- Charcoal consumption is expected to continue to rise (National Energy Plan 1980) while the supply gap is expected to widen.
- The msot critical factor for the charcoal industry is the diminishing forest resource base in Blue-Nile institutions. With inadequate wood supplies no technical prescription can provide the charcoal needed.
- Other major constraints include labour desertion, fuel supply, soil texture, price regulation and financing systems.
- Future price trends are going to continue to rise. This is due mainly to two factors:
    a) Raw material or wood costs.
    b) Transportation costs.