

**The Economics of Groundnut Production and Marketing:
A Case Study of the Farmers of Nyala Province, South
Darfur State**

By

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Dedications

To my

Lovely Mother

Soul of my father

Patient wife

Respected sister

*Lovely kids, Whom I missed so
much.*

I wish them all the best

Adam

Acknowledgement

Praise be to Almighty God who offered me health, ability and patience to undertake this work.

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Abstract

The study was conducted at Nyala Province of South Darfur State and included the village councils of Abga Ragil, Tabaldiat, Abu Salalah and Tugah. The soil type is characterised by sandy soils and the main crops cultivated are millet, sorghum and groundnut.

The main objective of the study was to investigate in the factors affecting the production of groundnut under rain-fed conditions, factors determining the marketable surplus of groundnut and to find out ways and means for improvement. Primary data was collected from a filed survey covering 91 producers who were randomly selected and interviewed about all aspects of their cultivated groundnuts and its marketing. The secondary data were collected from relevant departments, groundnut merchants and groundnut market auctions.

A number of analytical techniques were used for analysing the collected data. The coefficient of private profitability (CPP) was used to determine the profitability of groundnut at production and processing levels and break even yield that just covers the cost. Tabular and descriptive analysis for analysing the data and regression analysis with two models to determine the factors affecting the production and the marketable surplus, were also applied.

The results from the study showed that groundnut is profitable under rain-fed conditions of South Darfur. The regression analysis revealed that the area and labor are the major variables affecting the production of groundnut.

The crucial constraints of the groundnut production are the scarcity of credit and its high cost and insufficiency of animal drawn implements during the plowing period. The study recommended that future efforts should be put on increasing the number of animal drawn implements; for each producer, i.e. a plow and a horse for each producer strengthening the extension department to play its role, and improving the markets. Future research must include the other areas of the region, especially the eastern and southern provinces.

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Chapter One

Introduction

1.1 The world production of groundnut

Groundnut is grown all over the world, but China and India are the world leading groundnut producers accounting for nearly 60% of the production and 52% of the crop area. India cultivates about 7.74 million hectares and produces 7.61 millions tones of groundnut with productivity level of 991.8 kg/ha. South Africa is the major producer in Africa, while in Latin America almost one half of the total groundnut produced in the region may be certified to Argentina. (<http://WWW.genres.2000>). Among the developing countries Egypt has the highest productivity and capacity to produce groundnut. In most developing countries, the productivity levels are lower than in the United States of America, mainly due to a number of marginal constraints such as the cultivation of the crop on marginal lands under rain-fed conditions, occurrence of frequent drought stress due to vagaries of monsoon, higher incidence of diseases and pest attack, low input-use and factors related to socio-economic infrastructure. (<http://WWW.genres.2000>).

Groundnut, especially in the developing countries plays an important role both as oil and food crop. For example in India about 10-kg groundnut per capita are available for domestic consumption per year.

Similarly in other developing countries most of the groundnuts are used for extraction of oil for domestic consumption and export. Sudan accounted for 17 percent of the world groundnut trade in 2000. Groundnuts are important components of Nigerian diet and about 5% of the estimated 58.9 grams of crude protein available per head per day is

contributed by groundnut. (Abulu, 1978). In most developing countries groundnuts provides high quality cooking oil and is an important source of protein for both human and animal diet and also provides much needed foreign exchange by exporting kernels and cake. In the literature, groundnut role as cash crop is found to completely dominate its role as subsistence food crop. Countries like South Africa, India, China and Egypt have good potential to utilize the opportunity to export groundnuts to developed countries. They can earn valuable foreign exchange to improve their economic conditions. (<http://WWW.fao>. 2000).

Table 1.1 shows the groundnut area cultivated, yield and production in various developing countries in Africa, Asia, and Latin America during the last decade.

1.2 Ideal conditions for groundnut, The Groundnut Diseases, and groundnut Morphology:

1.2.1 The Ideal conditions for groundnut:

The ideal growing conditions for groundnut are well drained, light colored, loose friable, sandy loam soils; availability of optimum moisture in pod zone and an optimum mean daily temperature of about 30° C. groundnut can be grown either as a sole crop or in combination with other crops in inter or mixed cropping. (<http://www.icrisat.org>. 2003).

1.2.2 Groundnut Diseases

Early leaf spot, late leaf spot, rust and sclerotium rolfsii are among fungal diseases; bud necrosis virus, tomato spotted with virus, peanut stripe virus and rosette are among virus diseases; jassids, thrips, termites, leaf miner, spodoptera and white grub are among insect pests and aflatoxin contamination represent important biotic factors. Among abiotic stresses drought, low pH and low temperature are of substantial importance.

These factors occur in various combinations in Asia, Africa and the American. (<http://www.icrisat.org>.2003).

1.2.3 Groundnut Morphology

Botanically, cultivated groundnut can be classified into two species, which mainly differ in their branching pattern: subspecies *hypogaea* with alternate branching and species *fastigiata* with sequential branching. Each subspecies is again divided into two botanical varieties; Subsp. *Hypogaea* into var. *hypogaea* (Virginia) and var. *hirsuta*, and subsp. *Fastigiata* into var. *peruviana*, and var. *aequatoriana*. In trade bold seeded types are referred to as Virginia, the small seeded as Spanish. And third type runner is also recognized. (<http://www.icrisat.org>.2003).

Table 1.1 Areas, Yields and Production of groundnut in the main productive developing countries.

Country	Area (000 ha)	Yield (t-ha)	Production (000 t)
<u>African Countries:</u>			
Nigeria	1798	1.1	1917
Sudan	960	0.69	663
Senegal	829	0.83	684
Mozambique	279	0.39	109
Niger	207	0.37	83
Uganda	191	0.73	141
Zimbabwe	181	0.50	95
Mali	174	0.90	155
Tanzania	113	0.62	70
Egypt	38	2.70	107
<u>Asian Countries:</u>			
China	3658	2.60	9737
India	7740	0.98	7609
Indonesia	667	1.70	1159
Myanmar	493	1.00	506
Vietnam	239	1.20	302
Thailand	97	1.50	143
Pakistan	98	1.00	99
Turkey	30	2.40	75
Syria	13	2.20	28
<u>Latin American & Caribbean countries:</u>			
Argentina	214	2.20	464
Brazil	93	1.70	164
Mexico	82	1.30	112
Paraguay	32	1.00	35

Source: FAOSTAT, database for the period 1990 to 2000.

Egypt has shown the highest yield all over the world. That is probably due to use of permanent irrigation rather rain-fed in other countries.

1.4 Groundnut trade marketing

Regarding the trade of groundnut, slightly over half of the groundnut harvested worldwide is crushed into oil for human consumption or industrial uses. Protein meal, a by-product of crushing, is an ingredient in livestock feeds. Groundnut is also consumed directly and is used in processed food snacks. Approximately one third of the world production is used in the confectionery products. In many groundnuts producing countries several products and by-products are processed and consumed locally and quite a few are exported. Groundnut oil is limited traded in international markets, because the major producers like China, India and the United States of America consume substantial amounts in their domestic markets. This national use reduces the quantities available for export. In the 1960s and 1970s groundnut oil was the major item traded, as edible groundnut trade was negligible. Since that period, the reverse has occurred. Edible groundnut dominates world groundnut trade while groundnut oil is of minor importance. The export trade of oil in developing countries is concentrated in Senegal and the Sudan (<http://WWW.genres.2000>). Developing countries account for about 90 percent of export trade in groundnut meal. In 1995 to 1997 India ranked first by exporting 50 percent of groundnut cake in the world followed by another 35 percent of world exports in cake contributed by Sudan, Senegal, Argentina and Netherlands. France, Thailand and Indonesia account for more than 65 percent of groundnut cake imports. In the 1990s imports increased sharply in developing countries including Indonesia, Thailand, Malaysia and China due to demand for meal by the growing livestock sector. (FAO, 1999). The quality attributes defined by the final end products made from groundnuts vary among the developed and

developing countries. Groundnut is mainly used for making peanut butter and consumed roasted or in confectioneries in developed countries. Meanwhile in several developing countries it is mainly processed for its oil. Most developing countries have not given much attention to the quality. They are obliged to meet the quality parameters fixed by the importer countries for the international trade of groundnut kernels and cake. For example, the general guidelines for the quality of groundnut pods and kernels formulated by the Natural Resources Institute of the United Kingdom's Ministry for Overseas Development include the pod colour, type size, freedom from damage, absence from blind nuts, grading for size, resistance to splitting, moisture content, cleanliness, oil content, and flavor for kernels. (<http://WWW.genres>. 2000).

1.4 Groundnut production in Sudan

Table 1.2 Irrigated Groundnuts areas, production and yield trend 91/92 - 00/01, Gezira scheme.

Season	Area/ha	Production/ton	Yield/ton/ha
91/92	14890	28291	1.9
92/93	68636	115995	1.69
93/94	78601	153272	1.95
94/95	80259	170149	2.12
95/96	97018	173662	1.79
96/97	101422	190673	1.88
97/98	93678	232321	2.48
98/99	61163	72784	1.19
99/00	65023	100786	1.55
00/01	71780	112695	1.57

Source: Gezira scheme.

The groundnut in Sudan is grown in both the irrigated sub-sector and the rain-fed sub-sector. In the irrigated sub-sector the crop is grown in the Gezira Scheme, Rahad Corporation, and New Halfa Agricultural Production Corporation, while in the rain-fed sub-sector it is grown in Southern and part and Northern Kordofan and Darfur states. (Ali, 2001).

Most of the area devoted to groundnuts in the country is in the rain-fed areas, but the very high yields of the irrigated areas, indicate that they may produce as much as two third of the nation's crop in drought seasons. (Mirghani, et al, 2002).

The Gezira scheme produces large, but variable, amounts of groundnut. In the 1997/98 season 231196 tons were produced from 223043 feddans, while in 1998/99 the quantity produced was as low as 73000 tons from 145625 feddans. (Mirghani et al, 2002). Table 1.2 shows the groundnut area and yield trend in Gezira irrigated scheme.

At the same time, due to low productivity in the rain-fed areas, farmers increase the area utilized to maximize their production.

Table 1.3 Rain-fed Groundnuts areas, production and yield trend 91-2002, South Darfur State.

Season	Area/ha	Production/ton	Yield/t/ha
1991	247752	252707	1.02
1992	218128	189771	0.87
1993	474180	227606	0.48
1994	478907	227606	0.48
1995	306212	110236	0.36
1996	461721	290884	0.63
1997	708093	325722	0.46
1998	791420	546080	0.69
1999	690468	441899	0.64
2000	851364	485277	0.57
2001	985348	581355	0.59
2002	657815	364689	0.60

Source: Ministry of agriculture and Animal Wealth, South Darfur state, Nyala 2003.

Table 1.3 shows that yield per unit area in rain-fed areas is almost half the yield in irrigated areas.

1.5 Importance of groundnut

The arable land in Sudan is estimated at 80 millions hectares. Only about 16.2 millions hectare of that area is cultivated with different crops (20%). Out of that, 1.7 millions hectares are under irrigation and 14.5 millions hectares under rain-fed cultivation. Within the rain-fed sub-sector mechanized farming is 5.5 millions hectares and traditional farming has 9 millions hectares. (AOAD, 1995).

Agriculture is the main source of income for the majority of people of the Sudan, who are concentrated in rural areas. Agriculture, comprising plant and animal sub-sectors, contributed an average share 43.5% of the GDP for the period 1991 - 2001 (Bank of Sudan Annual Reports, 1991-2001). Although there are fluctuations and decline in the share of agriculture in the GDP, within the crop sector, the irrigated sub-sector showed an increase in growth rate from 7.6 to 12.3%, mechanized farming from -55.7 to 5.0% while the traditional agriculture from -5.9 to 12%. (Bank of Sudan Annual Reports, 1993-2001).

Table 1.4 Share of Agriculture in the GDP

For the period 1991-2001.

Year	Share in GDP as %
1991	33.9
1992	38.1
1993	40.0
1994	41.0
1995	43.0
1996	45.0
1997	47.4
1998	48.7
1999	49.8
2000	46.4
2001	45.6

Source: Bank of Sudan.

Table 1.4 shows the share of agriculture in the GDP. The majority of the population depends on this sector for food and labor. This sector absorbs 55% of the total labor force; rising to 80% in rural areas (Bank of Sudan, Annual Reports, 1991- 2001).

Groundnut is among the main crops cultivated within the agricultural sector. The area under groundnut in Sudan is estimated at 1.89 millions hectares. Out of which 0.71 millions hectares, are within South Darfur traditional farming in season 2000, and 0.66 hectares in season 2002 Post harvest surveys, (2002). The production and yield of groundnut are fluctuating from season to season due to variation in areas. Sudan contributes to the world, African and Arab countries with 1.4%, 6.9%, and 72% respectively. (FAO, 1997).

Sudan groundnuts contribution to the total exports of the country is also fluctuating and declining as well. That was attributed to the decrease in the area planted in irrigated sector and to changes in climate in the traditional sector, in addition to the decrease in the international prices which forced the exporters to sell locally (Bank of Sudan Annual Report (1998).Table 1.5 is shows the contribution of groundnuts to the total exports during the last decade.

Table 1.5 Groundnut contributions to total exports

Year	Share of groundnut to total exports as %.
1993	1.49
1994	0.61
1995	0.49
1996	0.21
1997	1.19
1998	2.38
1999	0.03
2000	0.30
2001	0.52

Source: Bank of Sudan annual reports. (1993 - 2001).

Groundnut is used for cooking, soap manufacturing and in lubricants. It's high quality oil is used in pharmaceutical industry, the crop residue is used as fodder, and the groundnut cake is used as source of protein for animal fattening and feeding. From an agronomic point of view, groundnut contributes significantly to nitrogen fixation.

1.6 Problem Statement:

During the last two decades South Darfur region witnessed a number of phenomena, one of which is the sharp increase in population especially in the urban areas due to migration from North Darfur and Bahr el Ghazal regions and from the Republic of Chad due to instability around the region. The second is the decline in an annual rainfall and the third is the fluctuations in prices of most crops. Those phenomena have resulted in an increase in the domestic consumption of agricultural products. Meanwhile the crop assessment and the post harvest surveys reports over the last ten years showed a continuous decline in the productivity of the main crops (millet, sorghum and groundnut). Based on the 1993 population census, the population of South Darfur region is estimated at 2.8 millions with an annual growth rate of 4.5 percent. (WSDC, 1995). This has led to a rapid increase in the area cultivated to compensate for the low productivity. Traditional agriculture is the main occupation for over 75% of the population, cultivating mainly millet and sorghum for food consumption and groundnut as a cash crop, beside sesame, okra and some vegetables in small areas around the valleys.

The area of South Darfur is approximately 13780900 hectares. Only 17% of that area (2342753 hectares) is cultivated with different crops, and about one third of this area is occupied by groundnut. The remaining area is unused due to lack of suitable agricultural equipment. The cultivated area is characterized by low fertility, which so far, is considered the main reason behind the low productivity.

Groundnut is considered the main cash crop in the area followed by gum Arabic. It is mainly cultivated by small farmers in small areas and some large areas in sandy loam soil (goz lands). And is faced by many problems such as low productivity, pests, lack of storage facilities, and inefficient marketing. Groundnut has notable share in the local market

and in exports as well. A number of efforts have been put regarding the low productivity and fluctuations in the prices of millet and sorghum, but there is very little information regarding groundnut. This has resulted in a knowledge gap and the persistence of the problems that hold back development. Therefore, it is worth while study to groundnut to identify its production and marketing problems, fill in the information gap and look into the possible ways and means of increasing the farmer income through accumulating capital and enhancing productivity and marketing.

1.7 Main objectives

The main objective of the study is to investigate in the main factors leading to decrease in productivity of groundnut under rain-fed conditions in South Darfur, to analyze the cost of production and productivity and to identify the marketing constraints.

1.7.1 Specific Objectives:

- (1) To investigate the socio-economic characteristics of producers and their effects on production and productivity.
- (2) To investigate and identify the economic factors influencing the productivity of groundnut.
- (3) To identify the marketing constraints.
- (4) To estimate the gross margins and profitability of the crop.
- (5) Based on the findings from 1,2,3 and 4 the researcher will draw conclusion and propose ways and means to increase the productivity and farmer's incomes and improve the existing marketing system.

1.8 Hypotheses

To achieve the above objectives the following hypotheses will be tested

(1) The low productivity of groundnut of South Darfur is due to a number of factors such as lack of credit, area cultivated, labor, seeds, sowing date and education

(2) The marketable surplus of groundnut is affected by that amount of seeds reserved, home consumption, repayment of debts and gifts for relatives.

1.9 Organization of the study:

The organization of the study will take the following sequence as chapters:

- Chapter one is considered as the general Introduction.
- Chapter two is Literature Review. It includes basically the experience of others in different with regard to their findings.
- Chapter three is research methodology and concentrates on the description of the study area, data collection and methods of data analysis.
- Chapter four is devoted to the socio-economics characteristics of South Darfur groundnut growers, the production of groundnut in South Darfur, and it's marketing.
- Chapter five is mainly addresses regression, for factors affecting the production of groundnut model and it's results.

Finally chapter six is devoted for conclusions and recommendations.

Chapter Two

Literature Review

Upton (1979) stated that the farmer age has an influence on management performance, although the overall direction of this influence is not clear. On the one hand as man ages, he gains experience and would expect his decision-making ability to improve. On the other hand it was found that there is a change with increasing age usually towards leisure and less work.

El Hadari (1968) stated that at age more than 50 years the propensity to manual effort could be expected to decrease.

El Sayed (1987) stated that low yield of groundnut in Gezira is due to improper cultural practices, mainly poor weed control.

Huffman (1974) Stated that education seems to be positively related to better performance and hence better yield.

Abu mihgan (1984) stated that it seems that there is a positive relationship between income and member's of family member's up-to; certain level (5 -7) after which the relationship becomes negative.

Mohammed (1996) In the Sudan groundnut is not given any fertilizer because it is a legume crop.

Hassan, (1987) suggested that the subsistent mode of agricultural production represents the dominant pattern of farming system in South Darfur region. About 80 percent of the total population is engaged in this pattern and relying on it. In addition to that the of migration nomads who obtain their agricultural requirements from sedentary.

Hassan (1987) the low productivity realized is expected to be due to many factors. The most important of which are reduced fertility due to

continuous cropping, reduced labor force, and credit availability to purchase modern inputs.

Upton (1976) stated that the provision of credit will facilitate and accelerate the necessary investment and hence the adoption of technology. However, in the absence of any new technology provision of credit alone may have little impact on agricultural production.

Khogali, et al (1999) Stated that the groundnut, *Arachis hypogea*, "Foul Soudani" is second to cereals as a rain-fed crop. The main cultivated areas are concentrated in strata, where the soils are light textured well drained and do not form a hard crust when dry. There are three varieties of groundnuts grown in South Darfur region, a local spreading type known as "Baladi" and recently introduced varieties known as "Barberton" and "Sodari". The local variety has normally three seeds per pod and a larger nut than the introduced varieties and is usually used for confectionery.

In most developing countries, the productivity levels are lower than in the United States of America, mainly due to a number of constraints such as the cultivation of the crop on marginal land under rain-fed conditions, occurrence of frequent drought stress due to vagaries of monsoon; higher incidence of disease & pest attack, low input use and other factors related to socio-economic infrastructure. FAOSTAT (2000).

Steohan mentioned that markets fail in their role of allocating scarce resources to alternatives ends when transaction cost become so high as to preclude exchange. An important step toward improving the functioning of markets in this case is to understand the nature and effects of transaction costs facing input suppliers, farmers, food retailers and/or consumers.

Keith stated that agricultural marketing is an essential component of the food system, adding transportation, storage, and market services to food

products. New technologies, which reduce the costs of marketing, can lower marketing margins between farm-gate and retail markets and affect the welfare of both farmers and consumers.

Craig (1999) Stated that in the traditional rain fed cultivation marketing is characterized by a hierarchy of markets and institutions. To obtain urgently needed cash to pay back informal credits. Peasants are usually compelled to sell during the seasonal low price at harvesting time. Studies have shown that the sheil prices amounted to about 50% of the market prices.

Ali (2000) Stated that the farmer family is assumed to be the main source of labour supply, if needed, is used in cases of seasonal bottleneck. It was noticed that the family labour participation often increases in the light agricultural operations, while there is much reliance on hired labour to perform the tedious cultivation practices.

According to IFAD (1987) the farmers of North Kordofan area use very few inputs in producing agricultural crops. This is the same as most of traditional farmers in developing countries. The main inputs used are seeds, hand tools, sacks and small amounts of seed dressing. The seed rate is 0.107 tons/ha.

Bain (1959) states that market structure consist of "characteristics of the organization of a market, which seems to influence strategically the nature of competition of pricing within the market. In particular, these are the degree of seller and buyer concentration, entry condition, and the extent of the agent and product differentiation. Clodices and Muller (1961) add the dissemination of market information and its adequacy in sharpening price and quality comparison in reducing risk.

Chapter Three

Research Methodology

3.1. The study area:

The study covered the area of Nyala Province of South Darfur State which extends from 8° 30' N to 13° 00' N and 23° 15' E to 27° 45' E, covering an area of 13780900 hectares. Its population is a mixture of Negroid and Arab groups estimated at 2.8 millions (1999 est). About 80% of the rural population their main activity is agriculture, while the urban and nomads represent 15% and 5% respectively.

The morphology of the study area in general is characterized by plain and gently undulating hilly slopes, while rarely exceeds a gradient of 6%, except in the region of Jebel Marra. The soil varies considerably and is classified into the following categories: Basement 25.2%, Naga (association of soils developed on stratified alluvium parent material which have a hard surface pan) 18.5%, Deposit clay 15.5%, and Sand soils representing the remaining 40.5%. The climate varies from semi desert in the North to humid in the South, while the high altitude of Jebel Marra is of Mediterranean climate. Moreover the climate of the study area is dry during summer (March - June) and wet in the rainy season (June - October.), with a moderately cool winter (September - February). The rainfall occurs during summer and extends from June to October. Its amount and duration are increasing Southwards with a range from 250 to 1000 mm/ years. The mean day temperature ranges from 16° - 36° C, while the range of Jebel Marra is characterized by variation from 4°-20°C (Khogali, (1999). In general groundnut in South Darfur is usually cultivated in the sand soils and rarely cultivated in the clay soils. The sand loam soils spread all over the state in an area estimated at 40.5% of

the total area (Koala, 1999). The study area covered the northern part of the state (Nyala Province) with an area approximately (5512360 hectares).

3.2 Data collection and sample design:

3.2.1. Data collection:

Data for this study were collected from two main sources. Primary data have been collected using structured questionnaire from the field survey, interviewing the farmers about various aspects of their cropping. Aspects covered include the composition of their households, landholdings, grown crops, the cost of production of groundnut and labor involved, source of inputs used, sources of credit and its quantities, the distribution of groundnut production and its marketing, marketing costs and channels of distribution, ways and means of marketing, marketable surplus, time of marketing, transport and costs, etc of marketing. Secondary data have been collected from relevant departments and ministries which included the State Ministry of Agriculture, research center, the metrology department, Nyala crops market and other informal sources such as the groundnut retail and wholesale merchants plus groundnut Sheller's companies.

The field survey was undertaken during January 2003. This time was considered optimal for collection of data because all farmers have just harvested their crops and were therefore expected to recall the information about the last season.

Lack of data is the main problem of research work regarding groundnut in the study area; therefore primary data have been given top priority in this study.

3.2.2 Sample design:

3.2.2.1 Sampling frame:

The sample frame used for this survey is the list of village councils classified by localities. Villages were weighted according to their population size and the sample was selected from list of farmers within each village. The sample unit for this survey is the household. Accordingly, four village councils and eight villages were selected for the purpose of this survey.

3.2.2.2 Sample size:

South Darfur is similar to areas of traditional farming every where which are characterized by the lack of statistical data and therefore there are no accurate data regarding the number of farmers in the area. The sample size is normally determined by the level of precision needed which can be improved either by increasing the sample size or by stratification of the main data. Increasing the sample size always generates errors rather than increases the precision. The available data at the moment is the list of village councils, villages and number of households in each village.

The available data dates back to 1993 population census but has been updated by the Regional Ministry of Agriculture of South Darfur using annual population growth rate of 4.15%. This rate of growth adopted locally, although it is higher than the national annual population growth rate of 2.5%. This is justified by the huge migration of people from Bahr el Ghazal area, North and West Darfur States and from the Republic of Chad. About 70% of the population of the area was considered as farmers which constituted about 1.96 millions.

Multi-stage random sampling was used, in which the area was classified by localities, localities classified by village councils, and from village councils villages were selected randomly based on their population. Four

village councils were selected from the area of study. When the researcher reached the selected village council a list of villages within the village council was obtained from the local leader and a range of 1-3 villages were selected based on their population using the random sample number table. Then a list of households is obtained from the local leader (Sheikh) within the concerned village. Finally 10% of the farmers (households) were selected randomly using scientific calculator. The selected households are 8, 25, 16 and 42 households were selected from the four village councils, making a total of 91 households as the sample size.

The formula used for that is as follows: -

According to Bhattachary and Johnson (1979).

$$\text{Sample size} = \frac{KV}{D}$$

Where

K = Z value of the normal deviation at significant level normally at 0.95.

V = the estimated standard deviation of output.

D = the magnitude of the difference to be selected.

Where $K = t = 2.576$

$$V = 1.76$$

$$D = 0.05$$

The sample size is $= \frac{2.575 \times 1.76}{0.05} = 90.6752 \cong 91$ households.

With respect to groundnut wholesalers, their number is not exactly known, but there are estimated by the crops main market in Nyala, based on the constant number of wholesalers for long period. However there are also annually new comers as companies or individuals, which make the number of the wholesalers not accurate. A random sample of about 30% from the list of wholesalers was selected. The middle sellers on the

other hand are also not exactly known because they include the village traders, wholesalers agents and mediators. They were only contacted accidentally in each village and market and interviewed.

Table No 3.1 (a) The distribution of the sample of groundnut farmers according to areas surveyed.

No	Village council	Planned	Surveyed	Sample	% of the total
1	Abga Ragil	3	3	25	27.47
2	Tabaldiat	1	1	8	8.79
3	Abu Salalah	2	2	16	17.58
4	Tugah	5	4	42	46.16
	Total	11	10	91	100

Source: Field survey 2003.

Table No 3.1 (b) The distribution of the sample of groundnut wholesaler according to Nyala main market information.

Market	Planned	Surveyed	% of the total
Nyala crop market	3	3	30
Total	3	3	100

Source: Field survey 2003.

Table No 3.1 (c) The distribution of the sample of groundnut mediators according to area surveyed.

No	Village council	Planned	Surveyed	% of the total
1	Abga Ragil	4	3	15
2	Tabaldiat	2	2	10
3	Abu Salalah	6	5	25
4	Tugah	8	6	30
	Total	20	16	80

Source: Field survey 2003.

3.3 Methods of data analysis:

To achieve the objectives of the survey, various analytical techniques were used in each stage according to requirements needed.

3.3.1 Descriptive analysis:

At the beginning the data were taken directly from the questionnaire forms for the tabulation and pre-analysis of the data using an Excel program, which is a simple tool used for capturing the data for totals, averages tables and graphs. This helped to generate general description of the land holding, family structure, credit, labor, cost of production, etc.

3.3.2 Analytical Analysis

3.3.2 Crop budget analysis was used to assess the cost of production as the net returns of the groundnut production.

3.3.3 Coefficient of private profitability (CPP) was used to determine the profitability of groundnuts under South Darfur conditions.

3.3.4 Break even yield was used to test the yield at current prices.

3.3.5 Regression analysis was used to estimate regression coefficients of groundnut marketable surplus and factors affecting the productivity of groundnut. Sales of groundnut have been regressed on yield per unit area (ha), quantity left for seeds, quantity left for home consumption and quantity directed for repayments of debits. The same technique also was applied to examine the factors affecting the productivity of groundnuts under rain fed conditions which was regressed on area cultivated, sex of house hold head, age of house hold head, labor available at house hold, seeds used per unit area kg/ha, credit received, number of hired labor used, sowing date and education level of the house hold head.

3.4 Basic Assumptions and abbreviations:

The calculations and the main statistical inferences concerning the estimates of various elements were produced in this concise study report under the context of some basic assumptions. These include:-

1. The initial area measurement used was Makhams, which eventually converted to Hectare. The results came out of the study revealed that Makhamas is approximately 1.33 feddans or 0.5586 hectare rather than 1.46 feddans of Regional Ministry of Agriculture or 1.75 of El hanan 1987.
2. One sack of groundnut is equivalent to 45 kgs.
3. 143 lb unshelled groundnut = 100 lb. shelled groundnut.
4. 31.80 kentar of unshelled groundnut = 1.0 ton shelled groundnut.
5. One ton of shelled groundnut produces the following:-
 - 40% oil = 25 jericans each of 16 liter.
 - 58% groundnut cake = 7.25 sacks (80 kgs).
 - 2% Industrial losses.

MD = Man days

SD - Sudanese Dinnars

Chapter Four

The Economics of groundnut production and marketing

4.1 The socio-economics characteristics of South Darfur groundnut cultivators

4.1.1 Household head

Out of the total sample size of 91 households, 82.4% were male headed households while only 17.6% were female headed households (Table 4.1).

4.1.2 Age:

On average the household head age is 42.1 years old. 48.4% were ranging between less than 40 and the rest over 40 years old.

4.1.3 Occupation:

Including the female households heads, 85.7% of the total households have their main occupation as farming while only 17.6% have main occupation other than agriculture such as government employees or village traders, which means that the majority depends on agriculture (Table 4.1).

4.1.4 Marital status:

Although rural people mostly tend to get engaged in a polygamy marriage, the survey results showed that 96% of the male interviewed household heads have one wife and only 4% with two wives or greater.

Table 4.1 Household heads analysis

Village council	No. of HHs	Avg. age of HH head	HH head sex		Main occupation		Avg. No of wives
			Male No.	Female No.	Farmer	Other	
Abga Ragil	8	47.4	7	1	8	3	1.13
Tabaldiat	25	45.2	22	3	24	0	1.00
Abu Salalah	16	47.4	12	4	12	3	1.00
Tugah	42	40.2	34	8	34	10	1.05
Average	91	45.1	75	16	78	16	1.05
%			82.4	17.6	85.7	17.6	

Source: The field survey 2003.

4.1.5 Education levels:

Only 5.5% of the total household heads obtained secondary school level, while 47.3% are at khalwah level and 28.6% are illiterates (table 4.2).

Table 4.2 Education levels.

Village council	No. of HHs	Education levels				
		Secondary	Primary	Intermediate	Khalwah	Illiterate
Abga Ragil	8	0	1	0	6	1
Tabaldiat	25	2	7	0	7	9
Abu Salalah	16	1	2	2	6	5
Tugah	42	2	4	1	24	11
Average	91	5	14	3	43	26
%		5.5	15.5	3.0	47.3	28.6

4.1.6 Household member characteristics:

4.1.6.1 Family size:

Family can be defined as all members living in the house and having a blood relationship and supported by family income. (Ali,1990). The family size in Darfur in general is very important especially in terms of its effect on agricultural activities, and as a deferential of the farm size and production in general.

4.1.6.2 Family members:

Table 4.3 shows that the family is composed of 15% household head, 15.4% wives, 37% boys, 31% girls and 2% others. It also shows the concentration of boys and girls in the range age of 0 - <20 years old with a percentage of 87.1% for boys 92.6% for girls and the remaining percentages for the range >20 - <30 years old.

Table 4.3 Household structure

Village council	HHs No	HH size	Sons			Daughters		
			>0-<20	>20-<30	Other	>0-<20	>20-<30	Other
Abga Ragil	8	7.13	25	2	0	13	1	0
Tabaldiat	25	6.84	60	13	5	39	3	4
Abu Salalah	16	6.44	32	2	1	38	1	1
Tugah	42	6.48	85	6	1	97	4	1
Total	91	26.89	202	23	7	187	9	6
Average		6.72	2.22	0.25	0.08	2.05	0.09	0.07
%			87.1	9.9	3.0	92.6	4.5	2.90

Source: The field survey 2003.

Table 4.3 shows that the average family size is estimated at 6.72 members per household.

4.1.6.3 Education levels:

The very important sign shown by the Table 4.4 is that there is no illiteracy among boys or girls, 71.71% of boys and girls are within primary level and only 1.97% at secondary levels.

Table 4.4 Education levels

Village council	No. of HHs	Education			
		Sec	Prim	Intermediate.	Khalwah
Abga Ragil	8	1	17	0	0
Tabaldiat	25	1	4	29	0
Abu Salalah	16	1	27	0	4
Tugah	42	0	61	0	7
Total	91	3	109	29	11
Average		0.03	1.19	0.32	0.12
%		1.97	71.71	19.08	7.24

Source: The field survey 2003.

4.1.6.4 Participation in agriculture:

Table 4.5 shows the rate in percentage of household members participation in agriculture. It indicates that only 56.2% out of the households are members participating in agriculture.

Table 4.5 Participation in agriculture

Village council	HHs No	HH size	Participation in Agri.	
			Participating	Not participating
Abga Ragil	8	7.13	23	18
Tabaldiat	25	6.84	42	82
Abu Salalah	16	6.44	48	27
Tugah	42	6.48	131	63
Total	91	26.89	244	190
Average per HH		6.72	2.70	2.1
%			56.2	43.8

Source: The field survey 2003.

4.2 The Economics of groundnut production in South Darfur:

4.2.1 Cropping patterns in South Darfur:

In terms of area it is clear clearly from Tables 4.6, 4.7 and 4.8 that, the main crops in the state are: millet with 4.7 ha per household, groundnut with 2.6 ha per household and sorghum with 1.38 ha per household. Millet covers the largest area. This may be explained by the fact that is in the staple food crop in the area (Mark,. 1989). The next important crop in terms of area is groundnuts, which is the main cash crop in the area. However, the wide distribution of this crop over the state may be due to its suitability to *goz* lands and its relatively less labour requirements compared to sesame which is also a cash crop. In addition groundnut has more industrial demand.

4.2.2 Landholding:

The area holding per household varies between 9.2 and 20.6 ha, but on average, 15.3 hectares were acquired per household. About 13.9 ha out of the total area is under direct ownership and 2.6 ha are on rent basis. This area is distributed between the main cultivated crops in the area, namely millet, sorghum, groundnuts and some other crops.

4.2.3 Main cultivated crops:

Both millet and sorghum are used for food but sorghum is of minor importance. Millet is considered as the staple food in the area, always not sold very much. For the last ten years, the yields of cereal crops have been declining while the area cultivated has been increasing. The area harvested is normally less than the area cultivated because of rainfall shortages, pest infestation or lack of finance.

Table 4.6 Millet production

	Abga Ragil	Tabaldiat	Abu Salalah	Tugah	Average
Total area holding/HH/(ha)	9.60	9.20	20.60	21.6	15.30
Area ownership/HH/(ha)	6.40	7.20	20.60	21.6	13.90
Area rented/HH/(ha)	3.20	2.00	0.00	0.00	2.60
Area under Millet/HH/(ha)	3.20	2.53	5.94	7.21	4.72
Area harvested/HH/(ha)	2.90	2.30	5.50	6.50	4.30
Total production/HH/(ton)	1.20	0.73	2.34	2.43	1.70
Yield/(ton/ha)	0.42	0.32	0.43	0.38	0.39

Source: The field survey 2003.

Table 4.7 Sorghum production

	Abga Ragil	Tabaldiat	Abu Salalah	Tugah	Average
Total area holding/HH/(ha)	9.60	9.20	20.60	21.60	15.30
Area ownership/HH/(ha)	6.40	7.20	20.60	21.60	13.90
Area rented/HH/(ha)	3.20	2.00	0.00	0.00	2.60
Area under Sorghum/HH/(ha)	2.03	1.96	0.15	0.00	1.38
Area harvested/HH/(ha)	1.90	1.80	0.13	0.00	1.28
Total production/HH/(ton)	0.81	0.84	0.22	0.00	0.62
Yield/ton/(ha)	0.43	0.47	0.81	0.00	0.57

Source: The field survey 2003.

4.2.4 Groundnut production

Table 4.8 shows that 80 household are groundnut cultivators. They constitute about 88% of the total households interviewed with an average area of 2.34 hectares per household. This area is equal to 15% of the total area owned by the household and ranked second in terms of area cultivated after millet. The average yield obtained is 0.69 ton/ha which is only half of the yield in irrigated areas, (New Halfa). (Ali, 2001). Almost all the agricultural operations are carried out manually except for the plowing and sowing for which they used animal drawn implements (donkey plow). Labor is insufficient, costly and is not affordable to most farmers. About 12% out of the interviewed farmers did not cultivate groundnut in season 2002/2003. The major reason behind that was lack of seeds because farmers sold out all their groundnut products to meet family and other commitments and also there is no any source of finance for seeds.

Table 4.8 The groundnut production/ha

	Abga Ragil	Tabaldiat	Abu Salalah	Tugah	Average
Total area holding/HH/ha	9.60	9.20	20.60	21.60	15.30
Area ownership/HH/(ha)	6.40	7.20	20.60	21.60	13.90
Area rented/HH/(ha)	3.20	2.00	0.00	0.00	2.60
Total Area under Groundnut/HH/(ha)	23.97	48.39	44.24	75.89	2.60
Total Area harvested/(ha)	21.79	43.99	40.22	68.69	
Area /HH/(ha)	2.72	1.99	2.68	1.97	2.34
Total production /(ton)	16.88	27.32	27.81	45.86	
Production/HH/(ha)	2.11	1.24	1.85	1.31	1.63
Yield/ton/(ha)	0.77	0.62	0.69	0.67	0.69

Source: The field survey 2003.

4.2.5 Labor requirements:

Table 4.9 shows the total labor requirement per household. The calculation of labor requirements was initially based on the number of man-days required per one operation to be performed, then total man-days is the sum of man-days of all operations per unit area. In this case the calculations were made for Makhamas, which is the traditional measurement used in the area and later converted to hectare. It was found that the total labor required per hectare on average is 58 man-days. Weeding comprised the most labour demanding followed by harvesting and then plowing. It was found that, on average, only 17% is hired labor, the rest are family contributions.

Table 4.9 labor requirements for groundnut by operation /MD/ha

Village Council	Land preparation	Shelling	Plowing	Weeding	Harvesting	Threshing	Transport	Total
Abga ragil	11.9	10.71	9.52	9.52	9.52	7.05	2.38	60.61
Tabaldiat	7.14	11.9	8.98	16.7	10.71	6.21	2.38	63.40
Abu Salalah	7.14	13.81	10.34	9.52	10.71	6.10	2.38	59.90
Tugah	7.14	7.62	11.02	7.74	8.33	5.71	2.38	49.95
Total	33.33	43.57	39.76	42.86	39.29	25.07	9.52	233.88
Average	8.33	10.9	9.95	10.71	9.83	6.26	2.38	58.38
%	14.3	18.3	17.0	18.7	16.6	10.70	4.20	100

Source: The field survey 2003.

Fig 4.1) the percentages of labor required by different operations

Source: The field survey 2003.

The above figure shows the labor required by groundnut operations. It reveals that weeding is the biggest labor demanding operation.

Fig 4.1 The percentages of labour required by different operations

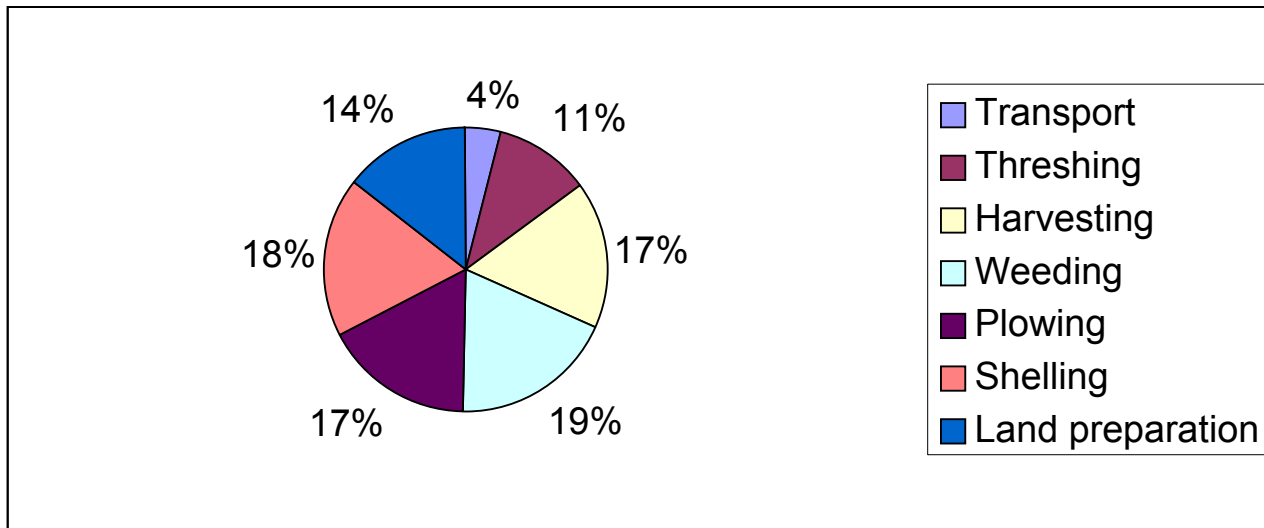


Figure 4.1 shows the labour required by ground nut operations. It reveals that weeding is the biggest labour demanding operation.

4.2.6 Labor requirement for production of one ton of groundnuts:

Table 4.10 shows the total labor required for producing one ton of groundnuts. It was calculated that the total labor needed to produce one ton of groundnuts is approximately 79 man-days against 1.52 hectares. Only 7.96 of the area hired for at the same time the contribution of the family labor is 83% which confirms the unavailability of credit.

Table 4.10 Labor requirements for the production one ton of groundnuts

No	Operation	Village councils				Average
		Abga ragil	Tabaldiat	Abu salalah	Tugah	
1	Area needed for production of one ton g'nuts (ha)	1.30	1.62	1.45	1.52	1.47
2	Labor used for land cleaning (MD).	15.47	11.57	10.35	10.85	12.06
3	Labor used for shelling (MD).	10.48	14.49	15.05	8.71	12.18
4	Labor used for sowing & weeding (MD).	12.38	14.55	14.85	16.75	14.63
5	Labor used for weeding (MD).	12.38	26.03	13.80	11.76	15.99
6	Labor used for harvesting (MD).	12.38	17.35	15.53	12.66	14.48
7	Labor used for threshing (MD).	6.88	7.57	6.64	6.52	6.90
8	Labor used for transport (MD).	2.33	2.89	2.59	2.72	2.63
9	Total labor required for producing one MT (MD).	72.3	94.45	79.81	69.97	79.13
10	Area cultivated (ha).	23.97	48.39	44.24	75.85	48.12
11	Area hired for	4.07	9.19	7.96	10.62	7.96
12	Total hired labor (MD).	226.29	535.87	432.7	488.9	420.95
13	Total family labor (MD).	1104.83	2284.5	1917.19	3004.	2077.5
14	Family labor %	83%	81%	82%	86%	83%

4.2.7 Costs of production of groundnuts:

Table 4.11 shows that costs of production per one hectare is about SD 22013 with highest cost proportion for plowing and sowing which constitutes about 28% of the total cost, followed by seeds and harvesting. The production of one ton of groundnuts requires total cost of SD 32355.

Table 4.11 Cost of production (SD/ha):

Village council	Seeds	Land Preparat.	Shell.	Plow. & Sowing	Weed.	Harvest.	Thresh.	Transp.	Total
Abga Ragil	4104	1705	1199	6593	3343	3029	2268	881	23029
Tabaldiat	2839	1717	1199	6274	3595	2738	1939	861	21161
Abu Salalah	3419	1021	1138	5045	3295	3852	1726	1019	20515
Tugah	3667	471	1260	6962	3848	3331	2279	1429	23247
Total	14029	4914	4914	24874	14081	12950	8212	4190	87952
Average	3507	1229	1199	6219	3520	3238	2053	1048	22013
Cost %	15.93	5.58	5.45	28.25	19.99	14.71	9.33	4.76	100

Source: The field survey 2003.

Figure 4.2: The percentages of cost of productions operations.

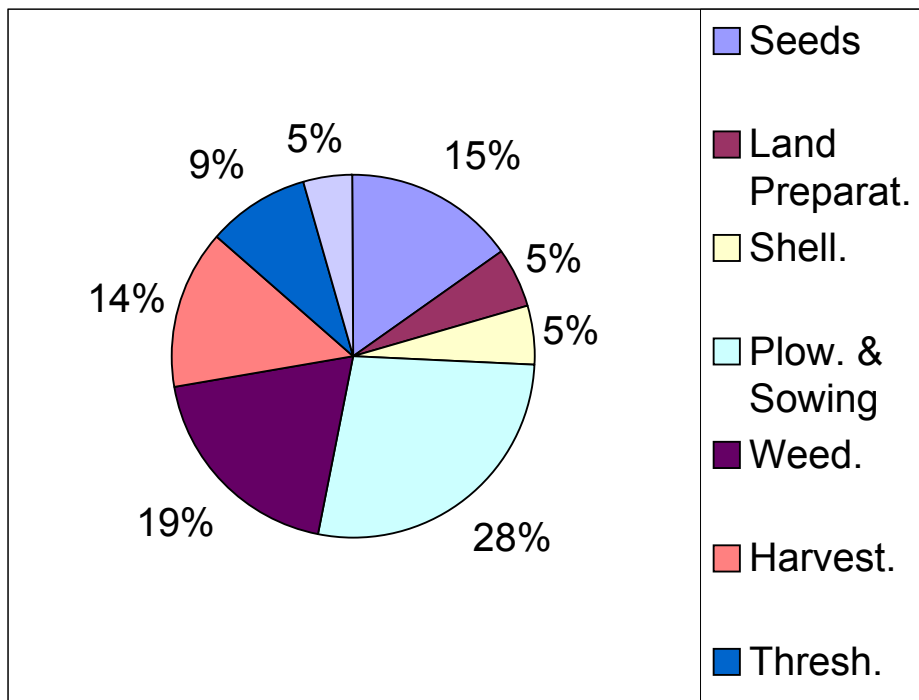


Figure 4.2 shows the costs of production by different operations. It shows that the plowing is the most expensive operation, because actually two operations were performed at the same time (plowing and sowing).

4.2.11 Cultural operations:

4.2.11.1 Seed rate:

The seed rate is a very important factor affecting the yield of any crop, because it directly affects the plant population which affects the yield of the crop (Ali, 2001). In NHAPC the groundnut sown is unshelled with the recommended seed rate of about 0.11 ton/ha. while in the study area the results showed that only 0.011 ton/ha is used for seeding. Even this little quantity constitutes about 16% of the total cost.

4.2.11.2 land preparation:

This operation is usually done manually using manual tools. It requires 8.33 man-days and 5.58% of the total cost per hectare.

4.2.11.3 Shelling:

Shelling is the least costly operation but in terms of labor it requires 18.3% man-days for one hectare to be performed.

4.2.11.4 Plowing and sowing:

Plowing and sowing are carried out at the same time using animal drawn implements. Although it takes less time compared with manual work, still it is still labor demanding, because it needs three people at the same time, one for pulling the animal, another for adjusting the plow and the third for putting the seeds. It absorbs 28.25% of the total cost and 9.95 man-days per hectare with variation depending on the quality of the animal and its speed.

4.2.11.5 Weeding:

The carefulness and timing on weeding directly affects yield and production. The weeding operation is done manually using small weeders. Carelessness in the weeding of groundnuts leads to cutting the crop plants and therefore reducing their number, which consequently affects the yield as well.

4.2.11.6 Harvesting:

Harvesting is a very tedious, laborious and expensive operation. In terms of labor requirement it is the second most demanding operation after weeding.

4.2.11.7 Threshing and winnowing:

This operation is done manually but it costs less, always charged per sack and requires only 6.26% man-days/ha. Here the researcher tried to calculate the groundnut straw because the farmers use it in feeding their animals and earn additional cash as well. The calculations gave that every sack of groundnut give three sacks of straw. This however cannot be generalized for every year, depending on plant growth.

4.2.11.8 Transportation:

Most of the farmers use their own pulling carts or hire carts for transportation of their products to home. In case of hiring, they pay per sack depending on the distance. And this is considered as the cheapest operation.

4.2.8 Credit:

Agricultural credit is needed to pay for the cost of different agricultural operations and inputs that the farmers are unable to pay for at the right time.

Table 4.12 shows that only 22 farmers out of 91 received credit from money lenders. The form of credit received was in cash at average of 4527 dinnars per farmer, which is equivalent to 0.25 ton of groundnuts to be repaid in kind after harvest calculated at the estimated price agreed upon at the time credit was given. The amount repaid was 0.25 tons of groundnuts. Which at repayment time was equivalent to 19834 dinnars. The cost per one dinnar is thus 4.4 dinnars or at an interest rate of 440%

for a period of three to four months (September - December/January). Most of the farmers are discouraged to get credit due to its high cost. The main source of credit was the village trader. Most of the credit received was not at the proper time and so was not used directly for agricultural operations. It was mainly used to bridge the harsh period September and October in terms of meeting the farmer's consumption needs.

Table 4.12 Cost of credit:

Village Council	No. of farmers	Total cash received SD	Repayments		
			Total G'nuts in tons	Total value/ SD	Cost per/ ton (SD)
Abga Ragil	0	0	0	0	0
Tabaldiat	13	45302	2.4	188040	4.2
Abu Salalah	7	51100	2.8	233100	4.6
Tugah	2	3200	0.2	15200	4.8
Total	22	99602	5.4	436340	13.6
Average per farmer		4527	0.25	19834	4.4

Source: The field survey 2003.

4.2.9 Source of seeds:

The type of seeds is an important factor in determining the level of production. The absence of certified seeds from the research centers or extension agents forces the farmers to use other sources of seeds which earn them lower productivity. Table 4.13 shows that only two sources were available. About 69.2% of the farmers used their own seeds and only 19.8% used seeds from market.

Table 4.13 Seed sources

Village council	No. of HHs	Sources	
		Farmer	Market
Abga Ragil	8	6	2
Tabaldiat	24	15	9
Abu Salalah	15	12	3
Tugah	34	30	4
Total	81	63	18
%	89	69.2	19.8

Source: The field survey 2003.

4.2.10 Inputs used:

Table 4.14 shows the different types of inputs used by farmers of South Darfur. Not so many inputs are used due to shortage of finance. About 40% of the farmers reported that they used animal drawn implements, 9.9% used pesticides, and only 1.1% used improved seeds and purchased bags which means most of the farmers sold their products locally.

Table 4.14 Inputs used

Village council	No. of HHs	Pesticides	Improved seeds	bags	Animal drawn implements
Abga Ragil	25	6	0	0	7
Tabaldiat	25	2	1	1	15
Abu Salalah	16	0	0	0	7
Tugah	42	1	0	0	7
Total	91	9	1	1	36
%	100	9.9	1.1	1.1	39.6

Source: The field survey 2003.

4.2.12 Groundnut budgets and producer return

4.2.12.1 Household gross income

The gross margin of an enterprise is its output less the variable costs attributed to it. (El-badawi, 1990). Taking this frame of work per hectare crop budget was estimated, based on averaging all variable costs incurred. Table 4.15 shows the household gross revenue from both groundnuts and its straws calculated at farm gate prices, depending on the area cultivated and the yield per area unit.

Table 4.15 Household gross Income

No	Items	Village councils				
		Abga ragil	Tabaldiat	Abu salalah	Tugah	Average
	Groundnut production:					
1	Total production per HH (tons).	2.11	1.24	1.85	1.31	1.63
2	Price per ton (SD)	71917.8	66911.1	74128.9	65740	69675
3	Return from groundnut production(1X2))	151746.6	82969.8	137138.5	86119.4	113571.2
4	By-products :					
5	Groundnut straw quantities (sacks)	15.6	9.2	13.7	9.7	12.05
6	Price per sack.(SD)	150	150	50	50	100
7	Income from straw (5X6)(SD).	2340	1380	685	485	1205
8	Gross revenue (3+7).	154086.6	84349.8	137823.5	86604.4	114776.2

Table 4.16 presents the per hectare budget for groundnuts. It also illustrates the area under groundnut. It shows that the average cost per hectare is about SD 51510.

4.2.12.2 **Household variable costs:**

Table 4.16 per hectare total cost

No	Items	Village council				Average
		Abga ragil	Tabaldiat	Abu salalah	Tugah	
1	Area under groundnut per HH/ha	2.72	1.99	2.68	1.97	2.34
2	Cost per hectare (SD)	23122	21162	20515	23247	22013.13
3	Total cost (SD)	62891.84	42112.4	54980.2	45796.6	51510.72
4	Coefficient of private profitability (CPP).	2.45	2.00	2.51	1.89	2.23

4.2.12.3 **The coefficient of private profitability for groundnut**

The coefficient of private profitability indicates the extent to which the production of a crop is profitable for the producer. It is a decision criterion for the producer whether to produce a certain crop or not. The coefficient of private profitability is equal to the total return per feddan at farm gate price (TR) divided by the total cost per feddan (TC). (Ali, 2000).

$$\text{Coefficient of private profitability (CPP.)} = \frac{\text{TR/ha at farm gate price}}{\text{TC/ha}}$$

The CPP is the same as the benefit/cost ratio. If CPP is less than unity (1) it is unprofitable to produce that crop at present productivity level, and or the present price level. El badawi, (1990).

Table 4.16 shows that this ratio (CPP ratio) is greater than one for all surveyed areas. Hence the groundnut production is profitable at the producer level.

4.2.12.4 **Groundnut break even yield:**

The break-even yield is defined as the yield that just covers the production cost. (Mohamed, 2000 cited by Ali, 2000). It is equal to the

total cost of production per unit area (ha) divided by price/unit of yield (ton).

$$\text{The break even yield} = \frac{\text{Total cost of production per unit area}}{\text{Price per unit of yield}}$$

Accordingly the break-even yield for groundnut was 0.32 tons/ha. This means that the average yield of groundnut per hectare in the study area exceeds the break-even yield by about 0.37 tons per hectare.

4.2.13 Costs and returns of processing one ton of groundnut

4.2.13.1 The cost of processing:

Table 4.18 is showing the cost of processing one ton of groundnuts into oil and different operations and cost items involved.

Table 4.19 Costs of processing one tone of groundnut:

No.	Items	Cost
1	Cost of purchasing nuts(SD)	93333.33
2	Cost of shelling (SD)	1397.33
3	Cost of grinding & extraction	4542.22
4	Cost of empty containers	5503.75
5	Gross total cost	104776.86

4.2.13.2 The returns from processing

Table 4.19 shows the outcome from processing one tone groundnuts, based on factory gate prices.

Table 4.19 Returns from processing:

No.	Items	Cost
1	An oil returns	103604
2	Groundnut cake returns	11265.54
3	An empty sacks returns	1150
4	Total returns	116019.54
5	Net Returns	11243

$$4.2.13.3 \quad \text{Coefficient of private profitability (CPP.)} = \frac{\text{TR/ton of groundnut}}{\text{TC/ton of groundnuts}} = \frac{116019.54}{104776.86} = 1.11$$

Coefficient of private profitability (CPP) = 1.11

From the above calculations the figure 1.11 indicates the ratio (CPP ratio) for the processing of groundnut is greater than one for this season, but nearly marginal, which means the cost is about to be equal to returns, although the processing is profitable, but little profit.

$$4.2.13.4 \quad \text{The break even yield} = \frac{\text{Total cost of production per unit area}}{\text{Price per unit of yield}} = \frac{104776.86}{6541.546} = 16.02$$

The above calculations show that the break-even yield for groundnut processing was 16.02 Jericans/ton of groundnut. This means that the average yield of processed groundnut per ton in this study area was more by only 1.54 Jericans per ton. From the above calculations, the break-even yield per ton for processed groundnut (including returns from groundnut cake). These results indicate that the output per ton of groundnut covers its actual costs of production in South Darfur (Nyala town) in this season 2002/2003.

4.2.13.5 **Producer's net profit:**

The producer net returns depend on yields, cost of production, and selling price. According to the survey results with an average yield of 0.69 tons/ha, and an average prices of SD 69675.6 per ton., the gross return per hectare is SD 114776.2; the average cost of production for the same season is SD 51510.72. Tables 15 and 16 show the net profit of SD 63265.64 per hectare.

Marketing of groundnut in South Darfur:

The word marketing has different meanings for different people. It means shopping for the housewife, sales of production for the farmer, finding foreign markets for commodities for the country and advertisement and sales promotions for companies and business. (Sid Ahmed, 1968).

Generally speaking, marketing of agricultural products comprises all the operations, activities and services involved in the movement of products from the farm gate up to the final consumer. The different aspects of marketing give an idea of the complexity of the whole subject and its contribution towards the proper functioning of the economy. Thomson (1951) defines marketing as “It comprises all the operations and the agencies conducting them, involved in the movement of the farm produced food and raw materials and their derivatives such as textiles, from the farms to the final consumer and the effects of such operations on farmers, middlemen and consumers. There are two aspects of marketing (a) The physical aspect such as freezing, packing, grading of commodities which is referred to as marketing technology, and (b) The economic aspect which is related primarily to costs, prices, functions and management. This is called the business phase of marketing. The two aspects are interrelated.

A complete and thorough knowledge and study of marketing involves knowledge of the commodity itself, its physical characteristics, storing, processing, handling, sale, quality (grade) and knowledge of the whole economic system in which the commodity is produced, bought and sold. An important part is the integration between the prices and the general supply and demand condition.

There are various approaches to the study of marketing, but the three basic ones are:

- (1) The functional approach, where the different marketing functions such as assembling, grading, storage, financing etc. are enumerated and analyzed.
- (2) Institutional approach, where we examine all the types of the distributors chains in the marketing system.
- (3) Commodity approach, where we follow a product from the farm gate up to the final consumer, Sid Ahmed, (1968).

Basically this study will follow the third approach with some considerations of the first and second approaches.

4.3.1 Market Structure, Conduct and Performance:

The structure of the market of groundnuts in South Darfur is more or less oligopoly market because it is controlled by a few numbers of large traders whose main objectives is to maximize their profits. Market conduct is the pattern of behavior which enterprises follow in adapting or adjusting to the market in which they sell (Bain, 1959). This method is used for determining price, sales promotion, and coordination policies. Since the market is under oligopoly the farmer does not expect fair prices because prices in South Darfur are determined by what are called mediators representing the large traders. They often determine the groundnut prices through negotiations between the producers and the large traders. There is no market information and within the same village prices may differ. This depends on the quantity of groundnut offered for sale by the farmer. Even among the large merchants there is no objective competition because price is always agreed upon secretly.

Table 4.20 shows the concentration ratio for the period 1991 - 2002 for four traders. On average it was found that about 58% of the groundnut

was concentrated in the hand of only five traders, which confirms the degree of concentration in the market.

Table 4.20 is shows the concentration ratio for different number of merchants for the same period.

Table 4.20 Marketing concentration ratio for four traders /1991-2002

Year	Qty sold/ton	Qty sold by top four traders.	Qty sold by other traders	Concentration ratio (%).
1991	10252	6459	3793	63
1992	11888	7965	3923	67
1993	11113	6001	5112	54
1994	17134	8738	8396	51
1995	9871	6021	3850	61
1996	49032	34813	14219	71
1997	56755	27810	28945	49
1998	180289	82933	97356	46
1999	165468	112518	52950	68
2000	171269	106187	65082	62
2001	94374	50962	43412	54
2002	59263	33187	26076	56
Total	836708	485291	351417	58

Source: Nyala auction market.

Table 4.21 marketing concentration ratios for different traders 1991 - 2002:

Ranking traders	Sales/ton	Concentration ratio %
Top four traders	485291	58
Top five traders	535493	64
Top six traders	577329	69
Top seven traders	610797	73
Top eight traders	635898	76
Top nine traders	652632	78
Top ten traders	674387	80.6

Source: Nyala auction market.

Market performance represents the economic results of structure and conduct. It is an assessment of how well the process of marketing is carried out and how successfully its aims are accomplished, in particular the relationship between distribution margins and the cost of marketing services.

4.3.2 Marketing system of groundnut in South Darfur:

4.3.2.1 Past situation:

Actual groundnuts marketing in South Darfur started in the 1960s. Before that period the majority of inhabitants of that area were nomads. In that period Nyala market was the only center running auctions in the area. Due to lack of transport and short age of auction centers, the producers bring their products direct to the central market. This situation continued up to the middle of seventies. Then, the Sudan oil Seeds Company was founded with the objective of setting price policy to organize the marketing of oil seeds. Sudan Oil Seed Company was established in 1974 and granted exports trade monopoly of Oil Seeds including groundnut. Its actual exports operations started in 1975. The oil seeds company played the role of exporting Oil Seeds, participated in establishing floor prices in coordination with the Ministry of commerce, taking into consideration the cost of production, purchasing oil seeds which can not be sold in auction market at floor prices already declared, discovery new markets for Sudan oil seeds, participation in financing development, and generally tries to improve the marketing systems of oil seeds including groundnut. This system continued up to the nineties when the company was dismantled because it failed to realize the stated objectives. The large traders and some private companies were running the market. This situation affected the producers negatively because the traders prices were determined by traders regardless of the actual cost of production.

4.3.2.2 **Current marketing systems:**

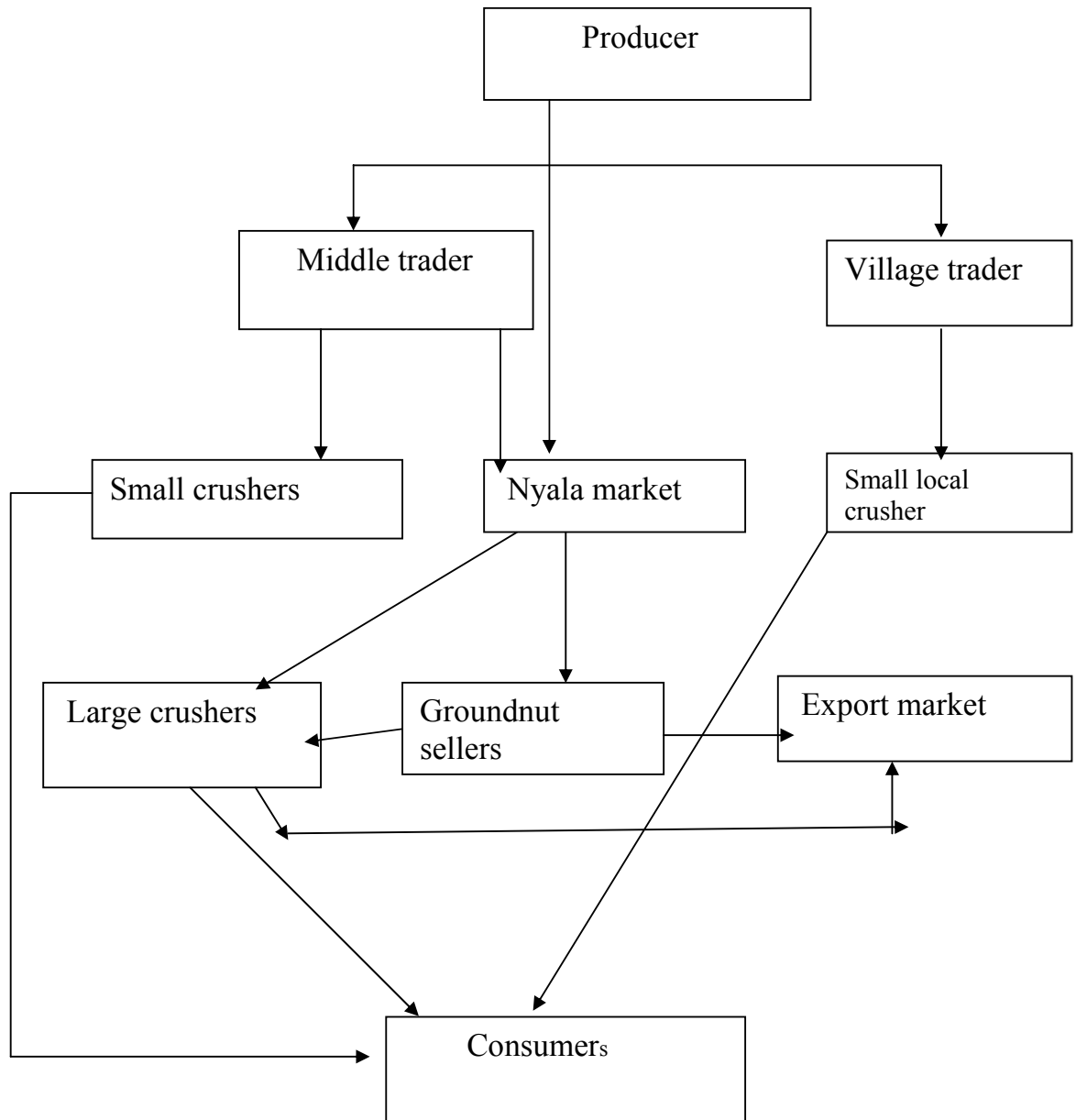
Currently there are no auction markets for groundnut in Southern Darfur. There are a number of rural markets scattered all over the state each of them has a certain day for selling and buying groundnuts. Apart from the market days, the village traders purchase groundnut from farmers on any day at prices always less than the market price. The marketing channel for Southern Darfur groundnuts is presented in figure (1). A large chain of middlemen intervenes between the producers of groundnut and the final consumers. According to the survey results 89% of the producers sold the groundnut at farm gate and that was equal to 44% of the total production, while only 11% have taken their production to Nyala market. Producers always sell their products either to the village trader or the middle trader. The village trader either processes groundnuts into oil and cake using the local processors or hands it over to middle traders. The middle trader also either takes it to small oil processors in Nyala town or the Nyala crops market. At Nyala crops market the groundnut are distributed between Nyala large oil extractors and groundnuts Sheller's owners. The groundnut Sheller owners after they shell it they transport it to Umdurman for oil extraction and to Port Sudan for export as shelled groundnut. But the large oil extractors process their share into oil and use it for local consumption and sometimes for export to the neighboring countries such as the Republic of Central Africa, Chad, and Nigeria. At early harvest season the price of groundnut is usually very low. Firstly, the traders consider it as still wet and therefore offer low price for it. Secondly, the farmer is forced to repay their debts. Thirdly, the large traders are not informed about the government policy regarding the export of groundnut. Fourthly, producers are forced to sell their products at low prices mainly to meet their urgent commitments. (Mark 1989) stated that the groundnut is the main cash crop in South Darfur. A very

significant proportion of groundnut was delivered into the market after being harvested as a major source of income to farmers. Money accumulated from the sale of groundnuts is used for various purposes.

These can be listed in order of importance: -

1. Purchase millet and sorghum for home consumption.
2. Purchase the household items for consumption or meet the needs.
2. Repayment of debts.
4. Buy livestock mainly because they are used for transport and carrying things. Farmers also prefer to buy goats or sheep when they get surplus money. Cattle and horses are usually expensive and normally farmers cannot afford buying them.

Fig 4.3 Groundnut marketing channels in South Darfur



Source: The field survey January 2003.

It can be said that the middle traders handle all produced groundnuts in South Darfur State at the point of first sale. In turn they sell it to wholesalers in Nyala. The system of the point of first sale was most inefficient and left the producers with weak bargaining position. Most of the producers have no working capital and as a result; they sell part of their groundnut product in advance at low prices to the middle traders. Even the producers who were able to avoid the farm gate selling, the marketing system compels them to be weak sellers. There is no market intelligence report system to assist the producers in selling their products. The numbers of the middle or village traders are limited so there is little competition among them. The storage at all levels is in open spaces. This also could be a reason for selling the groundnut early to avoid the groundnut pests. Few producers are able to store their products for longer periods to get higher prices. Storage is an important function of the marketing system. It enables regulating supply to meet the demand for goods throughout the year. (Mirghani, et al 2001). The researcher observed that there are no permanent storage facilities available in the study area for producers to store their products efficiently apart from sheds and small yards surrounded by grasses. The most widely used modes for transport are trucks and animals. Animals with pulling carts are used for shorter distances, mainly from farm to home or from home to nearby markets. The average cost of transportation for one sack of groundnut range between SD 100 and SD 200, which is really high compared with total cost of production.

4.3.3 Marketing costs and marketing margins of groundnut

Table 4.21 Marketing cost and marketing margins of groundnut SD/ton sold in Dec/Jan 2003.

The proportion of consumer price that occurs to the producer varies with different commodities due to product characteristics, which affect the complexity of marketing different farm products. Products, which have higher specific value per unit i.e. more work, is done to change the form into one that is suitable for consumption usually, have relatively greater marketing margins. In contract products which have a relatively lower marketing margins. (Bartlett, 1952).

Table 4.21 shows the marketing costs and margins in South Darfur as SD/ha. To understand the marketing cost and margins it is important to know the marketing channels. Discussed before, there are four levels of cost margins, which are related to producer, middle trader, wholesale trader, and retailer.

The major task of the perfect marketing system is to lead to consumer price and high farm gate price. (Hussein, R. 1987).

At the moment formally there are no so many taxes regards groundnut apart from the zakat which is 10% of the total production. The producer price is 69675.6 SD/ton. The producer has got highest net margins due to low marketing cost at the farm gate level and high prices of groundnut this season 2002/2003. The middle trader and the village trader both do the same job. It was observed that the middle traders take a commission from both the producer and the wholesaler for facilitating the marketing job. The middle traders are considered as the main price determinator and they always try to make an agreement between the wholesalers, the producer and the village trader against certain commission per kantar of groundnut (this year the commission ranges between 50 SD and 100 SD).

The middle-trader pays the cost of transport, loading, unloading, empty sacks and adding value costs. He received net margin of 10405 SD per ton. The wholesaler paid total marketing cost of 9776.6 SD but received a net margin of only 12919.24 SD per ton. The retailer paid the least marketing cost along the marketing channel and also received net margin less than the wholesaler. Mass purchasing and processing groundnuts by the wholesaler could justify this. This long marketing channel indicates that the producer loses so much amount of money for the mediators.