

The Role of Finance in Developing the Mechanized
Rainfed Sub-Sector in the Northern Upper Nile State

"Case of Agricultural Bank of Sudan-Renk Branch"

By

John Richard Ukello Morjan

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Supervisor

Prof. Babiker Idris Babiker

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Department of Agricultural Economics
Faculty of Agriculture
University of Khartoum

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Dedication

For Those who were educated ...

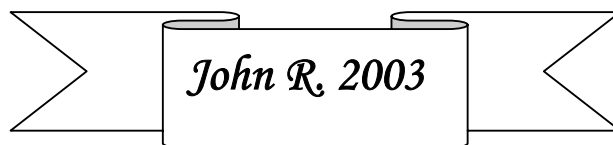
And those who are willing to educate ...

To my dear Father, mother,

Brothers, sisters,

Relatives and friends.

I dedicate this work with my love....



Acknowledgement

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Thanks are also extended to Agricultural Bank of Sudan (ABS) Renk branch and management of Upper Nile University (investment sector in Renk province) for their sincere help and interest co-operation in compiling the study information.

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ABSTRACT

This study was conducted in Renk Province (season 2001/2002). This study aimed at assessing the role of finance in developing the mechanized rainfed sub-sector in the Northern Upper Nile State Agricultural Bank of Sudan, Renk Branch as the case of the study.

The main objective of this study was to investigate the role played by the ABS in Northern Upper Nile State. Other objectives of the study included, studying the effects of some socio-economic feature of the population on finance and production. The study also measured the impact of ABS on developing agricultural production and improving farmers living standards.

The study based on both primary and secondary data, primary data were collected by means of structural questionnaire from multi-stage sample of 78 farmers producing the crops (sesame and sorghum). Secondary data were collected from institutional sources relevant to the study. Descriptive analysis procedures were applied for purposes of the study. Also other statistical methods used include multi-linear regression analysis to explain the relations between the crops equation variables.

The main findings were that, the contribution of commercial banks to agricultural credit surpasses that of ABS contribution. Private lenders who include relatives and money lenders apply simple loans procedures. The statistical analysis of socio-economic characteristics of the respondents revealed that the farmers are a homogenous group with respect to the education level, most of them

had primary school education (37.2%), the majority of them were with in the productive age group (31-45 years) which represent (56.4%) and most of the respondents were married (83.3%).

Agriculture is the main activity of respondents. The sorghum was the main food crop in the rainfed season and sesame was the main cash crop. The average yield was 119.12kg/fed.for sorghum and 62.73kg/fed. for sesame. The average cost per feddan for sorghum was 3887 SD and for sesame was 7368 SD. Respondents who borrow from informal sources have higher farm productivity, followed by those respondents who borrow from formal sources and those of self-financed respondents come last (for sorghum crop). The sesame regression equation showed that the data was well fitted to the dependent variable and have R^2 of about 66% with F-value of 13 which is significant at all levels of significance and the significant variables are area cultivated, formal loan and cost of production at 99%, 95% and 95% level of significance, respectively.

The sorghum regression equation revealed that the equation with a high R^2 of about 86% and the significant variables were cost of production, farm size and area cultivated at 99%, 99% and 95% level of significance, respectively.

The study recommended that, the administrative and technical staff of the bank should be increased and well-trained, also items like fuels, oils, spare parts, ...etc. must be made available in the bank, so that the bank can easily develop its program efficiently. The central and the state government must encourage the introduction of private financial institutions in the agricultural sector of the state. This due to the fact that the formal public sources can not cover the whole areas and reach every farmer, and also the demand for agricultural credit in rural area is increasing annually.

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CHAPTER ONE

INTRODUCTION

1.1 Agriculture and economic development:

The prerequisites for agricultural development in any country include the contribution of agricultural potential which have not been optimally exploited, the capital for employing the appropriate technology in agricultural development, and the efficient management that can bring out an appropriate combination of these factors to improve agricultural productivity (Mustafa, 1999).

It is generally believed that, at the early stage of development, countries have to rely, in developing agricultural sector, upon the available resources. The agricultural sector is the dominant and leading sector in the Sudanese economy and is likely to remain so for along time.

The agricultural sector (both agrarian and animal sub-sectors) is considered as the most important sector in the Sudanese economy, because it absorbs about 75% of the labor force and contributes a substantial share in the gross domestic product. However, in spite of that importance, its share in the gross domestic product decreased from 49.8% in 1999 to 46.4% in 2000. This decline was due to the noticeable decrease in the agricultural production growth rate from 8.5% to 0.8% in the same period which more than offset the increase of the other sectors contribution, particularly the industrial sector whose contribution in gross domestic product increased from 9.1% to 15% including oil extraction in 2000.

Bank of Sudan (BS) reports indicate that 22.3% of the total exports come from agriculture (2001).

1.2 Agricultural finance:

The need for credit to be made available as a development tool in developing countries has long been recognized, but both the costs and the logistic problems of institutional support to the small-scale rural economy have made it difficult to impart momentum to this policy (Bouman, 1981).

Considering that credit rules in an informal setting offer opportunities for experiments to put new life in rural credit, the problem of agricultural finance seems to be the main obstacle that hinders the development of agriculture in the Sudan.

Finance for the agriculture sector comes from two sources: either domestic finance, or foreign finance. As a typical third world country, the Sudan needs to receive and attract a lot of foreign capital and funds to develop the agricultural sector.

“Experience in developing countries has shown the importance of a good system of agricultural credit in promoting agricultural development and the necessity of providing farmers with short-term credit at reasonable cost for recurrent seasonal inputs such as fertilizers, insecticides, pesticides, ... etc. even when the prices of the inputs are subsidized. The credit must be available at the time when the input are purchased and must be extended until the crop is marketed” (Arnon, 1981).

1.3 Role of government in agricultural finance:

Governments have an essential role to play in efforts to make rural financial markets more effective and viable (institution and capacity building) and meeting the needs of small-scale farmers and other

disadvantaged rural people (public good argument). However, governments should be guided by the principle that any intervention be directed to strengthening the functioning of rural financial markets and they should abstain from interfering directly in day-to-day operations and management of financial institutions (FAO, 1997).

Heavy government intervention in agricultural credit supply and delivery system is often based on number of misconceptions which include:

- a. A perceived lack of saving potential on the part of the rural population.
- b. An ignorance of the relevance of non-farm income and not allowing lending for non agricultural rural activities and emergency purposes.
- c. Assumption that the access of small farmers to financial services can be improved through provision of subsidized credit.
- d. Over-optimism regarding benefits to farmers of credit access without other necessary measures (FAO, 1997).

Hence, the government intervention in the field of agricultural finance is seen very important in order to provide the necessary funds and promote the institutions required for extending credits to farmers and agricultural cooperative societies (Abdelmagid, 1986).

The main sources of agricultural credit in Sudan are:

- a. Informal sources such as money-lenders, land owners, merchants, shopkeepers, relatives, friends, etc...
- b. Formal sources such as commercial, cooperative and saving banks, the Bank of Sudan and the Agricultural Bank of Sudan.

“while the Bank of Sudan provides credit for public agricultural corporations in accordance with section 57(A) of the Bank of Sudan Act 1959, the Agricultural Bank of Sudan is the main source of agricultural credit in the country” (El-Hassan, 1976).

1.4 The problems of agriculture in least developing countries (LDCs):

One of the crucial problems of agriculture are related to capital finance and the provision of adequate credit as a necessary condition for the development and modernization of agriculture, especially in the least developing countries (LDCs), where agriculture is still back ward and has a lower rate of growth (Mustafa, 1995). In addition to the limited cultivable land, water sources and lack of technical and administrating skills of the typical farmer constitute real obstacles to any tangible and the technology, which may be imported or employed, the expected results with such obstacles will remain limited as well (Mustafa, 1999). Capital is a factor of production; that along with land and labour contributes services to the process of production (Upton, 1976). It has been observed that while productivity of land and labour are important, the concept of capital productivity has received the large share of attention in recent time (Elgozouli, 1998). Agricultural credit is an essential requirement for any productive activity. This process is related to acquiring of inputs, sale of output, improvement in land, meet consumption needs of farmers to sustain them for agricultural work. For these purposes, several purchases have to be made involving many payments (Agrawal, 1980).

1.5 Problem statements and justification:

Agricultural credit in many developing countries is intended to increase agricultural production and improve farmer living standard following the steps of the developed countries.

Sudan established the ABS, on the object of financing agriculture as a government owned formal credit institution. To achieve its purpose ABS extended branches all over the Sudan, including Northern Upper Nile State, to provide agricultural credit to the farmers. However, despite ABS modest efforts production has not increased, farmers standards of living are low, and most of the farmers have deserted the field of agriculture, (Table 1.1, Figure 1.1 and Table 1.2 , Figure 1.2 show clearly the fluctuation of production in Upper Nile State in general and in Renk Province in particular in mechanized rainfed sub-sector), which is due to the following conditions:

- Adequacy of credit: inadequate credit to meet the demand for credit lead to negative effects in production.
- Timing of credit: the credit given does not suit the production period, therefore it affect the product and the production.
- Credit and debt repayment: period of debt repayment by the farmers is not suitable to the farmer's financial states; as a result most of the farmers leave the field of agriculture.
- The cost of credit: the high cost of credit leads to the high cost of production as a result it reduces the farmer's net income.

More over, the credit provided by the ABS Renk Branch was unsatisfied (table 1.3) show the amount of loans per feddan (SD), number of beneficiaries (farmers) and average yield (Kg) in Renk province from 1998 to 2001. All the above indicate that finance is the most factor constrained agricultural production in the Northern Upper Nile State, this study intended to investigate the role of finance in the development of the

mechanized rain fed sub-sector, particularly the role of ABS on development of this sub-sector in Renk province.

Table 1.1. Sorghum area production and yield, period (1995-2001) in Upper Nile State mechanized rainfed sub- sector.
Area: in (000) fed, prod.: in (000) M.Ts, yield: in kg/fed.

Seasons	Area planted	Area harvested	Production	Yield
1995/96	337	280	40	143
1996/97	670	570	86	150
1997/98	492	435	90	207
1998/99	696	580	139	240
1999/2000	150	100	20	200
2000/2001	300	240	43	180
Total	3645	2205	418	1120

Source: Ministry of Agric. and Forestry.

Table 1.2. Sesame area production, and average yield, period
(1995-2001) in Renk Province mechanized rainfed sub-sector.

Area: in (000) fed, prod.: in (000) M.Ts, yield: in kg/fed.

Seasons	Area planted	Area harvested	Production	Yield
1995/96	60	50	2	40
1996/97	198	168	13	77
1997/98	122	110	9	81
1998/99	100	85	10	115
1999/2000	345	276	17	60
2000/2001	500	400	24	60
Total	1325	1089	75	433

Source: Ministry of Agric. and Forestry.

Table 1.3 Amount of loans per feddan (SD), number of beneficiaries (farmers) and average yield (kg) in Renk Province from (1998-2001).

Season	Amount of loans per feddan (SD)		Number of beneficiaries (farmers)	Average yield (kg)	
	Sorghum	Sesame		Sorghum	Sesame
1998	30.68	375.87	279	183	85.31
1999	-	760.53	100	-	89.8
2000	685.01	1133.80	190	137	67.35
2001	632.11	1706.75	70	137	67.35

Source: ABS Renk Branche

1.6 The objectives of the study:

Recognizing the agricultural credit problems in the developing countries in general and in particular in the Sudan, the ABS based financing system is introduced to increase agricultural production (crops yield), through the provision of adequate and timely finance to the farmer.

The main objective of this study is to investigate the role played by the ABS in mechanized rain fed sub-sector in Northern Upper Nile State. Other specific objectives are:-

- To identify and estimate demand for credit.
- To measure the impact of ABS on developing agricultural production and improving farmers living standards.
- To address the availability of credit, which could increase production and adoption of innovation.
- To identify and describe formal and informal credit agencies.

1.7 Hypotheses to be tested:

- a) The availability of formal sources of agricultural credit in cash and kind will succeed in decreasing farmers dependency upon other alternatives of money-lending. In so far as the ABS is in a position to reach most of the farmers of the province, then the informal credit markets will be reduced.
- b) Farmers use the credit for the purpose intended.
- c) There is real supervision from ABS officers for extended loans.

1.8 Organization of the study:

This study includes six chapters, chapter one is introduction. Chapter two reviews literature about agricultural credit and credit institution, while chapter three is a descriptive chapter, which describe the area of the study (Renk Province), chapter four is the methodology, while chapter five is the results and discussion carried out. The last chapter is summary, conclusion and recommendation.

CHAPTER TWO

THE AGRICULTURAL CREDIT INSTITUTIONS

2.1 Definition of agricultural credit:

Agricultural finance may be defined as the study of the financing and liquidity services credit provides to farm borrowers.

Also it may be defined as the study of these financial intermediaries who provide loan funds to agriculture and the financial markets in which these intermediaries obtain their loanable funds (Person, *et al.* 1980).

According to Schaefer (1986), agricultural credit is regarded as an important instrument of economic policy in most market-oriented developing countries, being used to stimulate development in a direction considered desirable on economic and social grounds.

Mellor (1974) defined agricultural credit as a device for facilitating the temporary transfer of purchasing power from an individual or organization to another.

2.2 The importance of agricultural credit:

There has been an increased concern about the role and the sources of agricultural credit in developing countries for the last six decades.

Questions about the process and procedures of formal and informal finance have been raised, as to which of these sources is beneficial to farmers. Emphasis has been placed on timing of credit, terms of credit, availability i.e. providing adequate credit services, credit and debt repayments and cost of credit.

The credit need for the majority of cultivators arises because their savings are normally too few to finance their farm activities. Moreover,

while their income occurs during limited period of the year, their expenses spread throughout the year.

Therefore, there is a high need for adequate and timely farm finance to the farmers to operate efficiently and at their maximum capacity. Otherwise they must borrow from private money-lenders at very high costs.

Not only can credit remove financial constraints, but it may accelerate the adoption of new technologies (World Bank, 1975).

Also it has been reported that credit is an important tool in fostering development but unless a great effort is made to hold down the rate of dependency on the informal finance sources, credit programs will fail to meet one of the criteria of success. The criteria of success have been suggested as their success to increase production and farm income, their success in generating the sufficient debt repayment and in the case of credit oriented towards small farmers their success in channeling adequate and timely credit to large number of farmers and mobilization of rural savings.

In Renk province, the availability of agricultural credit is very important for low-income farmers in order to carry out the different agricultural operations. At the beginning of the season, the farmers need credit for the purchase of seeds, fertilizers, herbicides, and the preparation of land for sowing. After sowing, the farmers need some financial resources for the land cleaning and at the harvesting time, the farmers need credit for the purchase of sacks, twine and transport the product to the markets. Therefore credit is needed by farmers throughout the season.

Today, agriculture needs a lot of inputs and this will increase the cost of agricultural production. Hence for small farmers of the province there is a need for a balance between their low financial resources and the high cost of agricultural production.

This financial gap explains why small farmers do not adopt modern and improved agricultural technical package which require large financial outlays.

“credit requirements for modernizing agriculture on a national scale are so considerable that only government initiative can provide the necessary funds and promote the organization required for providing credit to farmers” (Arnon, 1981).

The government of Sudan since 1957 thought of the establishment of a formal credit institution to provide farmers with agricultural credit in cash and kind and to look for the development of the agricultural sector as a whole. In 1959, the Agricultural Bank of Sudan started its activities of agricultural credit provision. Informal credit institutions were found in Renk province before the establishment of the Agricultural Bank of Sudan.

In this connection, availability of finance, in particular, is seen as the most positive way of:-

- a) Raising production and reducing its costs by raising productivity,
- b) Raising personal income per capita and improving the standard of living,
- c) Checking rural-urban migration, and,

- d) Improving the quality of life and the country side conditions in general (Fadlalla, 1982).

2.3 Needs and uses for credit:

The most common uses and needs for credit in agriculture are for current operations, emergencies, and capital investments.

Credit to finance current operations is usually short or intermediate term, that is, usually for one season or one year. A farmer uses such credit for the following purposes:-

- a. Buy seed, fertilizer, insecticides and other materials for crops.
- b. Hire extra help (labor), especially for planting, harvesting, and marketing.
- c. Store farm products.
- d. Purchase livestock, feed, and veterinary service.

Much of this credit is made necessary because of the seasonal characteristics of farming: A farmer needs money to cultivate his crop and take care of it, but he will not receive money back until the crop is harvested and sold. Occasionally, a farmer may need to borrow for a short time to provide his family with food, clothing and shelter. The farmer also faces unpredictable cash demands because of emergencies, such as drought, floods, disease, poor markets, death, and health problems. When farmers cannot obtain enough money to meet these emergencies, he may become bankrupt. At the very least he may be forced to sell products at low prices and borrow on extremely harsh terms. To protect himself, the farmer needs to remain in a liquid position by having cash reserves and resources that can be converted to cash. Low income farmers in developing countries tend to keep their limited assets in a liquid state,

whatever they possess is usually converted to jewelry, gold, or money and kept hidden ready for any emergency. Some have their assets almost entirely in livestock.

2.4 Sources of credit:

The main source of credit in the world is the savings of individuals and businesses. A lender's function is to transfer these funds to farmers and others who need to borrow them. Transfers are made within a local community, from one part of a country to another part, or even from one country to another. Thus, lenders are critical links in any credit system. Lenders may be individuals, institutions and governments and may be classified into two groups, informal and formal lenders. Every country has both groups.

2.4.1. The informal credit institution:

Informal lenders are the farmers' friends, neighbors, relatives, landlords, village storekeepers, merchants, itinerant traders, and money lenders.

Although the formal sources of credit have low nominal rates of interest (7% - 14%), the informal lenders continue to exist in any country charging high interest rates.

A study by FAO, reported that money-lenders charged 48% interest rate in Laguua province of the Philippines (FAO, 1973). In the Gezira province of the Sudan Ahmed calculated the rate of interest to range between 115% to 280% for the informal lenders, although a branch of the ABS is also available beside the built-in credit system of the Gezira Board for cotton crop produced on the share basis (Ahmed, 1975).

Generally, in developing countries, we find that the informal credit and the marketing processes are grouped together by informal money-lenders in order to compel the small farmers to sell their products to them at lower market prices. This situation is best explained by Ahmed who argued that:

“In organized credit markets, this arrangement is made to channel credit to farmers and agricultural products to commercial agents with the added result of alleviating price fluctuations. In the unorganized markets as in the case of Sudan, the flow of funds to finance agriculture is stimulated by the farmers need for liquidity and the informal lender accepts the agricultural products as a form of repayment pledged before hand” (Ahmed, 1983).

The impression is often conveyed that rural money-lenders get enormously wealthy from profits extracted from the poor and needy farmers. Yet the apparent wealth of such moneylenders may come from occupations other than money-lending, which is often a subsidiary job of a merchant, landowners, shopkeepers, relatives ... etc. In addition a great many money-lenders, despite the exorbitant rates of interest recorded, do not seem to lead the prosperous life one might expect. Finally, an answer must be given to a phenomenon which has puzzled many reform-minded observers: why does it happen so frequently that private money-lenders enjoy the continued patronage of poor rural and city workmen, even after socially-oriented credit facilities managed by cooperatives or the state have been made available to them?

2.4.1.1 The sheil system:

The sheil system simply means the provision of money against the next crop. It is a socio-economic transaction that avoids taking interest on credit which are prohibited by Islamic laws.

Until the 1930's the sheil system was the main source of finance in rural areas of Sudan. Several types of sheil are still practiced. The oldest type of sheil is an advance of grain or seeds valued at a price substantially below the estimated price at harvest (Ahmed, 1980).

Several forms of sheil are practiced in different parts of the province and these are:

- a. The small farmer (borrower) receives a certain amount of money before or during the agricultural season from the sheil merchant (money-lender). Then the sheil merchant determines a certain price for one ardab (two sacks) of the product, and order the small farmer to deliver the same amount of the crop after harvesting. The most important point here is that the sheil merchant determines the prices of the product below the last harvest prices.
- b. The small farmer receives a certain amount of money from the sheil merchant before or during the agricultural season. Then immediately the sheil merchant writes a financial receipt which will be signed by the small farmer. In the receipt, the amount of money the small farmer should pay after the crop harvesting, is equal to the loan plus 50%, 100%, or even 150% of that loan, as a profit. No description is found in the financial receipt, just the required amount of money. In case of failure in recovery the sheil merchant has the right to go to the police,

or add an extra amount of profit for delaying, to be delivered the following year.

- c. The small farmer who has no transportation and marketing facilities, contacts a local sheil merchant. A certain agreement is made between them. Then the sheil merchant agrees to buy the product according to the prevailing market prices.

2.4.1.2 Borrowing against standing property:

This is another type of informal money-lending and mainly concerns the mortgage or selling of animals at a low price, and after a certain time buying them at higher prices (same animals). The rural money-lender here may be the village merchant, or any other person.

Borrowing against standing property has the following forms:

- a. The small farmer may need some money during the season. He may sell his cow to a village merchant or any other sheil merchant at a certain price, and the village merchant (lender) leaves the cow with the small farmer (borrower) to be looked after. After harvest, the small farmer may earn some money, and here the village merchant will show his desire to keep the cow. Some negotiations between the two parties will take place, and finally, the small farmer buys the cow back at a higher price which is equivalent to the market price. In most cases, the prevailing market price of the cow will be two times that of the transaction price.
- b. This system of borrowing which is more akin to the sheil than the masak is lending of cash at a certain percentage of profit. The lenders normally do not like to be engaged in this operation if they can get in the

sheil system proper basically because in the sheil system their margin of profit is by far greater.

As a matter of fact, all the informal credit markets in Renk province whether the sheil system or the borrowing against standing property, work against the welfare of the small farmers by creating continuous farmers dependency upon these sources.

2.4.2. The formal credit institutions:

Formal lenders are institutions or systems, both private and government-owned, that provide credit through formalized procedures. They mobilize funds from individuals further away, from local businesses and governments, from other parts of the country, and even from other countries.

The major formal agricultural credit institutions in the various countries of the world fall into three types:-

- a. Government and private commercial banks, which provide credit to all sector including agriculture.
- b. Agencies, such as government cooperatives, which may involve shared ownership between private and public authorities.
- c. Institutions and organizations such as cooperatives, which may be multiple purposes, providing supplies, marketing, extension education and technical advice, as well as credit.

2.4.2.1 The masak system:

Masak is a form of borrowing against standing property. Here the small farmer brings to the rural council authority a valuable thing like gold or jewelry owned by his wife. The small farmer is given a cash credit equivalent to the valuables he brought, which are deposited in the

rural council. After harvest, the small farmer sells his products and pay back the debt which he received, and take his valuables without paying any interest obviously, this system is good for small farmers but unfortunately it has stopped recently due to money shortages in rural councils (Awad, 1984).

2.4.2.2 The Agricultural Bank of Sudan (ABS):

The ABS was established by the government of Sudan in 1957, to look after the development of the agricultural sector through the provision of agricultural credit in cash and kind to those working in the agricultural sector. The ABS act was passed in 1957 and the ABS started its activities in 1959. The ABS is an independent financial institution with a Board of Directors Under the Supervision of the Ministry of Finance.

2.4.2.2.1 The objectives of the ABS:

According to the ABS Act: The objectives of the ABS were to support agriculture and other activities that are incidental, ancilliary, and subsidiary there to by offering assistance in cash, kind and good or services to approved persons who are primarily engaged in agriculture or allied and subsidiary industries (The ABS Act, 1957 No. 19).

Therefore, the ABS according to its Act must favour and support small and medium farmers and agricultural cooperative societies, and provide farmers with certified seeds, fertilizers, insecticides, extension services and marketing facilities of handling, transportation, storage and selling the product. But evidence shows that it has not been doing this very effectively.

2.4.2.2.2 Loan duration, type and purpose:

Agricultural finance is at cross roads. It currently suffers from a dichotomy in purpose, in view of increasing concerns about the food situation as result of world population growth and accelerated world food demand especially among low-income large population countries. The need for substantial new investment in agriculture is clear (FAO, 1996). The purpose of credit is to increase resource efficiency, or incomes and standard of living. A farmer shouldn't use credit, or borrow, only when his back is to the wall (Heady *et al.*, 1960).

Individual small holder need financing of various kinds in order to develop their farms, this financing is usually divided into three categories by Agricultural Bank of Sudan.

2.4.2.2.2.1 Short-term loans:

Short-term or seasonal credit which is mainly for cultivation, cleaning and harvesting. Usually for a period up to 15 months. These are the loans that can usually be repaid fully out of the current income of farmers. Input such like seeds, fertilizers, are purchased out of these loans (Agrawal, 1980).

Beside, such current expenditures as payment of wages, taxes and rents are made out of these loans. In brief, these loans are concerned with the current activities of production. According to Heady (1960), Vasthoff (1968), the main purposes of the short term loans are:

- a) to finance current farm operating expenses,
- b) to pay family living expenses until the season's crops or livestock are marketed, and

c) to finance short-term obligation, which can be paid off in a short time.

2.4.2.2.2.2 Medium-term loans:

Cover a period extending from 15 months to 5 years (Agrawal, 1980), and 6 years Agricultural Bank of Sudan (ABS). Vasthoff (1968), said that this type of loans may run for a period 2 years, but usually for between 4 – 6 years.

Normally, purchase of cattle, improvement of land, repaid of wells and implements, establishment of new farms, improve and expand the operating ones, improvement of irrigation channels.

Such expenditure facilitates production over a large period. Repayment, along with interest, also spread over a period extending up to 5 years (Agrawal, 1980). Intermediate credit is not generally available even though farmers have great need for this type of credit (Heady *et al.*, 1960).

2.4.2.2.2.3 Long-term loans:

The period involved is more than 5 years and may be as long as 12 years (ABS, 1998) 15 to 20 years or even more (Agrawal, 1980). Long-term credit or loan is used for real estate and permanent improvements such as buildings. Others uses are for refinancing; short-term, which can be paid only over a relatively long time period, and existing mortgages.

This type of loan is rarely used in the area under study, the ABS lends only short, and medium-term loans for small farmers.

Table (2.1) shows the total agricultural loan by ABS (1997-2001) in (000) SD. In Table (2.1) the short-term loan was increased from 3860 thousand SD in season 1997 to 4835574 thousand SD in 2001, while the

medium-term loan increased from 220 thousand SD in season 1997 to 362053 thousand SD in season 2001.

The increased in short-term loan and medium-term loan lead to increased in total agricultural loan from 4080 thousand SD in 1997 to 5197627 thousand SD in 2001.

Table 2.1. The total agricultural loan by ABS (1997-2001) in (000) SD.

Season	Agricultural loans types		
	Short-term loan	Medium-term loan	Total
1997	3860	220	4080
1998	2916068	151332	3067300
1999	3023436	148347	3171783
2000	2991224	80704	3071928
2001	4835574	362053	5197627

Source: ABS, reports – Khartoum.

For the ABS capital, the Government of Sudan paid 40% while the Bank of Sudan paid 60%. In 1982, the paid up capital of the Bank was Ls. 25 million. Prior to 1964, the paid up capital was only Ls. 3 million out of Ls. 5 million authorized (Ahmed, 1983).

In addition to the above capital, the Bank was authorized to borrow up to Ls. 3 million from the Bank of Sudan, with an interest rate of 6.5% per annum. This rate was raised to 9.5% by 1977, and since the ABS is

authorized to charge only a maximum of 9% at that time this source of liquidity dried up (Ahmed, 1983).

Moreover, the ABS has other financial resources like the interest on agricultural credit, the profit from commercial activities, the rent from storage facilities.

Recently, the ABS received loans from international organizations such as the International Development Association, African Development Bank and from the Government of France through the French protocol.

The ABS now has (100) branches and offices throughout the country with the headquarter in Khartoum.

Table 2.2. ABS branches.

Sector	Branches
Central	19
White Nile	10
Gadaref	5
Eastern	6
Northern	11
River Nile	10
Khartoum	12
Kordofan	15
Darfur	14
Southern	3
Total	100

Source: ABS report 2001

CHAPTER THREE

THE UPPER NILE STATE

“Renk Province”

3.1 Introduction:

For the purpose of this study, Northern Upper Nile is considered as the most promising potential agricultural area of the whole south being the first to witness the introduction of modern agricultural practices, irrigated and mechanized rainfed sub-sector as early as the 1940s and 1950s respectively.

The Upper Nile State has an area of 236.000 km² with a population of about 1.6 million persons, whose majority are engaged in traditional farming and livestock rearing, in addition to fishing and hunting (Biar Akeg, 1992).

Modern farming in Upper Nile is represented by irrigated and mechanized rainfed sub-sectors in Renk and Kodok Districts. This area falls in the central main land zone.

Generally, the land in this zone is fertile and the production depend on the rainfall patterns.

This area has been seriously neglected both by the former Southern Regional Government and the Central Government. Despite the positive contribution of the area in the national income in agricultural output, agricultural resources remained unexploited, especially when comparing this area with the central clay plain part in Blue Nile, White Nile and Kassala Provinces. These areas have similar characteristics in soil, rainfall, vegetation etc ... The potentiality of these areas made possible a

positive growth and development of modern irrigated and mechanized rainfed agricultural projects since the 1950s.

3.2 Agricultural potentials of the area:

This area lies in the central rain land zone of low rainfall savanna with rainfall of 700 – 800 mm spread over 4 – 5 months. Its vegetation is open grass land alternating bush, thickets and thorny wood land, soils are heavy alkaline clays and loams. Due to low rainfall and short rain seasons, rainfed crop production is confined to quick maturing grains and oil seeds, both grown at low yield levels.

Drinking water for both human and livestock consumption is supplied through the White Nile and bore wells or in hafir or through canals which are dug and constructed in some area. The crops produced in the area include:-

- a. Food crops; such as sorghum, millet and maize.
- b. Oil crops; including sesame and groundnuts.
- c. Fiber crops; short staple cotton.

Livestock in the area includes, cattle, sheep and goats. Estimates could not be obtained due to transport problem and insecurity in the area. Livestock in this area is well adapted to their environment but appeared to have poor milking potential.

Livestock diseases are widely spread, the most common diseases are rinderpest and foot and mouth disease.

Cattle plays an important role in the social systems and thus livestock numbers tend to be more important than benefits from sale. Sheep in the area is particularly important to the livestock economy as

they are traded more freely than cattle. Goats are valuable for their liability to thrive in times of climatic stress.

Fishery potential exploitation of Northern Upper Nile is quite consistent and its rational exploitation would greatly increase the profits obtained. Approximately 10–15% of the population are engaged in fishing which is mainly a seasonal activity. It is carried out from January to April when the level of the river is lower.

In Northern Upper Nile, Forests are mainly suitable for the production of fire-wood, and the agricultural potential is very high.

3.3 Background of modern farming in Northern Upper Nile:

Upper Nile is one of the under developed states in the Sudan. Until the 1970s it did not witness any modern agricultural practices at wider scope except those established for the experimental and demonstration purposes such as, Malakal Rice scheme, which is the first pump scheme in the whole south. It was initiated by the colonial government in the 1940s. In addition, there are Renk and Tyara rainfed mechanized schemes (Biar Akeg, 1992). Modern farming in the area was confined to the pump irrigated schemes, established along the White Nile and managed in Kosti up to the 1940s under the name Kosti-Renk Agricultural Schemes. These schemes were privately-owned up to 1969 when they were nationalized by the Numeiri Regime and became a public property.

However, modern farming in the area did not end with the introduction of the Nile pump schemes in the area, but witnessed the introduction of the rainfed mechanized farming during the 1960s in Renk District taking the Model of Gedaref and Southern Blue Nile Provinces, respectively. With the introduction of machinery for crop production in both irrigated and mechanized rainfed schemes, which needed a huge

amount of capital and technical know-how, this modernity benefited the migrants who came to the area to acquire wealth and fortunes.

Mechanized rainfed farming came as a result of effort by some traders who replicated the Gedaref experiment. The area attracted many investors after the formation of mechanized farming corporation and many schemes were distributed to farmers. A number of rainfed schemes were established in the area under direct government supervision through Mechanized Farming Corporation. The schemes included state farms which were opened at Goz-Room in Renk District, and also at the same time a number of schemes were allotted to private farmers. State farms were established for experimental and demonstration purposes. As a result the area began to attract many traders or farmers from different parts of the Sudan. In the early 1970s, when the Renk Agricultural Schemes were established, the area developed as a good production and commercial center. Kodok mechanized rainfed farming scheme was established by the former Southern Regional Government in 1978. It is the second modern farming in Kodok District located in Tyara.

The bulk of farmers in Renk province receive credit from private money-lenders to cover the cost of production and meet family requirements. This practice can easily be observed, in the Northern Upper Nile state in particular, where mechanized and traditional agriculture is practiced.

Although the role played by the local money-lenders in the province is quite big, in the absence of formal credit institutions, yet it is very difficult to obtain any records or documents concerning this type of money-lending in the whole state or province because lending is done basically on personal trust worthiness and crop mortgage.

3.4 The objectives of the ABS Renk Branch:

The main objective of the ABS is to provide farmers with loans and to supervise the agricultural activities, which are financed with these loans.

The Bank purchases and sells machinery and implements and others inputs such as seeds, fertilizers, pesticides .. etc. But the cost of these inputs are beyond the farmers financial capabilities. Therefore, the government initiated certain conditions and procedures to be followed by the individual farmers and cooperative societies in obtaining loans. For a farmer or a cooperative to obtain a loan. The following conditions have to be satisfied:

3.4.1 Conditions to be satisfied by the individual farms:

- a) The applicant must have a good income which will enable him to repay his credit.
- b) The security offered must be to checked.
- c) The applicant must be a Sudanese.
- d) After the application is studied by the bank's official and accepted, an agreement should be signed after the approval.

3.4.2 Condition for the cooperative societies:

- a) The society should officially be registered and a certificate should be attached to the application form the cooperative authorities.
- b) All the documents pertaining to the last budget revised and authorized by the cooperative authority or registrar should be attached.
- c) The documents showing the goals, capital and assets should be attached.

- d) The society should obtain the approval from all its members to be financed by the bank with certain types of loans and values to specified goals.

3.5 Mechanized rainfed sub-sector:

Mechanized farming in the Sudan is the most recent sub-sector within the agricultural sector, compared with traditional rainfed and irrigated sub-sectors.

3.6 The role of mechanized farming corporation:

The mechanized farming corporation was established in 1968 in Northern Upper Nile (Renk) to be the government agency responsible for the development of mechanization in the rainfed sub-sector. Its role is to:-

- a- Survey the land which is allocated to it by the government and demarcate schemes distribute them to farmers for mechanized rainfed crop production and provide the necessary services according to a comprehensive plan for optimum land use which will promote production and realize settlement in these areas.
- b- Assist the private investors and direct their attention to the techniques, provide improved seeds, extension service, and crop production service in coordination with the concerned institutions and departments.
- c- Promote agricultural research.
- d- Provide credit for farmers on reasonable terms to finance farm operations and other agricultural aspects which are appropriate.
- e- Operate state farms.
- f- Provide social services.

3.7 Land allotment policies:

The allotment of the schemes of Renk unlike those of Kodok area has not been consistent with the laid down policies, although government intervention remained the main core of the allotment.

The land is public property, as such only the central government through the mechanized farming corporation could allot the schemes.

The mechanized farming corporation had been allotting schemes in conformity with the declared central government plans and policies before the Addis Ababa Agreement in 1972.

3.8 The conditions of acquiring land are as following:

- a- The applicant should be capable to farm.
- b- He should have a tractor and its implements.
- c- He should have capital to enable him cultivate the land.
- d- He should be a Sudanese by birth.

The procedures which were adopted by mechanized farming corporation for the distribution of land can be summarized as follows:

- a. About 30% of the demarcated land goes to the owners of the lands (inhabitants of the area).
- b. 25% to qualified applicants who come from other areas.
- c. 45% to be distributed by the area council and the commissioner of the province.

3.9 Ownership and beneficiaries of land:

3.9.1 Mechanized farming:

The role of the government in this sector was to prepare the land and provide machinery, while the rest of the work was to be the

responsibility of the farmer as it was a manual work. This system of share cropping existed until the government abandoned its participation.

The role of the government became related to the provision of infrastructure and information to the private sector.

This resulted in the establishment of Mechanized Farming Corporation in 1968 in Northern Upper Nile (Renk District).

3.9.2 Private schemes:

Private schemes are categorized into two types:

- a) Private schemes which are distributed by mechanized farming corporation.
- b) Private schemes distributed by the Regional Government.

The schemes distributed by the regional government, according to the mechanized farming corporation, are called undermarked schemes, because they are neither surveyed and distributed by the mechanized farming corporation, nor do these schemes receive any service from it. But for the Regional Government these schemes are known as development schemes. These schemes were initiated by the former Southern Region Government to encourage the local citizens to produce food for self-sufficiency. Another aim was to encourage southern entrepreneurship to engage in agricultural development. The Government in the Southern Sudan tried to establish Regional Development Corporation (RDC) to provide cultivators and investors from the south with credit facilities in terms of loans (machinery and equipment for farming).

Today in Northern Upper Nile, agricultural mechanized rainfed farming schemes are either rented to a farmer from other states or owned by him when sold or allotted to him.

3.9.3 The state farms:

The government established these farms in 1970 in the area of Goz-Room. The size of all these farms covered an area of 30.000 feddans. They were established for research purposes. The important areas of research are the improvement of the quality of seeds, design the most efficient crop rotation and the most effective way of using chemicals for improving productivity. These farms are run by the government and their main objectives are to:-

- a. Stabilize prices of sorghum through building up stocks which could be released to the market when prices rise as a result of shortage of supplies.
- b. Increase government farms from which farmers learn the benefits of advanced mechanization and crop husbandry methods used in these farms.
- c. Increase production for export.
- d. Training of agriculturalists and skilled farm labours.

The performance of state farms did not achieve most of these objectives, only the fourth objective might have been achieved.

Therefore, the state farms, have proved to be a serious financial liability which come as a result of the dual effect of low yields and high cost of production.

3.9.4 Co-operative farms:

In 1969, the cooperative sector dominated the second position after the public sector. About 29 agricultural schemes were allotted to citizens of Northern Renk in Goz-Room and Umdelwis. At present, there are about 78 schemes under cooperatives in which about 51 schemes are hired to individual farmers.

3.10 Problems of mechanized rainfed sub-sector:

Although the performance of the mechanized rainfed sub-sector is considered to be satisfactory as a producer of crops for the home and market, in Northern Upper Nile, it has been felt that it needs more efforts to make the sector a competitive producer for crops for export particularly sorghum.

These problems can be grouped as:

- Low yields: The yield per feddan for the three main crops grown in the area (i.e sorghum, sesame and cotton) in the mechanized rainfed sub-sector is estimated to be:-

Sorghum 0.35 ton per feddan.

Sesame 0.15 ton per feddan.

Cotton 3.50 small kantars per feddan (1992)

- Causes of low productivity:-

- a. Lack of adequate applied research.
- b. Inadequate land preparation.
- c. Ineffective mechanization technology used and lack of trained and skilled operators and techniques.
- d. Lack of spare parts and shortage of fuel and lubricants.
- e. Delayed agricultural operations, particularly sowing.
- f. Poor seed quality.
- g. Inadequate pest-control.
- h. Poor weed control.
- i. Limited cropping possibilities with sorghum as the main crop and sesame and cotton as secondary crops. The introduction of sunflower is now a promising alternative.

CHAPTER FOUR

RESEARCH METHODOLOGY AND SOCIO-ECONOMIC FEATURES

4.1 Research methodology:

For this study, primary data were collected through field interviews involving use of structured questionnaire, secondary data were collected from references reports and other materials from official sources, descriptive and statistical analysis methods were applied in the analysis of data.

4.1.1 Description of the sample:

a- Sampling procedure:

The sample size to be chosen is a trade-off between the level of precision aimed at and the resources available in terms of time, cost and other facilities.

Due to homogeneity of the socio-economic characteristics of the agricultural community in Renk area of the Upper Nile State a sample of 78 farmers was selected from 5 schemes area. Lists of farmers were taken from the selected schemes and systematic proportional selection was followed resulting from sample technique.

b- Sample technique:

The sample technique is of multi-stage cluster sampling, which finally represent the small farmers in private schemes.

The province is divided into three localities, which are further subdivided into a number of schemes area, then the holders were randomly selected from each schemes.

4.1.2 Methods of data collection:

A field research was conducted during the period from March 2002 up to July 2002 (season 2001/2002). Methods of data collection used included:

- Questionnaire:

Primary data was collected by means of structural questionnaire, it is composed of closed-ended and open-ended questions. Covering information of, identification, farm production, sources of finance, area cropped, cost of production, different uses and repayment of loans and loans from various sources.

These questionnaires focus on the intensity of farmers and their access to formal and informal lenders. Others are time of loan release, the quantity, forms of loan and loan use.

- Interviews:

Interview techniques were applied to 78 farmers. Secondary data were collected from relevant institutional sources, which included Agricultural Bank of Sudan (ABS), Ministry of Agriculture and Forestry (MAF), Bank of Sudan (BS). And other sources dispersed in the Upper Nile State relevant to the study.

4.1.3 Method of analysis:

Descriptive analysis procedures were applied for the purposes of the study. Also other statistical methods used include multiple linear regression analysis to explain the relation between the parameters.

4.2 Socio-economic features:

Farmers efficiency is directly influenced by their socio-economic characteristics. Many parameters are used to indicate these features, which include: age, education level, marital status, family size, ownership of fixed assets and sources of finance.

4.2.1 Effect of age:

Age has important effect on productivity and output of individuals either on mental or the manual abilities. Many writers reported that age has positive effect on productivity until certain level beyond which it would start to decrease.

Osman (1996) stated that the variation in age among farmers does not appear to explain much of variation in the output of the broad bean and wheat crops. This is due to the fact that almost all the farmers in his sample (about 87% of them) were within the productive age (15 – 60 years).

Table (4.1) shows the age groups among respondents and productivity of sorghum in season (2001/2002). In Table (4.1) about 56.4% of the farmers are in age group (31 – 45 years old). This means that this age group is effective and energetic, and has a higher productivity of sorghum, which average of 129.43 kg/fed.

Table 4.1. Age group and productivity of respondents in kg/fed season (2001-2002).

Age group	30 and less	31 – 45	46 – 60	61 – 75	Total
Frequency	5	44	21	8	78
Percentage	6.4	56.4	26.9	10.3	100
Average productivity of sorghum (kg/fed.)	101.78	129.43	99.12	114.49	118

Source: Field Survey (2001/2002).

4.2.2 Effect of education:

It is well recognized that education plays a vital role in increasing and improving farmers productivity. Through education people's knowledge, attitude and skill can be improved.

Education stimulates people to realize their needs to understand the problems of their immediate environment rights, duties and citizenship.

El-Awad (1994) found that education and age variable were negatively correlated to yield of wheat crop. Probably due to the engagement of farmers in activities other than farming, therefore, reducing their actual hours of supervising crop fields. Table (4.2) shows the level of education among respondents and their relationship to productivity.

Table 4.2. Education level and productivity of respondents in kg/fed.

Items	Illiterate	Khalwa	Primary	Secondary	University	Total
Frequency	5	2	29	23	19	78
Percentage	6.4	2.6	37.2	29.5	24.4	100
Average productivity of sorghum	43.19	68.63	142.17	107.73	122.99	119.12

Source: Field Survey (2001/2002).

In Table (4.2) 93.6% of the respondents received some forms of education, while 6.4% are illiterate. Illiterate farmers had a lower productivity of sorghum. About 37.2% of the farmers had primary school level. Their average of productivity amounted to about 142.17 kg/fed.

4.2.3 Effect of the family size:

The survey result showed that about 83.3% of the respondents were married. The unmarried (single) constitute only 16.7%. Table (4.3) shows the marital status of the respondents.

Table 4.3. Marital status of the respondents season (2001/2002).

Marital status	Frequency	Percentage
Married	65	83.3
Single	13	16.7
Total	78	100

Source: Field Survey (2001/2002).

There was a definite relationship between the size of family and the average productivity per feddan. The increase of size of family could be explained by the fact that a large family offered a relatively large percentage of farmer working members at peak demand, and may decrease the cost of production by decreasing labor costs. Table (4.4) shows the effect of family size on productivity of sorghum in season (2001/2002).

In Table (4.4) about 55.2% had family size ranging between 6 to 10 persons, and has a higher productivity which averaged 127.06 kg/fed. while about 15.4% had family size more than 10 persons and has a lower productivity which averaged 94.55 kg/fed. This fact explained that small farmers families participate in decision-making process and provision of labor for different agricultural operation in the farm, also the larger the family the more income is needed to meet the consumption needs for the family.

Table 4.4. The effect of family size on productivity kg/fed season (2001/2002).

Family size	5 & less	6 – 10	Above 10	Total
Frequency	23	43	12	78
Percentage	29.5	55.2	15.4	100
Average productivity of sorghum (kg/fed.)	117.08	127.06	94.55	119.12

Source: Field Survey (2001/2002)

4.2.4. Effect of tractor ownership on productivity:

To investigate the effect of tractor ownership upon productivity the survey indicated no significant differences between respondents who owned tractors and those without tractor. Table (4.5) shows the effect of tractor ownership on productivity.

The result showed that 65.4% had tractor with an average productivity of 119.04 kg/fed and about 34.6% of the farmers were tractor renters (without tractor) with an average productivity of 119.25 kg/fed.

Table 4.5. The effect of tractor ownership on productivity of respondents in kg/fed season (2001/2002).

Items	Own tractor	Do not own tractor	Total
Frequency	51	27	78
Percentage	65.4	34.6	100
Average productivity of sorghum	119.04	119.25	119.11

Source: Field survey (2001/2002).

4.2.5 Effect of land tenure:

There was relationship between land ownership and the productivity of sorghum per feddan. The productivity per feddan for rented respondents was less than that of those who owned land.

Table 4.6. The relationship between land ownership and productivity
Season (2001-2002).

Form of land tenure	Frequency	Percentage	Ave. productivity
Land owned	49	62.8	128.7
Land rented	29	37.2	102.8
Total	78	100	119.12

Source: Field survey (2001/2002).

In Table (4.6) about 62.8% of the sampled farmers were owned land with an average productivity of 128.7 kg/fed and about 37.2% of the respondents were land rented with an average productivity of 102.8 kg/fed. This fact explained that land ownership helped in increasing productivity but those who rented land their productivity decreasing, probably because land owner invested more in maintaining land productivity.

4.3 Crop production:

All farmers in the sample cultivated sorghum and 87.2% cultivated sesame. The average productivities were 119.12 kg/fed for sorghum and

62.73 kg/fed for sesame. Table (4.7) shows the number of farmers and productivity of the main crops grown in Renk Province.

Table 4.7. The number of farmers and productivity (kg/fed) of the main crops grown in Renk Province season (2001/2002).

Crops	Sorghum	Sesame
No. of farmers	78	68
Average productivity	119.12	62.73

Source: Field Survey (2001/2002).

4.4 Costs of production:

Cost of production per feddan was very high for sesame and sorghum. The main factors causing or contributing to this high cost were harvesting, fuel, weeding, land preparation and spare parts. Table (4.8) shows the cost of production per feddan, which had an average of (7368) SD for sesame and (3887) SD for sorghum in which the cost of harvesting only constitute 51.7% for sesame and 21.7% for sorghum of the total cost. This is because harvesting system of sesame depends on using more manual labor (high cost per labor), and for sorghum it depends on using both manual labor first and harvester in the end.

Table 4.8. The cost of production/fed by SD of the main crops grown in Renk area during season (2001/2002).

Inputs	Crop			
	Sorghum T. cost	%	Sesame T. cost	%
Land preparation	400	10.3	400	5.4
Seed	175	4.5	346	4.7
Sowing	300	7.7	300	4.1
First weeding	316	8.2	378	5.2
Second weeding	417	10.7	527	7.2
Harvesting	845	21.7	3808	51.6
Sacks	300	7.7	300	4.1
Filling	200	5.2	300	4.1
Fuel	543	13.9	543	7.3
Spare parts	316	8.2	316	4.2
Province dutes	75	1.9	150	2.1
Total	3887	100	7368	100

Source: Field Survey (2001/2002).

CHAPTER FIVE

RESULTS AND DISCUSSION

5.1 Financial activities:

The survey results showed that about 57.7% of the respondents were found to be engaged into formal credit (12.8% engaged into ABS and 35.9% engaged into commercial banks), 20.5% of them were found to be indebted to informal creditors.

Table 5.1. Percentage of respondents according to selling time of crops grown in Renk Province season (2001/2002).

Crop	Sold %	Stored %	Store and sold later %	No. of respondents
Sorghum	57.7	20.5	21.8	78
Sesame	64.8	17.6	17.6	68
Average	60.9	19.2	19.8	-

Source: Field Survey (2001/2002).

Table (5.1) shows the percentage of the respondents according to the selling time of their crops. In Table (5.1) about 60.9% of respondents sold their products at harvest time with lower prices in order to repay the loans, while about 19.2% of the respondents stored their products for consumption or for seed for the coming season, and about 19.8% of respondents stored their products and sold it later because they expected to obtain higher prices (four months after the harvest).

Concerning loan size, 76.9% of the respondents reported that the quantity of loan was not sufficient. However, 69.3% of respondents

reported that formal loans (ABS and commercial banks) arrived at non-suitable time.

Tables (5.2) and (5.3) show the quantity and timing of loans season (2001/2002).

Table 5.2. Quantity of loans season (2001/2002).

Quantity of loan	Frequency	Percentage
Sufficient	18	23.1
Not sufficient	60	76.9
Total	78	100

Source: Field Survey (2001/2002).

Table 5.3. Timing of loans season (2001/2002).

Timing of loan	Frequency	Percentage
Suitable	20	25.6
Not suitable	54	69.3
No response	4	5.1
Total	78	100

Source: Field Survey (2001/2002).

In Table (5.4), about 12.8% of the sampled farmers received loans from ABS, while 35.9% received their loans from commercial banks, 19.2% received from sheil merchant. Table (5.4), shows the number of respondents related to each source of finance season (2001/2002).

Table 5.4. The number of respondents related to each source of finance season (2001/2002).

Source	Frequency	Percentage
Self-finance	17	21.8
ABS	10	12.8
Commercial bank	28	35.9
Sheil	15	19.2
Government finance	1	1.3
ABS and commercial bank	6	7.7
ABS, commercial bank and sheil	1	1.3
Total	78	100

Source: Field Survey (2001/2002).

To differentiate between sources of finance; 45 respondents received formal credit, 17 respondents were self-finance, 15 respondents received informal credit and only one respondent knock all the doors of finance. He used formal and informal financial sources in one season.

All respondents receiving loans from ABS and commercial banks reported that there was no good supervision by credit personnel, and the bank personnel was active only at harvest time to collect debts, while there was absence of extension services.

The survey results showed that 59% of the respondents reported that the date of repayment is not suitable with the date of harvest because

prices at that time are at the lowest level. Table (5.5) shows the comparison of the date of repayment of loan with the date of harvest.

Table 5.5. Comparison of the date of repayment of loan with the date of harvest season (2001/2002).

Repayment period	Frequency	Percentage
Suitable	31	39.7
Not suitable	46	59.0
No response	1	1.3
Total	78	100

Source: Field Survey (2001/2002).

5.1.1. Impact of sources of finance on productivity of the sorghum crop grown in Renk Province:

In Table (5.6) the productivity of the main crops are higher for those of informal sources, while the respondents borrowed from formal sources came at the second, then those of self-finance came later. This fact is due to that, informal farmers assumed to use more inputs. Formal sources assumed to use less inputs and this lead them to work hard to repay the loans.

Also informal sources improved farmers productivity pattern, while in other sources (formal and self-finance) productivity patterns were near the same. The effect of those sources of finance specially informal source is clearly seen in the average productivity which represent 182.8 kg/fed, while the others sources have 124.1 kg/fed, 120.7 kg/fed for formal and self-finance, respectively.

Table 5.6. Impact of sources of finance on productivity of the sorghum crop (kg/fed) grown in Renk Province season (2001/2002).

Source	Sorghum
Self-finance	120.7
Formal	124.1
Informal	182.8
Formal and informal	91.5
Average	134.3

Source: Field Survey (2001/2002).

5.1.2. Forms of finance:

Table (5.7), shows percentage of the respondents according to the forms of finance season (2001/2002). In Table (5.7) about 52.6% of the respondents were found to have engaged into Salam form, about 19.2% of the sampled farmers were found to be engaged into sheil system.

Table 5.7. Percentage of respondents according to the financial forms season (2001/2002).

Financial form	Frequency	Percentage
Salam	41	52.6
Sheil	15	19.2
Salam and Morabaha	4	5.1
No response	18	23.1
Total	78	100

Source: Field Survey (2001/2002).

5.1.3. The opinion of respondents on ABS finance:

The survey results showed that 71.8% of the respondents reported that their opinion on ABS finance and administration was weak because they applied to ABS but they did not find loans, while 19.3% of the respondents reported that their opinion on ABS finance was very good because ABS objectives were developmental objectives but ABS branch of Renk did not receive more funds from headquarter to finance all the farmers of the area. Table (5.8) shows percentage of respondent's opinion on ABS finance season (2001/2002).

Table 5.8. Respondent's opinion on ABS finance season (2001/2002).

ABS finance	Frequency	Percentage
Very good	15	19.3
Moderate	4	5.1
Weak	56	71.8
No response	3	3.8
Total	78	100

Source: Field Survey (2001/2002).

5.1.4. The opinion of the respondents on sheil system:

Table (5.9) shows respondent's opinion on sheil system season (2001/2002). In this table 74.4% of the respondents reported that sheil system was moderate as a form of finance. While 17.9% of them reported that sheil system was very good because they found it (loan) on a good time.

Table 5.9. Respondent's opinion on sheil system season (2001/2002).

Sheil	Frequency	Percentage
Very good	14	17.9
Moderate	58	74.4
Weak	-	-
No response	6	7.7
Total	78	100

Source: Field Survey (2001/2002).

5.2. Linear regression analysis:

Linear regression analysis was used to test the significance of the relationships between crop productivity and some factors that are expected to constitute significant determinants (using the statistical package for the social sciences – SPSS).

5.2.1. Specification of model:

In specifying the economic model Elgozouli (1998) states that, specification of any economic model, requires first, single equation or system of appropriate equations, secondly, a relevant set of variables have to be identified and thirdly, a test of hypothesis has to be in an appropriate algebraic form of equation.

5.2.2. The functional form specification:

In this study, to show the degree of influence, level of significance and nature of the relationship between the dependent and independent variables, the linear form was proposed and tried in the first run of analysis.

The general equation for this function can be written as:

$$Y = a + b_1x_1 + b_2x_2 + b_3x_3 + \dots b_nx_n$$

Where:

Y = The dependent variable

a = Constant

$x_1, x_2, x_3, \dots x_n$ = The independent variables

$b_1, b_2, b_x, \dots b_n$ = The production coefficient with respect to individual resource.

5.2.3. Hypotheses testing:

For the validity of the estimated regression models and for the regression coefficients to make any sense at all, there are many

hypotheses that have to be tested before any conclusions could be reached these are:

5.2.3.1. R-square:

R-squared value shows the percentage variation in the dependent variable explained by the regression portion of the equation. It is the square of the correlation coefficient between Y and its ordinary least square estimator is often called the best fitting estimate and high R-squared is called a good fit. R-square could be low because of high variance of the disturbance term, El-Fiel (1993).

5.2.3.2. T-test:

The T-test is related to the individual coefficient in the regression model. They are used to test whether each individual coefficient is significantly different from zero or not i.e. whether if there any relationship at all. The T-value is calculated by the deviation of regression coefficient of any variable by its standard error.

5.2.3.3. F-test:

The F-test is the same as the T-test, but rather than testing the individual coefficients, it test the whole regression model whether the equation hold or not. The null hypothesis here assumes that all regression coefficients are simultaneously equal to zero.

5.2.4. Sesame regression equation:

The dependent variable (Y) is the output of crop, taken in physical units (kilograms per feddan) for sesame.

The independent variables used were: area cultivated in feddan season (2001-2002), formal loan (SD/farmer), cost of production (SD), in addition to these there are two dummy variables (timing of loan suitable,

not suitable and occupation farmer, non farmer). The estimated sesame regression equation is given in Table (5.10). This estimate seems to give a very good fit to data with: R-square is 0.66, which means that 66% of the observed variation in dependent variable (yield) is explained by the variation in the independent variables. Adjusted R-square 0.61, the F-statistics was 13.187, which is significant, with 5 and 34 degrees of freedom. All the variables have the right signs with their coefficient. The rest of the variables were not significantly different from zero (timing of loan and occupation).

Table 5.10 Sesame regression equation.

Variables	Co-efficient	St-error	T-value	Sig.
Area cultivated (fed.)	51.537	10.319	4.994	0.000***
Formal loan (SD/farmer)	0.102	0.035	2.873	0.007**
Cost of production (SD)	3.684	1.479	2.492	0.018**
Timing of loan (dummy)	9842.672	9309.218	1.057	0.298
Occupation (dummy)	475.296	5047.174	0.094	0.926
Constant	-64148.582	18274.175	-3.510	0.001***

R-square = 0.660

Adjusted R-square = 0.610

F = 13.187

Significant level = 0.000

5.2.5. The sesame regression equation discussion:

This part will discuss the regression results of the sesame crop.

a- Area cultivated variable:

The area cultivated in feddan for sesame has got a coefficient of 51.53 was significantly different from zero at 0.001 level of significance. This means that as the area cultivated increased by 1% the output of sesame increased by 51.53%.

b- Formal loan variable:

Formal loan is assumed to be one of the factors that affect the output of the crop. Table (5.10), shows the coefficient of this variable, was 0.10 for sesame. The coefficient for sesame is significantly different from zero . The coefficient implies that a 1% increase in formal loan will increase the output of sesame by 0.1%.

c- Cost of production variable:

In Table (5.10) the cost of production (SD) for sesame has got a coefficient of 3.68 was significantly different from zero. This means that as the cost of production increased by 1% the output of sesame increased by 3.68%. This coefficient indicates that increasing cost of production means more inputs used.

d- Timing of loan variable:

The timing of loan (dummy variable) for sesame crop has got the coefficient of 9842.67, which was not significantly different from zero (Table 5.10).

The variation in the timing of loan does not explain much of the variation in output of sesame crop in the study area.

5.2.6. Sorghum regression equation:

The dependent variable (Y) is the output of sorghum crop, taken in physical units (kilograms per feddan).

The independent variables used were: formal loan (SD/farmer), area cultivated in feddan season (2001/2002), farm size, cost of production (SD) in addition to these there is one dummy variable the landownership (owned and rented). The estimated sorghum regression equation was given in Table (5.11). This estimate seems to give a very good fit to data with: R-square is 0.869, which means that 86% of the observed variation in dependent variable (yield) is explained by the variation in the independent variables. Adjusted R-square 0.852 this implies that 85.2% of the total variation in the dependent variable was explained by the variation in the explanatory variables. The F-statistics was 51.743 which is highly significant at (0.000 percent level) with 5 and 39 degrees of freedom indicating that, the independent variables were collectively important in explaining variation in the dependent variable.

All variables have right signs with their coefficient. The rest of the variables were not significantly different from zero (landownership and formal loan).

Table 5.11. Sorghum regression equation.

Variables	Co-efficient	St-error	T-value	Sig.
Cost of production (SD)	1.062 E-02	0.002	4.530	0.000***
Farm size (fed.)	1152.416	113.806	10.126	0.000***
Area cultivated (fed.)	27.501	12.969	2.121	0.040**
Formal loan (SD/farmer)	6.563 E-02	0.081	0.814	0.421
Landownership (dummy)	5870.208	22321.297	0.263	0.794
Constant	-124272	39076.138	-3.180	0.003***

R-square = 0.869

Adjusted R-square = 0.852

F = 51.743

Significant level = 0.000

5.2.7. The sorghum regression equation discussion:

a- Cost of production variable:

The cost of production in (SD) for sorghum has got a coefficient of 1.06, which was significantly different from zero at 0.003 level of significance. This means that as the cost of production (land preparation, seeds, sowing, weeding, harvesting, fuel and spare parts) increased by 1% the output of sorghum increased by 1.06%. This coefficient indicates that when cost of production increased this means more inputs used Table (5.11).

b- Area cultivated variable:

Area cultivated is assumed to be one of the factors that affect the output of the crop. Table (5.11), shows the coefficient of this variable, was 27.50 for sorghum. The coefficient is significantly different from zero (Table 5.11).

The coefficient implies that a 1% increase in area cultivated by the coming season will increase the output of sorghum by 27.50%.

c- Formal loan variable:

The formal loan (SD/farmer) for sorghum crop has got the coefficient of 6.56, which was not significantly different from zero (Table 5.11). This was due to the fact that the amount of money paid to use inputs does not explain the amount of inputs used.

The variation in the amount of loan (SD/farmer) does not explain much of the variation in output of sorghum crop in the area of study.

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Summary:

The subject of this study was the role of finance in developing the mechanized rainfed sub-sector in the Northern Upper Nile State, A case study of Agricultural Bank of Sudan–Renk branch, as a formal source of finance, and informal credit sources represented by sheil-lenders.

The ABS entered Renk Province in 1972 as an office. The ABS delivers three types of credit to farmers, in addition to the credit in kind supplied, namely, short-term loans, medium-term loans and long-term loans.

It is known that increasing the productivity is the main objective of any agricultural strategy, high rates of productivity lead to high levels of farmer's income and improve farmer living standard.

Sudan established the ABS, on the object of financing agriculture as government owned formal credit institution. To achieve its purpose ABS extended branches all over the Sudan, including Northern Upper Nile State, to provide agricultural credits to the farmers. However, despite ABS modest efforts productivity has not increased, farmer standards of living are low.

This study was conducted in Renk Province during season (2001/2002). Recognizing the agricultural credit problems in the developing countries in general and in particular in the Sudan, the ABS based financing system is introduced to increase agricultural production,

through the provision of adequate and timely finance to the farmer. The main objective of this study was to investigate the role played by the ABS in Northern Upper Nile. Other objectives of the study included, studying the effects of some socio-economic feature of the population on finance and production. The study also measured the impact of ABS on developing agricultural production and improving farmers living standards, addressed the availability of credit, which could increase production and adoption of innovation, and identify and describe the activities of formal and informal credit agencies.

Primary data were collected by means of structural questionnaire through a multi-stage cluster sample of 78 farmers. Secondary data were collected from institutional sources relevant to the study. The general literature review showed that the provision of timely and adequate credit is a necessary condition for the development and modernization of agriculture.

The contribution of commercial banks to agricultural credit surpasses that of ABS contribution. Private lenders who include relatives and money lenders apply simple loans procedures.

The statistical analysis of socio-economic characteristics of the farmers revealed that the farmers are a homogenous group with respect to the education level, most of them had primary school education (37.2%), the majority of them were with in the productive age group (31–45 years) which represent 56.4% and most of the respondents were married (83.3%).

Agriculture is the main activity of farmers. The sorghum was the main food crop in the rainfed season and sesame was the main cash crop. The average yield was 119.12 kg/fed for sorghum and 62.73 kg/fed for sesame. The average cost per feddan for sorghum was 3887 SD and for

sesame was 7368 SD. Respondents who borrow from informal sources have higher farm productivity, followed by those respondents who borrow from formal sources and those of self-financed respondents come last (for sorghum crop).

The sesame regression equation showed that the data was well fitted to the dependant variable, have R^2 of about 0.66 with F-value of 13 which is significant at all level of significance and the significant variables are area cultivated, formal loan and cost of production at 99%, 95% and 95% level of significant, respectively.

Moreover, the sorghum regression equation revealed that the equation with high R^2 of about 0.86 with F-value of 51.7 which is highly significant and the significant variables were cost of production, farm size and area cultivated at 99%, 99% and 95% level of significant, respectively

6.2 Conclusion:

The overall performance of ABS in Renk area has been poor and there was a complete absence of supervision by the bank personnel due to the shortage of profesional supervisors, the feasibility of the financed project and credit criteria was not put into consideration when the project financed, lack of loan supervision and co-ordination with research and extension, inadequate credit provided to farmers and high cost and non-suitable time of borrowing.

All sources of finance showed direct and indirect positive effects on farm productivity. Adequate credit from formal sources could help in channeling saving and investment activities. Therefore, unless formal loans to be available in terms that could improve farm productivity, informal loans will remain the important source in rural economy.

6.3 Recommendations:

The following recommendations would be helpful for improving farmers financial situation:

1. The administrative and technical staff of the bank should be increased and well-trained, also items like fuels, oils, spare parts, etc ..., must be made available in the bank, so that the bank can easily develop, execute, and supervise its annual policies and programmes more effectively and efficiently.
2. Provision of adequate finance directly to farmers to promote saving, self-finance and investment in rural areas.
3. A more efficient credit system should be appropriate both in optimal time and adequate amounts to enable the farmers to purchase the essential agricultural inputs.
4. The extension services must concentrate on usage of technological packages and the application of measures to minimized risks and cost of production.
5. It is very important in the rural areas of Upper Nile State, to join credit provision with storage, transportation, and marketing facilities in order to avoid exploitation for small farmers by big merchants. The best system as evidence shows is that the bank conducts all these operations on behalf of the farmers to assure better returns for them.
6. The central and the state government must encourage the introduction of private financial institutions in the agricultural sector of the state. This is due to the fact that the formal public sources can not cover the whole areas and reach every farmer, and also the demand for agricultural credit in rural areas is increasing annually.

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