

## Financial and Economic Evaluation of Cotton Production in New Halfa Agricultural Corporation, Kassala State, Sudan (1981/1982-2009/2010)

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### Abstract

The New Halfa agricultural Production Corporation (NHAPC) is considered as one of the leading agricultural scheme in cotton production, being the second largest in comparison with the Gezira scheme concerning the area. The Government's agricultural policies were the main factors for the studying and knowing the financial and economic evaluation indicators for the production of cotton in New Halfa Agricultural Production Corporation during the period (1981/1982-2009/2010), and the comparison between these indicators for different periods in producing cotton at New Halfa Agricultural Production Corporation (first period 1981/1982-1991/1992) individual account system, (second period 1992/1993-2009/2010) liberalization in the following phases: Financial and economic indicators (net present worth NPW, benefit cost ratio B/C, internal rate of return IRR, net benefit investment N/K ratio, and payback period), area, production and average yield. The study was mainly based on the secondary data of the cotton crop at (NHAPC) such as areas, production, average yield, return, costs, benefits and net benefits for period (1981/82-2009/10), using descriptive statistics, simple mathematics, and different ways of analysis and descriptive tables. The financial and economic evaluation during the periods (1981/1982-2009/2010), (1981/1982-1991/1992), (1992/1993-2009/2010) study showed that the production of cotton was feasible and the indicators were positive. The study recommended that the Government should have a commitment to appropriate agricultural policies, subsidize the agricultural sector particularly with regard to increasing the areas of cotton production, reduce the cost of production, process cotton locally to increase the added value, and manufacture the inputs locally for making more foreign currencies, and increase the cotton production through research development and extension.

**Keywords:** Financial and economic analysis indicators; Sudan Project analysis; Cotton; Sudan

### Introduction

Sudan is the largest country in Africa, with an area of about one million square miles (2.5 million square kilometers). It is characterized by a variety of climatic zones from the desert in the north to tropical zone in the south. This gives it favorable environments for all agricultural activities as well as integrated investment in industries. The country forms wide basin sloping gently down towards the North, with high land on the other three sides, namely the Red Sea Hills and Ethiopian Highlands on the Eastern side, Jebel Marra range on the Western side and the Imatong range in the South the Imatong range in the South [1].

The agricultural sector in Sudan is the most important sector in terms of its contribution to both Gross Domestic Product (GDP) and employment. In 2001 agriculture directly accounted for 45.6% of the GDP [2]. Then its contribution decreased to 38.7% in 2003, and to 32.2%, 31.6%, 28.9%, 29.3%, and 31.1% in 2005, 2006, 2007, 2008, and 2009 respectively [3].

The sector also provides about 80% of the country's exports (excluding petroleum) and contributes to livelihood of 80% of its population [4].

The agricultural sector is the source of raw material for processing factories in the country including textiles, sugar, vegetable, oil, soap factories, grain mills, dairies, etc.; which contribute 17% of the GDP and about 20% of foreign exchange earnings [5].

Most economies of the developing countries are basically agricultural. With respect to Sudan, agriculture is the largest contributor to national income and foreign exchange. The average contributions of the agricultural sector in gross domestic product (GDP) and in

export during the period 1990-1995 were 35% and 65% respectively. In addition this sector employs 70% of the labour force in Sudan [6].

### Problem statement

In the Sudan cotton has been the most important cash crop and foreign currency earner. According to Food and Agricultural [7], cotton production fluctuation affected cotton's contribution to export revenue, as its contribution had dropped from 45-65% during the seventies to 34% in 2005 and in 2007 and 2008 it dropped below 16%, 18% respectively (Table 1).

This fluctuation in export together with quality problems during harvesting and handling may lead to weak global demand for the Sudanese cotton and hence the loss of some international markets.

Cotton production fluctuation may be due to the cumulative effects of production problems such as centralized government and scheme management's decisions of area allocation between the different crops.

In New Halfa, there are fluctuations in area, production, average

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**Received** January 09, 2016; **Accepted** January 27, 2016; **Published** February 03, 2016

**Citation:** Bushara MOA, Aziz YAM (2016) Financial and Economic Evaluation of Cotton Production in New Halfa Agricultural Corporation, Kassala State, Sudan (1981/1982-2009/2010). Arabian J Bus Manag Review 6: 197.

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yield and high cost year after year; in addition government policies have negatively affected farmer's net return.

The central question of the study whether the production of cotton in New Halfa is financially and economically feasible?

### Objectives of the study

The main objective of this study is to evaluate the financial and economic indicators of cotton production in New Halfa Agricultural Production Corporation in the two different periods. (1981/82-1991/1992) Individual Account System, (1992/1993-2009/2010) Liberalization.

To compare the indicators, (NPW), (B/C), (N/K), (IRR) and (PBP) for two different production periods (1981/82-1991/1992), (1992/1993-2009/2010).

To identify some policy recommendations that may help to improve the production of cotton in New Halfa scheme.

### Research hypothesis

The study hypothesis is that the production of cotton in New Halfa is feasible financially and economically?

### Materials and Methods

The calculation of the net present worth NPW, benefit cost ratio N/C, net benefit investment ratio N/K, internal rate of return IRR, and payback period PBP) was done manually with Excel program. However, while some indicators such as N/K and IRR required to be calculated from the beginning of the project, therefore they were not accurately estimated.

### The oretical frame work of the model

In both the financial and economic analysis of an agricultural project, the change value of money over time must be considered. If the project extends over several accounting periods, the values of costs and benefits streams must be standardized to provide a proper basis for comparison [8].

This could be done by calculating the values to their "present worth" also referred to as present value or discounted value.

The process of calculating the present value of a sum of money due sometimes in the future is called discounting. It calculates the present value of the future cash flow. Discounting looks for backward from the future to the present [9,10].

The study concentrated on five discounted measures suitable for application to agricultural projects:-

Net present worth (NPW) or net present value (NPV), benefit-cost ratio (B/C), net benefit-Investment ratio (N/K), internal rate of return (IRR), and payback Period (PBP).

#### Net present value or net present worth

$$NPV = \sum_{t=1}^{t=n} \frac{(B_t - C_t)}{(1+r)^t} \quad (1)$$

Where:

$B_t$  Benefit in each year

$C_t$  Cost in each year

r is the discount rate

t 1,2,...,n

n number of years

We accept the project (cotton production) when NPW is positive.

#### Benefit/Cost ratio

$$B / C = \frac{\sum_{t=1}^n \frac{B_t}{(1+r)^t}}{\sum_{t=1}^n \frac{C_t}{(1+r)^t}} \quad (2)$$

Where:

B Benefit

C Cost

t 1,2,...,n

n number of years

We accept the project (cotton production) when B/C is greater than or equal one.

#### Net- benefit- investment ratio

$$N / K = \frac{\sum_{t=1}^n \frac{N_t}{(1+r)^t}}{\sum_{t=1}^n \frac{K_t}{(1+r)^t}} \quad (3)$$

Where:

$N_t$  Incremental net benefit in each year after stream has turned positive

$K_t$  Incremental net benefit in initial years when stream is negative

We accept the project (cotton production) when N/K is greater than or equal one

#### Internal rate of return (IRR) or Marginal efficiency of capital (MEC)

$$\text{Internal rate of return} = \frac{\text{Lower Discount rate} + \text{Difference between the two discount rates} \times \left( \frac{\text{Net present work at lower discount rate}}{\text{Sum of the present worth of the incremental net benefit stream at two discount rates}} \right)}$$

$$IRR = \sum_{t=1}^n \frac{(B_t - C_t)}{(1+r)^t} = 0$$

Where:

$B_t$  Benefit in each year

$C_t$  Cost in each year

t 1,2,...,n

r is the discount rate( the lower r=15% and upper r=20%)

n number of years

We accept the project (cotton production) when IRR is greater than opportunity cost.

#### Payback period (PBP)

$$PBP = \frac{1}{IRR} \times 100 \quad (5)$$

#### Source of data and data variables

The study depends on secondary data and information collected from different sources and references mainly the publications of the

New Halfa Agricultural Production Corporation [11], Ministry of Agriculture, Bank of Sudan, Sudan Cotton Company, and other different traditional and electronic sources, and references, where data such as cotton cultivated areas, productions, yields, costs, benefits and returns were collected and analyzed and the Net Present Worth (NPW), Benefit Cost ratio (B/C), Internal Rate of Return (IRR), Net benefit investment ratio (N/K) and Payback Period (PBP) were calculated as measures of financial and economic evaluation indicators.

## Results and Discussion

The cotton area, production and average yield for the two periods (individual account and liberalization), were shown in Table 2. In the first period of the individual account period (1981/82-1991/92), the average area, production and yield were 67261 feddans, 297918 kentars and 4.4 kentars per Feddan respectively. The second period (1992/93 – 2009/2010) liberalization recorded 41374 feddans, 163653 kentars and 4.03 kentars/ Feddan for the respective cotton area, production and yield.

Depending on the t-test highly significant differences were found for both the area and production with respective values of 5.8 and 4.9, while the average yield did not show significant differences since the t-value of 1.4 was less the table value of 2.05 (Table 3).

The data did not only show seasonal variation but marked decrease in area, production and yield between the two periods. The decrease was more noticeable in the area and production but the drop in yield was not pronounced. The decline in the average area, production and yield from the first period to the second period amounted to 38%, 45% and 8%, respectively. The noticeable decrease in the cultivated area was attributed to the following sources.

- a. Spread of the Mesquite over the agricultural areas.
- b. Water shortage due to the sedimentation problem of the Khashm Elgirba dam.3- Farmers' immigration because of water shortage.

Production also decreased steadily from 297918.1545 kentar (kentar=44.4kg) to 163653.06 kentar, due to the following sources:

- The changes that occurred in the agricultural rotation.
- Production cost increase.
- Farmers do not follow the recommended practices from New Halfa Agricultural Production Corporation such as (planting time, fertilization, land preparation ...etc.).

That means that the main factor affecting cotton production is the area specified for cotton planting.

Cotton average yield decreased from 4.4kentar/Feddan to 4.04kentar/Feddan due to the government policies during that period such as:

- Government commands for substituted crops planting to insure strategic reserves of food grains.
- Lack of encouragement policies.
- International prices that lead to less value of Sudanese pound versus the hard currencies.

It is clear that the coefficient of variation for the two periods is different, being higher for the production and average yield in the individual account than the liberalization period while the area recorded a higher coefficient of variation of 22.51% in the LIB period than that

of the IAS of 19.01 % indicating that the variation in cultivated area is low during IAS period from LIB, while the variation in production and average yield were high during IAS than LIB (Table 3).

In these two periods, the economic net present worth decreases from 19456765.51\$ in the individual account to 1285983.701\$ in the liberalization and this is a bad indicator.

It had also been found that B/C ratio decreases from 1.57 in the individual account to 1.12 in the liberalization and this indicator was badly decreased, that means cotton production situation in New Halfa scheme is going to the worst.

But the financial net present worth decreases from 18980060.42\$ in the individual account to 1416878.424\$ in the liberalization which means cotton production in (NHAPC) is heading to the worst. It has also been found that the FB/C ratio decreased from 1.54 in the individual account to 1.12 in the liberalization and this is a bad indicator (Table 4 and Appendix A).

## Conclusion

- In all periods the production of cotton was economically and financially feasible.
- Mean total area allocated for cotton was higher in the first period than the second period as well as the mean production.
- The average yields were better in the first period than the second period.
- The individual account system was better than the period of liberalization.

## Policy recommendations

- The influence of the Government policies is evident and it is recommended that transparent Government policies be adopted with subsidies to the agricultural sector particularly to the cotton production.
- The result of financial and economic evaluation of cotton production in New Halfa Agricultural Production Corporation is feasible but it needs revision of Government policies, more incentives to producers and part of petroleum revenues are devoted to agriculture particularly to the cotton production to increase the farmer's net return.
- Downstream cotton processing is recommended for added value.
- Upstream of cotton inputs processing is recommended for import substitutions.
- Improving cotton productivity through research development and extension is necessary.

Season	Value (Million. US\$)	Cotton contribution %
2004	87.7	27
2005	103.6	34.2
2006	71.1	26.4
2007	34.4	16.2
2008	58.3	18.8
total	355.1	

Source: (Organization 2001)

**Table 1:** Cotton contribution to Sudan's exports (Million US\$), (2004-2008).

Seas on	Areas (fed)	Production(kentars )	Avg. yield Kentar/ fed
1981/1982	57735	223434.45	3.87
1982/1983	80000	385600	4.82
1983/1984	84000	339360	4.04
1984/1985	75000	265500	3.54
1985/1986	68345	375214.05	5.49
1986/1987	72585	451478.7	6.22
1987/1988	76155	322135.65	4.23
1988/1989	60000	176400	2.94
1989/1990	75000	345750	4.61
1990/1991	50000	200500	4.01
1991/1992	41055	191726.85	4.67
Total	739875	3277099.7	48.44
Average	67261	297918	4.4
Standard deviation	12788.65	87369.49	0.87
1992/1993	41000	143500	3.5
1993/1994	50000	151500	3.03
1994/1995	50000	200500	4.01
1995/1996	60150	255637.5	4.25
1996/1997	58065	185808	3.2
1997/1998	45110	179537.8	3.98
1998/1999	35000	106050	3.03
1999/2000	40870	147132	3.6

Source: NHAPC (New Halfa Agricultural Production Corporation) statistical information unit (2010)

**Table 2:** The area, production and average yield of cotton in New Halfa agricultural production corporation during the individual accounts sys tem period (1981/82-1991/ 92) and liberalization period (1992/93-2009/10).

Year	Area	Production	Average yield
(1981/82-1991/92)Individual account system	19.01	29.33	19.66
(1992/93-2009/ 10)Liberalization	22.51	20.37	15.04
T-value	(t.05 ) 5.8*	(t.05 ) 4.9*	(t.05 ) 1.4

Source: Author's calculations based on Table 2.

**Table 3:** Coefficient of variation for the area, production and average yield, 1981/82-1991/92 (individual account) and 1992/93-2009/10 (liberalization period).

Item	Indivi dual account	Liberalization account
ENPW (dollar)	19456765.51	1285983.701
FNPW (dollar)	18980060.42	1416878.424
EB/C ratio	1.57	1.12
FB/C ratio	1.54	1.12
EIRR	18.21	19.04
FIRR	18.21	19.12
EN/K	00	6.8
FN/K	00	7.44
Economic payback period (EPBP)	5.48	5.24
Financial payback period (FPBP)	5.49	5.22

**Table 4:** Economic and financial indicators of new Halfa agricultural production corporation during the individual account s ys tem period (1981/1982-1991/1992) and the liberalization period (1992/1993-2009/2010).

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