CHAPTER SIX

ANALYSIS THE SAMPLE DATA

Introduction:

Basically, this chapter presents Analyze of the field data of the research, which generated from the area of the study. The results of the data analysis are obtained by using the data envelopment analysis (DEA) solver software, it gives (TFP) estimates ;efficiency change and frontier shift for the schemes of the study sample; south Kordofan and Gedaref Mechanized rain fed agricultural schemes. The objective of analyzing is to measure the technical efficiency and productivity change of mechanized rain fed schemes in the two areas; south Kordofan and Gedaref states. Also this chapter reviews the discussion of the research finding.finally this chapter illustrates theEmpirical implications of the research, which divided into theoretical implications and empirical implications as follows:

6.1 Analysis of the field data of the research:

This section is divided into two parts. Part one , which concerns with Gedaref mechanized rain fed schemes gedaref mechanized rain fed schemes ,while part two concerns with the analysis of data that mechanized rain fed schemes of south Kordofan area as table (6.1.1), (6.1.2), (6.1.3), (6.1.4).

A. Gedaref State:

Table (6.1.1), Gedaref State (Sesame)

Frontier shift	Efficiency change	Malmquist index	Year
0.157	3.41	0.53	2001
0.208	1.87	0.39	2002
0.165	0.76	0.12	2003
0.162	3.46	0.56	2004
0.162	0.43	0.07	2005
0.162	0.35	0.057	2006
0.165	1.13	0.186	2007
0.162	1.03	0.168	2008
0.251	0.37	0.093	2009
0.176	0.88	0.156	2010
0.177	1.369	0.233	mean

Source: Agricultural inputs and outputs for (2001-2010) as analyze by DEA Solver program.

It is seen from table (6.1.1), that the Malmquist total factor productivity (TFP) index for Sesame crop in Gedaref agricultural schemes during the period of study were less than one. Similarly, frontier shift scores during period of the study (2001 -2010) as seen in the table were less than one.Alsoefficiency changefor Gedarefmechanized rain fed schemes of sesame production as shown on the above table were positive tosome extent. The years 2001, 2002, 2004, 2007 and 2008were the years where the efficiency change scored more than one, while theyears 2003, 2005, 2006, 2009 and 2010 were the worst. In these years the efficiency change scoresless than one; and that means there recorded improvement in efficiency change, in these years, or in

other words the □ , is greater than ¿¿ ¿ ¿ < 1) mean that all input can be simultaneously without altering (= proportion) in which they are utilized .

Table (6.1.2), Gedaref State (Sorghum).

Frontier shift	Efficiency change	Malmquist index	Year
0.40	0.76	0.31	2001
0.69	0.57	0.37	2002
0.42	1.00	0.42	2003
0.42	0.74	0.31	2004
0.42	2.18	0.92	2005
0.42	1.96	0.83	2006
0.42	0.58	0.24	2007
0.42	1.09	0.46	2008
0.82	0.16	0.14	2009
0.42	1.12	0.47	2010
0.485	1.016	0.447	mean

Source: Agricultural inputs and outputs for (2001-2010) as analyze by DEA Solver program

The table (3.5.2)shows the total picture of Malmquist (TFP) index , efficiency change and frontier shift for Sorghum crop in GedarefMechanized rain fed schemes during (2001- 2010),as in the table(3.5.2) .Ingeneral theMalmquist (TFP) growth and the frontiershift can be seen during (2001-2010) less than one.The efficiency change wasmore than one in years 2003, 2005, 2006, 2008 and 2010, while the years 2001, 2002, 2004, 2007 and 2009 were the worst in terms of efficiency change, where it declinedto less than one.

B.South Kordofan state:

Table (6.1.3), South Kordofan State (Sorghum)

Frontier shift	Efficiency change	Malmquist index	Year
2.46	1.30	3.22	2001
1.54	1.73	2.66	2002
2.36	1.00	2.35	2003
2.35	1.33	3.15	2004
2.35	0.46	1.07	2005
2.35	0.51	1.19	2006
2.35	1.72	4.06	2007
2.35	0.91	2.14	2008
1.20	5.88	7.11	2009
2.35	0.88	2.09	2010
2.166	1.572	2.904	mean

Source: Agricultural inputs and outputs for (2001-2010) as analyze by DEA Solver program

The table (6.1.3) presents the Malmquist index, Efficiency change and Frontier shift for sorghum crop at scheme level, and specifically in south Kordofan. It is clear that the (TFP) index and Frontier shift weremore thanone. Also the efficiency change was positive in years 2001, 2002, 2003, 2004, 2007 and 2009, but the years 2005, 2006, 2008 and 2010 were appeared to be the years where the efficiency change score was less than one. Thechanges in (TFP) Index closely follow efficiency change.The results indicate that is relations between the efficiency change and the economic and political situation; south Kodofan cease fire in 2001 , green campaign program plan 2001-2006 in the area. Also the during transitional period (2005- 2010) of the Sudan comprehensive peace (CPA) the area witnessed full settlement, people return to

their areas, and this indicate that no migration in the agricultural labor to other area.

Table (6.1.4), SouthKordofan State (Sesame).

Frontier shift	Efficiency change	Malmquist index	Year
6.35	0.29	1.86	2001
4.79	0.53	2.56	2002
6.03	1.31	7.91	2003
6.15	0.28	1.77	2004
6.15	2.30	14.17	2005
6.15	2.83	17.48	2006
6.07	0.88	5.36	2007
6.15	0.96	5.93	2008
3.98	2.69	10.73	2009
5.67	1.12	6.39	2010
5. 749	1.319	7.416	mean

Source: Agricultural inputs and outputs for (2001-2010) as analyze by DEA Solver program

The DEA analysis results in the previous table (6.1.4) explains the total factor productivity for sesame crop in South Kordofan during (2001 -2010) .The table shows that the (TFP) growth was positive during the years of study (2001-2010) , Similarly frontier shift was positive, while efficiency change is negative in the years 2001, 2002, 2004, 2007 and 2008, but the years 2003, 2005, 2006, 2009 and 2010 appear to be the years where the efficiency change of sesame production is positive and more than one . In order to give clear understanding for productivity change, frontier shift and efficiency in Mechanized rain fed schemes in the sample,it is better to analyze this component at sector level, in the other word taking the two areas together to identify weather the two area were efficient during period of the study, or inefficient because these steps could help in giving final picture of the efficiency and productivity change in the study areas.

Thesecomponents are mentioned in tables (3.5.5) and(3.5.6) as follows:

Table (6.1.5), agri- Schemes based on frontier shift for (Sesame) in the two areas.

mean	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	Region
5.749	5.67	3.98	6.15	6.07	6.15	6.15	6.15	6.03	4.79	6.35	S.Kordofan
0.177	0.176	0.251	0.162	0.165	0.162	0.162	0.162	0.165	0.208	0.157	Gedaref
2.939	2.923	2.116	3.118	3.118	3.156	3.156	3.156	3.098	2.499	3.254	mean

Source: The researcher, according to the results of the (DEA) Solver program.

From the above table (3.5.5), the frontier shift of efficiency scores are shown. This measurement of efficiency change comparethe areas of the study in terms of sesame crops production , the Mechanized rain fed agricultural schemes, in both south Kordofan and Gedaref in Sudan during(2001- 2010),asshown in the above table, South Kordofan(MRS) on overage had high frontier, while the GedarefMechanized rain fed agricultural schemes were low in terms of frontier shift in all period of thestudy, it should be noted that its means in the periods of study under one or negative.

Table (6.1.6), Malmquist TFP for (Sesame)) in the two areas.

mean	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	Region
7.416	6.39	10.73	5.93	5.36	17.48	14.17	1.77	7.91	2.56	1.86	S.Kordofan
0.233	0.156	0.093	0.168	0.186	0.057	0.07	0.56	0.12	0.39	0.53	Gedaref
3.824	3.273	5.412	3.049	2.773	8.768	7.12	1.165	4.015	1.475	1.195	Mean

Source: The researcher, according to the results of the (DEA) Solver program.

Table (6.1.6)illustrates the Malmquist (TFP) indexfor South Kordofan and Gedaref (MFC) schemesin terms of sesame crops

production. According to(TFP) annual means for Sesame crop, it is found that the(TFP) growthfor South Kordofan Agricultural schemes on overage has high Malmquist (TFP) Growth , the (TFP) Growth is Positive for all period of the study (2001 to 2010) . In contrast the Gedaref Agricultural schemes on overage has low Malmquist(TFP) Growth, or less than one during the whole period of thestudy, which mean that in comparison with south Kordofan agricultural schemes, the Gedaref schemes were less growth in term of productivity growth, where no progress in their annual Total factor productivity growth during the period of the study.

Table(6.1.7), the efficiency change forSesame) in the two areas.

mean	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	Region
0.773	1.12	2.69	0.96	0.88	2.83	2.30	0.28	1.31	0.53	0.29	S.Kordofan
1.369	0.88	0.37	1.03	1.13	0.35	0.43	3.46	0.76	1.87	3.41	Gedaref
1.344	1.0	1.53	0.995	1.005	1.59	1.365	1.87	1.035	1.2	1.85	Mean

Source: The researcher, according to the results of the (DEA) Solver program.

Table (6.1.7) explainsthe efficiency change means , in both South Kordofan and Gedaref (MFC) schemes in terms of sesame crops production ,during period (2001 – 2010) .The table shows that,Years 2003, 2005, 2006, 2009 and 2010 were the years, where efficiency change in South Kordofanmechanized rain fed schemes for sesame production is positive and greater that one . Whileyear's 2001, 2002, 2004, 2007, 2008 were the years where efficiency change is negative or less than one. Also table ((3.5.6), shows efficiency change means inGedarefmechanized rain fed schemes for sesame production for the period of the study throughcomparing the results of efficiency change meansin both

South Kordofan and Gedaref (MFC) Schemes in the same table, it noticed that the picture is totally different. The results in contrast,Years which shows efficiency change means positive, were found negative in term of efficiency change. And year 2001, 2002, 2004, 2007, 2008 were the years where efficiency change is negative there in south Kordofan, here in Gedaref schemes were positive or more than one in terms of efficiency change.

Table (6.1.8), Malmquist TFP of annual means for (Sesame) inthe two areas.

Frontier shift	Efficiency change	Malmquist(TFP) index	Year
3.254	1.85	1.195	2001
2.299	1.2	1.475	2002
3.098	1.035	4.015	2003
3.156	1.87	1.165	2004
3.156	1.365	7.120	2005
3.156	1.59	8.768	2006
3.118	1.005	2.773	2007
3.118	0.995	3.049	2008
2.116	1.53	5.412	2009
2.923	1.0	3.273	2010
2.939	1.344	3.824	Mean

Source: The researcher, according to the results of the (DEA) Solver program.

The previous table (6.1.8), illustrates that , the Malmquist (TFP) growth means for sesame crop during period of the study in both two area of the study; south Kordofan and Gedaref agricultural (MRS) in Sudan were over one ,which mean that there were positive progress in (TFP) Growth for sesame during periods of study in the area of study. The years2002, 2006, 2007 and 2009 appearto be the years where (TFP) Growth were high. During

years 2001, 2003, 200, 2005 and 2008, the (TFP) Growth were lowest level.

On the other hand the table also shows the means of efficiency change for sesame in the same area during the period of the study. The means of efficiency change are positive during the period of the study (2001 – 2010).ifwe excluded2008.In the year 2008 the efficiency change was lowest, or decreased by(0.05%) , this is because of agricultural land see the previous Figures(5.4.7) and(5.4.14).

Also table (3.5.8) shows frontier shift means,from data of frontier shift means, it is clear that allthe scores were positive in terms of sesame production during the period of the study.

Table (6.1.9), Malmquist TFP for (Sesame) and its component in the twoArea

Frontier shift	Efficiency change	Malmquist index	Area
5.749	1.31	7.416	S.K
0.177	1.369	0.233	G.
2.963	1.34	3.8245	Mean

Source: The researcher, according to the results of the (DEA) Solver program.

The table (6.1.9), presents(DEA) analysis for the total factor productivity and its components in terms of sesame crops production, in the two areas under study, with in period (2001-2010), the period which witnessed economic and political stability.

From the table it is clear that the means of Malmquist index, efficiency change and frontier shift is above one, which means that there were positive progress in all periodsof the study for Sudanese mechanized rain fed schemes in the two area under study .ON the schemes level show that South Kordofan schemes on overage has the highest in TFP (41.6%) during the period 2001

to 2010, while Gedaref schemes on overage has the highest in TFP (23.3%) during the study period. The best performer of TFP Growth is the South KordofanMechanized rain fed agriculture schemes. The total productivity of these schemes increased on average by (41.6%).The total average of efficiency change for Gedaref schemes is more than one, which means that there is positive change in managerial efficiency in the period study for these schemes. in contrast The total average of efficiency change for the South Kordofan is less than one, and that mean south Kordofan schemes were weak in the period study for these schemes. On the other hand south Kordofan schemes were positive in term of frontier shift,while Gedaref schemes were low in frontier shift. And that mean Gedaref schemes were inefficient in comparison with south Kordofan schemes.

Table (6.1.10), Malmquist TFP for(Sorghum) and its component in the Area of South Kordofan and Gedaref.

Frontier shift	Efficiency change	Malmquist index	Area
2.166	1.572	20.904	S.K
0.48	1.016	0.447	G.
1.323	1.294	10.6755	Mean

Source: The researcher, according to the results of the (DEA) Solver program.

The previous table (6.1.10), compares of Total Factor Productivity (TFP) change in Sudanese Mechanized rain fed agriculture corporation schemes in the twoareas, South Kordofan and Gedaref . This table showsthat South KordofanSchemes on average has the highest in TFP (90.4%) during the period 2001 to 2010. The worse performer of TFP Growth is the GedarefMechanized rain fed agriculture schemes. The total productivity of these schemes decreased on average by (55.3%).

Table (6.1.11), Malmquist TFPof yearly means of (Sorghum) in the twoareas 2001-2010

Frontier shift	Efficiency change	Malmquist(TFP) index	Year
1.43	1.03	1.76	2001
1.09	1.15	1.52	2002
1.39	1.0	1.39	2003
1.385	1.035	1.73	2004
1.385	1.32	1	2005
1.385	1.235	1.51	2006
1.385	1.15	2.15	2007
1.385	1.0	1.30	2008
1.01	3.02	3.62	2009
1.385	1.0	1.28	2010
1.323	1.294	1.5	Mean

Source: The researcher, according to the results of the (DEA) Solver program.

The results in table (6.1.11), shows that the change in TFP is above one during the period of the study, the change in TFP Growth closely follow changes in efficiency change. The year2005,2009 and2007 appear to be the year where the Total Factor Productivity Growth were the highest at 99.5% , 62.5% and 15% respectively . During 2002 and 2006, the TFP growths were lowest at 1% all the same. If we analyze the efficiency change over period of the study , it indicate that during year 2005and 2006 the efficiency change increased by 3,2% and 2.35% respectively while in year 2003 , 2008 and 2010 the efficiency change were lowest. On the other hand the frontier shift increased by 39 % during year 2003 and 38.5% during year 2005, 2007, and 2010 where the TFP growth was positive i.e. year 2005.

The previous table (6.1.11), needs to be analyzed at individual level for each area separately and for each year during period 2001 to 2010, as table(6.1.12), (6.1.13), (6.1.14), (6.1.15), these tables present and explain the total factor productivity growth for both South Kordofan and Gedaref Mechanized rainfedagricultural schemes on yearly basis and provide comprehensive understanding about the performance of these schemes.

Table (6.1.12), Malmquist TFP for (Sorghum) during 2001-2010

mean	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	Region
2.904	2.09	7.11	2.14	4.06	1.19	1.07	3.15	2.35	2.66	3.22	S.kordofan

0.447	0.47	0.14	0.46	0.24	0.83	0.92	0.31	0.42	0.37	0.31	Gedaref
1.676	1.28	3.625	1.3	2.15	1.01	0.995	1.73	1.385	1.515	1.765	Mean

Source: The researcher, according to the results of the (DEA) Solver program.

Intable ((6.1.12), the first year of the analysis, south Kordofan agricultural schemes is the best performance with TFP growth 22%. Gedaref agricultural schemes are the worst performer with decline in TFP growth by 67%. Also in the next year 2002 the south Kordofan agricultural schemes has 66% higher TFP growth. During years 2003 up to 2010 south Kordofan agricultural schemes played leading role in total factor productivity growth with highest 35%, 70%, 14% , 11%, 95%, respectively . Year 2005 is best period for Gedaref agricultural schemes among the period of the study, south Kordofan is more stable in term of TFP.Year 2006 is the most crucial for the agricultural schemes where the total factor productivity is low for all agricultural schemes in the sample.

Sorghum))Table((6.1.13), Efficiency change for

mean	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	Region
1.572	0.88	5.88	0.91	1.72	0.51	0.46	1.33	1.00	1.73	1.30	S.kordofan
1.016	1.12	0.16	1.09	0.58	1.96	2.18	0.74	1.00	0.57	0.76	Gedaref
1.294	1.o	3.02	1.0	1.15	1.235	1.32	1.035	1.0	1.15	1.03	Mean

Source: The researcher, according to the results of the (DEA) Solver program.

According to thetable ((6.1.13),these results show that the efficiency (managerial) change has changed over time; this changeis an important contributor in dampening the total factor productivity growth of agricultural schemes in the two area of mechanized rain fed agricultural schemes south Kordofan and Gedaref. The annual average efficiency change for these schemes is more than one, which mean that there is positive change in managerial efficiency during theperiod study for these schemes.

During 2001, being the first year of analysis, the efficiency change is increased by 30 % for South Kordofan agricultural schemes, while the efficiency change for Gedaref agricultural schemes declined. Also in years 2002, 2004, 2007 and

2009there is decrease in efficiency change it is less than one or(negative) in managerial efficiency in Gedarefmechanized rain fed agricultural schemes. The years 2005, 2006, 2008 and 2010 were the worst performer in term of efficiency change in South Kordofan agricultural schemes with decline in efficiency change by 54% , 49 % ,12% . year 2010 was relatively better for all schemes in the sample where their managerial efficiency equal to one .In the schemes level, change in managerial efficiency show that South Kordofan schemes has positive change in most of the years, South Kordofan is on top ranking according to managerial change and more stable where the efficiency change in six out of the ten years of the study is more than one.

On the other hand,it is useful to make rank for mechanizedrain fed schemes in term of total productivity growth efficiency change and frontier shift. Table (3.5.14)present ranking of these schemes during period 2001 - 2010.

Table ((6.1.14), Ranking of schemes based on Malmquist TFP for (Sorghum) and its component in the twoAreas.

Frontier shift	schemes	Efficiency change	schemes	TFP change	schemes	Ranking
2.166	S. Kordofan	1.572	S. Kordofan	2.904	S. Kordofan	1
0.48	Gedaref	1.016	Gedaref	0.447	Gedaref	2

Source: The researcher, according to the results of the (DEA) Solver program.

The table((6.1.14),provide furtherillustrates, it gives good caparison in terms of(TFP)growth, the table shows that , South Kordofan agricultural schemes is more efficient than Gedaref schemes ,this indicate that managerial efficiency(efficiency change) is the major source which effects the total factor productivity growth for the mechanized rain fed agricultural schemes in both area study (South Kordofan&Gedaref).The South Kordofan schemes are the best practice according to efficiency change , Gedaref schemes are worst according to TFP growth and

efficiency change , this also indicate that for mechanized rain fed schemes efficiency change is the major source of total factor productivity growth.

The total factor productivity growth is used to construct grand production frontier on data from two area of mechanized rain fed schemes (south Kordofan&Gedaref) , the area where the study is conducted , how much this grand frontier shift at each scheme observed inputs mix . Table (3.5.15) present production frontier shift for both SouthKordofan and Gedarefmechanized rain fed schemes based on TFP.

Table (6.1.15), Agri- Schemes based on frontier shift for (Sorghum)

mean	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	Region
2.166	2.35	1.20	2.35	2.35	2.35	2.35	2.35	2.36	1.54	2.46	S.kordofan
0.48	0.42	0.82	0.42	0.42	0.42	0.42	0.42	0.42	0.64	0.40	Gedaref
1.323	1.385	1.01	1.385	1.385	1.385	1.385	1.385	1.39	1.09	1.43	Mean

Source: The researcher, according to the results of the (DEA) Solver program.

The table(6.1.15)indicate that South Kordofan schemes recorded improvement in frontier shift (technological change) , all records is over one during the period of study , Gedaref mechanized rain fed schemes below frontier all their scores are less than one , therefore the south Kordofan schemes is said they are technically efficient. Therefore the agricultural schemes of Gedaref mechanized rain fed schemes are to push their frontierPossibilities, outwards relative to south Kordofan agricultural Schemes level.

6.2Discussionof the results of the research:

Based on the previous section,this section is devoted to the discussion the research finding. The discussion covers; theoretical prospects of the study, empirical evidence and conceptual studies ,which are valuable components throughout the the period of the study. Alsothis discussion includes the measures of efficiency and productivity change estimatorsfor the selected schemes and the main

factors which influenced the productivity change looking forwards to measure technical efficiency and productivity change in sesame and sorghum production, in the other words this discussion tried to answer the research questions .In the coming part the research reviews this discussion and the main research finding.

6.2.1Measure the technical efficiency and productivity change for the sample of the study:

The first research objectives was to measure the technical efficiency and productivity change for the sample of the study in terms of sesame and sorghum production and make comparison between them to find the firms with more efficiency. The finding in this research that south Kordofan agricultural schemes were more efficiency than Gedaref schemes in term of two crops .The outcomes had showed that the efficiency change was the main source of productivity change, this agree with the outcome of (Abdurrahman and others, 2006) who mentioned thatThe sugar industry islacking in terms of managerial efficiency which could be explained by ageneral reduction in the quality of managerial decisionmakingamong the best practicefirms,the study alsoshows that static TFP growth is mainlycontributed by technical efficiency which declined for nine sugar firms andremained equal to one for nine sugar firms during period 1998 to 2007, while the technical change is positive foreleven out of twenty sugarfirms, while the technical efficiency was positive for nine out of twenty sugar firms .Also Bereket& Lalitha(2012) have used the same ways in their study to examine the total factor productivity change in the Ethiopian Microfinance Institutions over period (2004-2009).Many authors have proposed that defining total factor productivity source can help lead to improve performance in these units .

6.2.2 Determine the efficiency factors in Sudanese agricultural sector that use the fewer amounts of inputs to produce certain outputs.

The second research objectivewas to determine the efficiency factors in Sudanese agricultural sector that use the fewer amounts of inputs to produce certain outputs. The important benefit of this objective is the ability to monitor the schemes performance and to enhance the strength point of schemes to reach the minimization and maximization goals during the study period. Another important benefit of this objective is the ability to know the source of efficiency that can be used to help the DMUO to put questions like (whatif) which help in sensitivity analysis of resources, this objective go with what Jan and Barry conducted in their study (2002) they have explained new foreign banks were more inputs efficient than local banks, mainly due to their superior scale efficiency. The outcome of this study showed that the pattern TFP growth tends to be driven more by frontier shift rather than efficiency (managerial) improvement among South Kordofan schemes due to high performance in using existing agricultural inputs.this results go the outcome of (Abdurrahman and others, 2006). Also this philosophy adopted by Raphael. (2013).

6.2.3 Determine the inefficiency factors in Sudanese agricultural sector that use the fewer amounts of inputs to produce certain outputs.

The thirdresearch objective was todetermine the inefficient amount of inputs that should be treated to reach theefficiency production level in Sudanese agricultural sector in the two areas. This

objective has benefits for its ability to monitor schemes performance more effectively, specifically with respect to make early attention to the inefficient factors that should be treated to reach theefficiency productive system and to assist policy maker and managers in their practicing in different DMU_o. The outcome of this study showed that Gedaref (MFC) schemes were weak in terms of (TFP) for Sesame and sorghum crops .This weakness of TFP in Gedaref schemes is mainly attributed to frontier shift, which is also so weak during period (2001-2010).This could be explained by lack of labor force, machines and production means.

6.2.4 Provide the reference set for the mechanized rain fed schemes in sample of the study.

This objective can help the other DMU_o to project their performance on to best practice level in the sector. Another benefit for this objective is that defining reference set can serve as the process that provide knowledge's about the best practice decision making units working in the same field in other words the peer set which can help this inefficient units to improve their efficiency. The outcome of the study brought out that the reference set for the mechanized rain fed in the sample during the period of the study,is South Kordofan schemes. Therefore, South Kordofan schemes can serve as areference set for Gedaref mechanized rain fed schemes in terms of the two crops production; sesame and sorghum. It can understand that the most authors agree with this objective and argued that it is essential to define the reference set for inefficient units.

6.3 Major outcome of the study:

Instituted on the above discussion, the key outcome of this study are as follows:

1- South Kordofan agricultural schemes were more efficient than Gedaref schemes in terms of the two crops; sesame and sorghum.

2- The research found that the technical is the main source of productivity change for the mechanized rain fed schemes in the two areas during the period of the study.
3- The reference set for the mechanized rain fed in the sample, during the period of the study , are south Kordofan schemes, they can serve as areference set for Gedaref mechanized rain fed schemes in terms of the two crops production ; sesame and sorghum.
4- Gedaref (MFC) schemes were weak in terms of (TFP) for Sesame and sorghum crops. Theweakness of TFP in Gedaref schemes is mainly attributed to frontier shift, andcould be explained by lack of labor force, machines and production means.
5- The pattern TFP growth tends to be driven more by frontier shift rather than efficiency (managerial) improvement among South Kordofan schemes due to high performance in using existing agricultural inputs.

6.4 Implication of the study:

This section contain twosub- chapter, the theoretical implications and empirical implications of the study finding which discussed in the above section , this implication illustrated as follows :

6-4.1Theoretical implications of the study:

The current study has supported the present knowledge on efficiency and productivity measurements techniques. One of very important contribution of this study is the use of modern and more acceptable measurements (DEA) approach in terms of efficiency measurement and productivity change .The outcome of this study explained the different (DEA) models and assumption that should be understood to use this new approach in terms of efficiency measurement in differentforms ofOrganizations of all sizes.Therefore this research highlight the technical efficiency and productivity element that may provide solution for the problems of efficiency and productivity change in decision making units . Also this

research may provide some justification for the use of this methodology, which is reduce the past conventional theoretical claims.

6-4.2 Empirical implications of the study

This sub-section is for empirical implications of the research; this research contributes towards empirical practice, it may help DMUO to improve their efficiency and productivity growth through using this methodology. The important empirical implications that can be gained from this studyare as follows:

- Determine the efficient and inefficient factors will help manager and decision makers to set a sound policy in their fields, which will lead to reach the minimization and maximization goals. This is an especially challenge goals in now days business.
- The outcome of this research well help managers and those who are responsible in converting the output into input to analyze the efficiency and productivity and make them able to use the type of question like (what if) to make the productive system more efficient.

In the coming chapter, the study will throw lights on the main results and recommendation that researcher could be derived from discussed some of these results. Also the coming chapter will reviews Suggestions for the future Researchand list of References.