Pastoral Adaptation and Socio-Economic Transformations in the Butana Area - Al Gedaref State, Sudan.

A thesis submitted in Fulfillment of the Requirement for the Degree of Ph.D. in Geography

By

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Dedication

To My Family
Acknowledgement

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Abstract

This study investigates the adaptive strategies adopted by pastoral communities towards African Sahel zone and the recent socio-economic transformations that have taken place. The main objective is to investigate the indicators and consequences of such changes and to uncover the real causes behind that. Butana of the Northern Gedaref state-Eastern Sudan has been selected as case study area. The study adopted both political and cultural ecology approaches to achieve the main objectives of this research. Methodologically, the study was based on the primary data collected from the field through questionnaire, observation, group discussions and official reports. The study uses statistical package for social science (SPSS) and Geographical Information System (GIS) in analyzing such data.

The main findings of the study showed that local communities have adapted themselves to the scarcity of nature in Butana area through the adoption of pastoral life (mobility). This strategy helps them in securing their livelihood and maintaining ecological balances in such area. The study explains that pastoral economy has profoundly been transformed due to natural, socio-economic and political factors. The study proved that state intervention in land use under the pretext of land reform is the essential factor behind recent changes. Indictors of the recent transformation include: drop out from traditional sectors, collapse of pastoral economy, decline in production, rural urban migration, weakening the role of tribal leaders and acute conflict between land users. The study revealed that the absence of a body to enforce regulations after the abolition of the native administration has changed the common property into open access thus ruin for all.

The study concluded that integration between statutory and customary laws that governed access to land, security of land rights and reinforcement for all rangelands regulations such as grazing line, open traditional route; determine the private and common grazing lands are highly needed. In order to have proper information in all aspects (land use map) of pastoral sector the study suggests that designing of rangeland information system should be established as soon as possible.
kasruf تأكيد

وكشفت دراسة على مستوى المجتمع التي تتبنتها الاستراتيجيات التي تبحث عنها والتحولات المتأخرة ذات شهادتها الاجتماعية الاقتصادية. وذلك معونًا بطرق الحركة الحضرية في المناطق ذات الأثر الاجتماعي. وتعد جموعها التي تتمحور حول الدورة والتكيف الاجتماعي في جغرافيا المعلومات والتنظيم، على سبيل المعاناة الاجتماعية والسياسية. وتتدخل في المرشحات المصاحبة للقرن الإداري، التي تحوّلها، المعاناة الأدبية، وتشكل الأوان في الأراضي النامية. وتعيد في مرافق الرعاية والرعي، وفي الأطر叕، وتمكّنها عن طريق الأمكنة، أو من أجل الوصول. وتشمل الأبعاد الاجتماعية والاقتصادية، المعاناة الإدارية، والبحث عن الدورة والتكيف الاجتماعي في جغرافيا المعلومات والتنظيم.

وذلك معونًا بطرق الحركة الحضرية في المناطق ذات الأثر الاجتماعي. وتعد جموعها التي تتمحور حول الدورة والتكيف الاجتماعي في جغرافيا المعلومات والتنظيم، على سبيل المعاناة الاجتماعية والسياسية. وتتدخل في المرشحات المصاحبة للقرن الإداري، التي تحوّلها، المعاناة الأدبية، وتشكل الأوان في الأراضي النامية. وتعيد في مرافق الرعاية والرعي، وفي الأطر叕، وتمكّنها عن طريق الأمكنة، أو من أجل الوصول. وتشمل الأبعاد الاجتماعية والاقتصادية، المعاناة الإدارية، والبحث عن الدورة والتكيف الاجتماعي في جغرافيا المعلومات والتنظيم.
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Chapter One: Research Strategy

1.1 Introduction:

The majority of population in the African sahel, depend on access to rangeland for securing their livelihoods. Therefore, land has occupied a very important place in the pastoral economy. By nature in arid and semi-arid region, natural resources such as water are the scarcest resource and varied over space and time. Historically the inhabitants of such regions had adapted to the limitation of nature and scarcity of water by a wide range of adaptive and coping mechanisms that involved both practical and cultural practices. Practically this includes mobility over space and time; adaptability (selection of crops varieties, adjusting herd composition, raising of suitable animal and adoption of specific forms of simple adaptive technologies); and diversity (increasing options of income generations activities). Culturally, the practices involved group solidarity, communal work, socially responsible institutions and comprehensive knowledge of the surrounding habitat.

Most of the planners and decision makers in African Sahel don't recognize and appreciate the ecological significance of such adaptations and coping strategies, thus consequently much interfered by policy makers in their common desire to modernize livestock production and settle pastoralists. Recognition of pastoralism as sustainable livelihood mainly in dry lands needs to look to the pastoralism as a form of livelihood rather than simply as a mode of production. As (Scoones, 1994) states that the contribution of mobile livestock keeping to macroeconomic development, to income security of large sections of the population and also to the conservation of natural resources in arid and semi-arid areas is, meanwhile, largely recognized. This explains that the way the government deals with the issue of pastoralism and pastoralists needs to be changed.

In Sudan accessing land and natural resources are governed by two types of contradicting and overlapping laws. These are the statutory law which an official and documented (formal law) and the customary which is the tribal law (informal). Like many African countries the government of Sudan applied the land reform policy that transfers the communal land ownership to the state ownership aiming to increase agricultural land for both investors and private owners. The state believes that accessing land and resources through the system of tribal land tenure is a problem that hinders the process of development. Changing communal land tenure system to other forms has led to remarkable
changes of pastoral economy and also undermined current land use patterns as well as speed up resource degradation and conflict.

At present, pastoral economy in the Third World, particularly in the places like African Sahel, are experiencing a severe crisis that threatens their existence and it has become unable to secure basic needs of people whose their livelihood depend mainly in pastoral production. Symptoms and manifestations of the crises include, food insecurity, famine out-breaks, displacement, widespread of poverty conditions and general transformation in livelihood conditions. Environmental degradation, drought, rapid population growth, changing land tenure, conversion of range land into other uses and over exploitation of natural resources have been repeatedly blamed for the generation of crises.

The study focuses on the traditional adaptation and the recent changes in arid and semi arid lands of the Gedaref state, Eastern Sudan. The over all objective is to investigate the causes and factors responsible for the recent transformation in the study area and uncover some indictors of the recent transformation. The study adopts political and cultural ecology approach that links environment, culture, economics and politics to address the problem of the study.

1.2 Research problem:
Pastoral communities in African Sahel in general and in the East Sudan in particular adopted various mechanisms to cope with limitation of nature in arid and semi arid lands. The adaptations mechanism include human mobility, selection of suitable animals, sound sharing of common resources, respect of the tribal leaders system, cooprative work, sharing of indigenous knowledge, etc.

Historical evidence shows that traditional sector in Eastern Sudan adapted itself to marginal areas and created a balanced relationship between people and land in cultivation and grazing (Grigg 1974). Preliminary observation from the study area suggests that the situation has significantly changed during the last four decades and the traditional adaptation to scarcity of nature has been profoundly transformed and changed. Rural communities of the African Sahel face severe crises such as social illness, land degradation, desertification, poverty, conflict etc. Looking to the written literature several factors have repeatedly been accused as the real causes behind collapse of pastoral adaptation and current problem in African Sahel. The dilemma facing the people of such region is a result of a combination of both natural and human factors. These include
drought, rapid increase of population, market economy, state policy and lack of accurate and up to date information.

Obviously shortage of rainfall, which is the one characteristics of African Sahel makes people in such area more vulnerable to crises but does not always lead to collapse of the pastoral adaptation and not wholly responsible for the current crisis. This because drought occurs in many parts of the word especially Africa, in almost cyclical fashion; in comparison, there is nothing showing that collapse of pastoral adaptation also cyclic. Recently, (Egemi 1994) mentions that drought can be managed and its effect can be prevented or at least reduced. This indicates that drought is not the main factor behind socio-economic changes among rural communities of the African sahel.

Although not rejecting the severe effects of drought on rural communities, the study argues that the present changes and collapse of traditional adaptation were due to the interference of the state in land tenure and land use system. The overall objective behind this intervention is to apply development policies (modernization). The year 1971 was considered as the turning point in the land tenure system in Sudan and this appeared when the government proclaimed that “any land of any kind occupied or unoccupied which has not been registered before the commencement of the Act of 1971 shall be the property of the government” (El Mahadi 1979). This means that the flexible institutions have been affected and the system of tribal leaders has been weakened in the area. The introduction of unregistered land Act 1971 is the beginning and starting point of the problem in the study area as drought can be managed. The introduction of unregistered land Policy has contributed to the geographical marginalization of the rural communities by pushing them to harsh area and hence, collapses the traditional adaptation.

The general theme of land use policy in Sudan in general, and the study area in particular is to develop water resources for growing cash crops. A number of large irrigated schemes were established in the country such as (Gezira, Kennana, Halfa, Rahad, Asalaya and Elgineed). The study area in particular witnessed a dramatic increase in rainfed mechanized agriculture at the expense of the traditional land that belongs to the local producers. (Ahmed 1980) states that despite the major role of the nomads in national economy, the livestock sector has not been given the attention it deserves from the government.

The government policies in water supply for pastoral development, changing land tenure system and rapid expansion of unorganized mechanized
farming were widely accused for the collapse of pastoral economy. The study argues that demarcations and titling of land besides the elimination of mobility that proposed by different government in African countries has lion share in the collapse of pastoral economy. The general policy of such countries is to settle pastoralist for the purposes of development and offering them better services. The study concentrates on that, the state policies, particularly those affecting right and access to land in Butana area as the major factor behind the collapse of pastoral economy and could be held responsible for the recent transformation. These policies make people in such areas more vulnerable.

The study adopted the technique of problem tree to show the causes and consequences of the collapse of pastoral economy (see figure 1.1.). Problem tree technique is widely used in social sciences and it covers three major components. These include causes in the lower part, core problem in the middle and the consequences in the upper part of the diagram. Figure 1.1 shows that lack of proper and up to date information is the major cause behind the collapse of pastoral adaptation. Due to that, most of the state policies towards pastoral sector are not matching the need and requirement of pastoral communities. As the result to that, land of unorganized mechanized farming is increasing sharply at the expense of pastoral land. These major causes are supported by other minor causes that aggravated the situation of pastoral communities. These include repeated drought and the role of unfair market. Concerning the core problem of this research this techniques reflects that collapse of pastoral adaptation is the major out put of the causes mentioned above. Many consequences are reflected by this technique. These include land use conflict, massive degradation, low production and all sorts of environmental and social illness.

1.3 Justification for Selecting the Topic:

The main objective for the selection of the topic is my own concern for the dramatic changes that faced traditional communities during the last four decades. One of the views circulated in many academic and policy –making circles is the lack of knowledge on the part of traditional producers, which led them to employ unsound natural resource management techniques. In fact there are numerous examples, which show that knowledge as not being the scarce commodity among traditional producers. Many of the so-called traditional farming and herding practices, which were, once regarded as primitive and misguided are now recognized as sophisticated and appropriate. (Chambers
1983) states that without a continuous dialogue and mutual understanding between indigenous knowledge and modern sciences any effort to confront natural resource management would at best be wasted. Looking to the pastoral adaptation in dry lands, two tendencies however, seem to dominate. The first is that identifies pastoral behavior as being a major cause of ecological degradation and never ending socio-economic crises. Those supporting this idea see that sedentarization as solution to the current crises. The second perspective is the idea of researcher who considers pastoralism as the most viable mode of production in ecologically marginal areas such as African Sahel. The researcher selects this topic to show how traditional producers possess systematic and sophisticated knowledge in such marginal areas. In addition the study would like to proof that knowledge is not scarce commodity among local communities.

Figure 1.1: Research problems:

Source: Researcher 2006
1.4 Justification for Selecting the Area:
The study area has traditionally been occupied and utilized by traditional producers (farmers and grazers). Butana area in particular is considered as the vast and good natural grazing area for both local inhabitants and outsiders. The area is by nature considered as an ecologically marginal and there is scarcity of natural resources beside concentration of livestock during wet season. This area is affected by unregistered land Act of 1971. Recently the study area witnessed a severe unorganized expansion of mechanized farming at the expense of other land users. In the past the rural communities of such area managed to adapt themselves to the limitation of nature by a wide range of coping mechanisms, supported by different element of moral economy. Now this system of adaptation is under going drastic changes. This gives the study opportunity to examine the real causes behind the recent transformation and measure its impact on socio-economic aspect and environment. In addition to the above mentioned justification there is a lack of literature concerning the causes and the transformation in such area. Thus the study will be valuable in covering these issues.

1.5 Hypotheses of the Study:
This study is based on the following hypotheses:
1. Pastoral communities in the study area are traditionally adaptive to the arid and semi-arid lands through wide range of adapting and coping mechanisms.
2. Recently traditional adaptation has been dramatically changed and affected.
3. Changes in traditional adaptation are due to physical and human factors.
4. Changes in land tenure since 1971 are the starting point for recent changes in human adaptation.
5. Environmental and socio-economic conditions in the area have recently changed.
6. There is a lack of accurate and up to date information concerning pastoral economy.
1.6 Objectives of the Study:

1. To investigate how local producers have traditionally adapted themselves to the ecological marginality of Butana area.
2. To examine the real causes behind the recent changes and the collapse of pastoral economy.
3. To show some indicators and consequences of the recent transformation that found in the study area.
4. To setup rangeland information system that may help both local communities and decision makers.
5. To provide planners and decision makers with the relevant and recent database so as to apply sustainable development.

1.7 Geographical limits of the Research:

This study focuses mainly on the traditional adaptation and the current crisis in African Sahel in general and Eastern Sudan in particular. The time limit of the study is about 37 years from the year of 1970 until the year of 2006. In eastern Sudan the study will concentrate on Gedaref state (Northern part of Butana), the vast area for pastoral activities. The study area lies between latitude (12.45N up to 16 N) and longitude (34 E to 37E). The detail of the study will focus on Butana at the northern part of Gedaref state (part of Gedaref locality) which now called the locality of El Subagh (mahalyat El Subaqh) See map1.1. The main indigenous trees in the region are *Balanitis aegyptiaca* ("Higleeg"), *Acacia seyal* ("Talh"), *Acacia senegal* ("Hashab"), *Acacia mellifera* ("Kiter"), *Calotropis procera* ("Usher"), and a host of other species of trees, bushes and grasses.
1.8 Research Approaches and Method of Data Collection:

To understand and trace the traditional adaptation mechanisms among the local producers and the recent transformation, the study utilizes historical approach. The descriptive approach is used by this study is to describe the human and natural aspects that exist in the area and its impact on pastoral economy. Statistical package for social science (SPSS) has been used by this study for general statistical analysis. Besides this the study also tries to apply the geographic information system (GIS application) to do some spatial analysis.
1.8.1 Data Collection:

The extended political ecology approach and cultural ecology approach require descriptive and nominal data in order to analyze both past and present situation. The study adopted various techniques in collecting data including both primary and secondary:

1. Secondary Information:

Secondary information includes reports and files found in the government offices at the local or national level have been used. At the level of the state the research use some official data from different sources that has a link with the study such as ministry of agriculture, water, forest etc. Generally the researcher accesses all the stakeholders that have direct or indirect contribution to the topic. The study will not use this report unless it approves that of high accuracy or at least acceptable. Moreover, the study accesses some sites in the internet that have a relation with this topic. It is worth mentioning that these sites help the researcher to widen his knowledge and it is hardly quoted in this study.

2. Primary Information:

To fill the gap of the available data, the larger part of methodology depends on the product of fieldwork (Questionnaires, Observation, and Group Discussion). In order to have an idea about the pastoral economy, indigenous knowledge among traditional sector and moral economy, the study followed the method of the extensive group discussion with an elderly people. The researcher with a help of elites and tribal leaders made some group discussion in various villages and more in Sobaq centre. The area under study has been visited formally three times. The fist visit was in the beginning of 2005, the purpose behind that is to get general and basic information about the study area. The second visit was in the in the mid of wet season in the same year aiming to have some knowledge about the situation during this time as most of livestock if not all accumulate in the Butana in rainy season. The last and main visit was in the July of 2006 the objective was to distribute the questionnaire and get more quantitative data. This will help the study in collecting basic data such as ecological, cultural, and socio-economic besides tracing the history of traditional adaptation and recent transformation. It is worth mentioning that the study gets much of data through group discussion.
A. Questionnaires:-

With the reference to the population statistical office in Gedaref, the total population in the Butana area is about 40,000 persons distributed roughly in more than forty villages. Due to the homogeneity of the area as most if not all depends on the pastoral economy for their livelihoods, the approach followed was to select some of these villages to collect the necessary information from the households. The study selects a total of 300 household covering 19 villages and five sectors (see table 1.1 and map 1.2). The random selection of the villages was based on the administrative boundary. Administratively Sobaq locality was divided into five sectors based on geographical direction. These are the northern, southern, western, eastern, and central sector. The selection of questionnaire number is based on the formula of 5% from the total. The total population is about 40 thousands with an average number of six people per household. The total household is roughly about 6000 thus, 5% out of the total household is equal 300 household. For selecting the number of the representative household in each village the study adopted the formula \( N = \frac{X}{Y \times S} \) when \( N \) represent the number of total household interviewed in each village, while \( X \) represent the total number of household in each village, \( Y \) represents the sum up households for all villages, and \( S \) represents the total number of questionnaire.

Meaning the number of household interviewed in the village = the total number of household divided over the total household of all villages (2553 households) this all multiplied by the total number of questionnaire (300).

B. Group Discussion:

Most of the data especially descriptive one is collected through group discussion during the three visits to the study area. The study made a group discussion in different villages with considerable number in Subagh centre. With help of sheikh Omer Haj Hassan (director in Subagh) People from different villages gathered in the evening times in Subagh and the author raised many hot and valuable questions related to the past and present situation of pastoral economy and how they see the future for the pastoral sector. Again in each village especially after distributing the needed questionnaire the researcher discuss some issues with the people in the villages. The discussion aimed at obtaining basic data about the ecological, cultural, and socio-economic condition. Also the discussion aim to trace the history about the area aiming to see the past and present adaptation and the recent transformation. Moreover
some key informants have been interviewed during the fieldwork. Those were the Nazirs, tribal leader and official person at various governmental offices.

Table 1.1: Selected Villages in the Study Area

<table>
<thead>
<tr>
<th>CLUSTER</th>
<th>VILLAGE NAME</th>
<th>HOUSE HOLD</th>
<th>SAMPLE SIZE</th>
<th>PERCENT %</th>
</tr>
</thead>
<tbody>
<tr>
<td>NORTH EAST (46)</td>
<td>EL SADDAH</td>
<td>227</td>
<td>26</td>
<td>8.7</td>
</tr>
<tr>
<td></td>
<td>EL GELIEB</td>
<td>56</td>
<td>7</td>
<td>2.3</td>
</tr>
<tr>
<td></td>
<td>EL FOWAL</td>
<td>110</td>
<td>13</td>
<td>4.3</td>
</tr>
<tr>
<td>NORTH WEST (59)</td>
<td>QELI ANKIYA</td>
<td>133</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>QELI EL SHIBIEK</td>
<td>195</td>
<td>23</td>
<td>7.7</td>
</tr>
<tr>
<td></td>
<td>QELI EL GLEIH</td>
<td>177</td>
<td>21</td>
<td>7</td>
</tr>
<tr>
<td>SOUTH EAST (33)</td>
<td>EL HAJAR</td>
<td>200</td>
<td>23</td>
<td>7.7</td>
</tr>
<tr>
<td></td>
<td>RAIRAH</td>
<td>7</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>SUFIEA</td>
<td>64</td>
<td>7</td>
<td>2.3</td>
</tr>
<tr>
<td>SOUTH WEST (63)</td>
<td>UMM SERHA</td>
<td>175</td>
<td>21</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>EL IDEID EL HUMUR</td>
<td>132</td>
<td>16</td>
<td>5.3</td>
</tr>
<tr>
<td></td>
<td>ELDIED EL SAMENAH</td>
<td>230</td>
<td>26</td>
<td>8.7</td>
</tr>
<tr>
<td>CENTRAL BUTANA (99)</td>
<td>SOBAQH SHAMAL</td>
<td>105</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>SOBAQ GANOOB</td>
<td>201</td>
<td>23</td>
<td>7.7</td>
</tr>
<tr>
<td></td>
<td>EL JABORAB</td>
<td>62</td>
<td>8</td>
<td>2.7</td>
</tr>
<tr>
<td></td>
<td>EL HAMAIEB</td>
<td>133</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>EL TAKOUN SHAMAL</td>
<td>99</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>EL TAKOUN GANOOB</td>
<td>129</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>EL BAHOGI</td>
<td>118</td>
<td>14</td>
<td>4.7</td>
</tr>
<tr>
<td>TOTAL</td>
<td>19</td>
<td>2553</td>
<td>300</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Fieldwork 2006
1.9 The Approach of the Study

With the reference to the research problem and to understand the nature of interaction of population and environment, the study adopted political ecology as the approach of the study join with cultural ecology perspective. Political
ecology is based on the influences of state in rural economies and land use pattern. It explains the recent transformation of pastoral economy in the logic of capitalists' development and market economy. This approach's applied by many researchers in different fields such as poverty, land degradation and social changes. The researcher gathered three works applied political ecology approach, these are the work of (Blaikie 1985), (Michael Watts 1985) and (Egemi 1998).

(Michael Watts 1985) used this approach to see the relationship between population growth and desertification in West Africa. At that time it was commonly believed that population growth was the principal reason for continuing desertification in the region. Watts suggested that desertification is not as much a product of the size of a population, but instead reflects the kinds of actions taken by people who have very few options for survival. When the poor are pushed into the most marginal natural environments to produce a living, they often have few choices for how they manage the natural resources that are available to them. The policy implications of these kinds of findings are important, for they suggest that it is not population growth which is the problem that must be solved, but the conditions of social and economic inequality which force people to use their resources in particular ways.

Also (Blaikie 1985) applied this approach in the field of soil erosion in Third World countries. It was seen in the conventional (colonial) view as an environmental problem caused by irrational (peasant) land uses and overpopulation, with the solution found in involving peasants in market (capitalist) economies. Blaikie criticizes this position and states that household is immersed in two kinds of social relations: local relations of production and exchange relations with the world market. In both spheres, ("surplus is extracted from cultivators who then in turn are forced to extract 'surpluses' ... from the environment .... And this in time and under certain physical circumstances leads to degradation and/or erosion"). For Blaikie underdevelopment rather than 'peasant ignorance' lies at the heart of what is better phrased as a poverty-nature syndrome. He traced land degradation in Africa to colonial policies of land appropriation, rather than to over-exploitation by African farmers.

(Egemi 1998) who has been studied the transformation and collapse of pastoral economy among the Hadandowa in Eastern Sudan. He argues that drought is an ecological reality and part of the general rhythm of nature in the Red Sea. In the past, that ecological reality of drought and food shortage has been
internalized by the Hadandowa and was very much part of their social life. The Hadandowa are currently undergoing severe crisis in their subsistence supply and a general collapse in their resilience to drought. He argued that the collapse of pastoral economy is a result of structural processes of marginalization.

Cultural ecology approach on the other hand offers the study a chance to investigate how local producers manage to live in such harsh areas. This idea supported by the (Scott 1998) who stated that studies on human ecology show how cultivators and nomadic pastoralists in the savannah sahelain zone have adopted very finely adjusted system which employs a variety of adaptive mechanisms such as the use of micro environment to grow stables, exploitation of different eco-system and co-operation and exchange between herders and farmers. (Manger 1998) concentrates in the human ecology perspective in order to understand human adaptation in arid lands. He states that the contribution of human ecology perspective might enhance our understanding of east African environment and society. This approach focuses on how arid eco-system are able to deal with such a shock like drought and how human population deal with the reality of drought. The studies have also shown how earlier coping mechanism have deteriorated with new constrain on pastoral migration, herd diversification and relationship with other group. Dynamics in the arid lands ecosystem, particularly as dramatized by drought, thus trigger larger processes of wider socio-economic and political significance (Manger ibid). These above mentioned ideas are enough justification why the study adopts the join of political ecology approach and human ecology approach.

1.10 Literature Review:

This section deals with the literature of this research. It covers different topics such as the debate of pastoralist definition, pastoral economy, land tenure, policies, adaptation and recent changes. Data of this section is a written one whether it is published or not in addition of some inputs from the fieldwork data.

• Pastoralism and Pastoralists:

There is a long debate and confusion about who is nomad and who is a pastoralist. To tackle this problem the study adopted several definitions. The Sudanese National Council for Research 1975 now (National Centre for Research), defines nomads as “people in regular movement, the whole family with their livestock in search of pasture and water. They don’t generally have
permanent homes and live in tents. Such movement is seasonal and in most cases tend to be roughly in a north-south direction”.

Concerning pastoralists (Swift 1988) defines it as, “those people in which 50% or more of the household revenue comes from livestock or livestock related activities or where more than 15% of household’s food energy consumption consist of milk and milk products while agro-pastoralists is one of which more than 50% of household’s gross revenue comes from farming and 10-50% from pastoralism”. (Abu sin1993) defines pastoralists as the mode of life and production system of self oriented strategy of mobility, in time and space, and socio-economic network to maximize utility from meagre and patchily distributed resources by inter-changeable emphasis between livestock keeping and agriculture. Moreover, he divided pastoral production into three groups these are:-

1. Group one is pastoralists where 75% of their living on livestock under extensive spatial mobility.
2. Group two agro-pastoralists where 50-75% of their living depends on livestock
3. Group three is farmers where less than 50% of their living depends on livestock.

(Sanford 1986) defined pastoralists as a people who devote the bulk of their own and their families working time and energy to look after their livestock rather than to other economic activities. Most of the definitions concentrate on that pastoralism is the way of life and essential source of livelihoods in harsh environment where practicing agriculture is impossible or costly in term of money and environment. The study accepts that the definition of nomads as the people who have no permanent settlement and always in moving of both family and livestock. Concerning pastoralist the study defines it as that people who have clear location and settlement their livestock may be in seasonal moving with part of family member or shared herder or any others form of grazing.

Thus, the study adopts the term pastoralist to represent the people that have permanent settlement and spent part of their time in other places searching for better grazing areas. Those people besides raising some animals they do have some cultivation in small scale. In addition to that both types of activities support each other for example surplus in animals helps investing in agriculture and they use residues and crops as supplemented fodder for their animals.
• **Studies on Pastoral Economy:**

Concerning the studies on pastoral economy in Africa, the researcher collected different works conducted in various countries these are organized as follows. For example (Lane1990) who studied land management in Tanzania pointed out that in 1970 a large scale wheat scheme was introduced in the area which led to a great loss in grazing lands. In addition the state policy believed in the tragedy of the commons and that pastoralism is relatively inefficient use of land compared to mechanized agriculture. The project has displaced the pastoralists and made their traditional way of life untenable. The results were soil erosion, elimination of local grasses and great losses of livestock. In the same field (Mustafa 1990) explained why livestock producing peasants in Tanzania have been marginalized by the livestock policy as the state concentrates on capitalists sectors with less priority to the pastoral sector. His main findings showed that a great transformation in pastoralists life.

(Batterbuy 1993) studied traditional farmers in Burkina Faso showing that farmers and planners work with knowledge from multiple sources. So, in order to develop recent agriculture there should be clear relationships between traditional farmers and the state therefore, indigenous knowledge of dry land should be considered. (Gefu 1991) studied pastoralism in Nigeria mentioning that pressure on limited land resources through rapid expansion of agriculture and unsustainable environmental policies have led to pastoralists crises. He argues that a multi disciplinary approach is needed toward the study of ecological stress, to look at demographic, sociological and political factors. Also (Bovin 995) explained that Nigeria has been affected by drought during 1970 and 1980s. He mentioned that Agro-pastoralists adopted survival strategies to drought. These were divided into main group (sedentarization) and increased mobility and migration.

(Tseren 1995) studied pastoralism in Mongolia mentioning that pastoralist life style adopts taboos and whole set of beliefs to prevent human activities which harm environment and use management techniques to coordinate their needs with natural characteristics of their surrounding area. By so doing they protect the fragile environment practically, improve productivity of their rangeland by using long distance mobility, rotational pasturing, non intensive grazing and use of manure as fertilizer.

(Samatar 1989) demonstrated that traditional adaptation and social structure of Somalese have gone through qualitative transformation because of political economy, peripheral capitalist and ignoring policy from the state. The
A proportion of state development expenditure earmarked for pastoral production increased marginally from (3%) in 1963 to (14%) in 1986. (Unruh 1995) studied land tenure system in Somalia, which favoured crop cultivation. The relationship between indigenous tenure and state imposed tenure has, in many locations decreased the ability of pastoralists to reproduce itself, increased land degradation, resource use conflicts, decline pastoral production and increased impact on local institutions which in many cases regulated rational resource access and use. (Butcher 1994) studied land tenure among the Borana in Ethiopia and his main findings were that like many African pastoralists, the Borana are also under going change in indigenous resource tenure due to the development policies. It is clear that farming has been rapidly expanding at the expense of rangeland. Moreover, the land tenure has profoundly changed and pastoral communities became more vulnerable. (Kassa 1991) studied women pastoralists in Ethiopia pointing that household chores are predominantly the sphere of women but due to the recent transformation among pastoralists women also bear the responsibility of financing the household budget in many cases, through the intensive local retail activities and long distance trading. Moreover, they also became household heads for various reasons. (Burggeman 1994) studied pastoralist in central Chad and showed that the role played by women is far greater than originally believed especially when it comes to milking cow and calf health and control over livestock products. Recently, insecurity and degradation of grazing land area have caused many livestock losses. This means that women are gradually losing their traditional rights and so have to be considered in livestock projects.

- **Adaptation Strategies:**

In term of adaptation pastoralists developed their own techniques to cope with natural crises such as drought. These adaptations include mobility, herd diversification and adoption of alternative livelihoods. (Unganai 1994) studied drought in South Africa explaining that drought is considered as unavoidable risk to agriculture in the area. Therefore in order to mitigate drought, sound water management is needed. Drought predictions are so important in reducing its impacts. This study concluded that drought management is so important than crises management. (Hatch, et al 1997) studied pastoralists' strategies and drought in Natal-South Africa focusing on the drought response strategies among pastoralists who adopted several strategies in coping with drought. These include moving animals to an area not
affected by drought; no reaction to drought, purchasing replacement stock after drought, supplementing stock during the drought with sugar cane residues, feeding stock generated greater milk yields and cooperation. (Fratkin 1997) studied livestock in North Kenya (Ariaal) mentioning that head of household divided livestock into different ecological zones depending on their feeding requirements. Ariaal household and settlement organization revolves around rearing and safe guarding livestock which in turn provides the predominant source of food and cash income in marginal environments. (Macabe 1994) studied the Turkana pastoralists in Kenya mentioning that during 1980s the Turkana were seen as rational in their organizational decisions operating available, healthy agricultural economy and utilizing a harsh ecosystem in a very effective manner. Mobility is the most important strategy as it involves a complex process of evaluating environment, political and social factor. (Galaty 1994) studied rangeland in Kenya explaining that mobility is the sound strategy to cope with marginal land. Recently, rangeland in Kenya went through a progressive process of privatization which supported by the tragedy of the commons idea. The study argues that tragedy of the commons occurs not when rangeland is controlled by common, but when community control is undermined by state or private interests. (Stiles 1992) studied Gabbara pastoralists in North Kenya and explained that despite the harsh environment the Gabbro can survive through the employment of sophisticated land use management system that stresses high mobility, social cooperation and highly intensive labour inputs.

Markakis (2004) states that double imperative of the pastoralist mode of production, namely extensive land use and freedom of movement in order first to have access to dispersed, ecologically specialized and seasonality varied grazing land and watering holes; secondly to afford a margin of safety against erratic rainfall and thirdly to provide forage for different livestock species. So the idea that see pastoralism as irrational and destroys the environment must be revised as it has no scientific basis.

(Babiker 1996) in his paper managing scarcity in Dar Hamar in western Sudan, showed that farmers and pastoralists have sophisticated knowledge about their surrounding environment; so people adopted some techniques to cope the scarcity of water such as early practicing of agriculture, shifting cultivation, storage of water in tree trunks and water harvesting techniques. (Ibrahim 1980) in (Ahmed 1994) study drought in western kordofan he revealed that inhabitants in such area have adapted to drought hazard through practicing
agriculture, pastoralism and cooperation. He argues that indigenous rural knowledge of drought in needed to have a sound development policy.

In order to maximize the use of available browse and forage supply, pastoralists also tend to keep a range of different livestock (cattle, camels, sheep and goats) which graze on different parts of the vegetation. Camels and goats are usually more drought resistant than sheep and cattle and they browse shrubs in the open range without herder assistance. Herd diversification is also used as a risk spreading strategy, since it enables pastoralists to minimize losses when livestock disease epidemics occur (Watson 1994). Herd diversification is not the only kind of risk-spreading strategy. Others involve herd redistribution through social groups or at clan or sub-clan level. Pastoralists usually build social security systems based on reciprocity in order to reduce problems of food security especially in the case of drought or disease. Such systems give herders the possibility of creating widespread networks which allow them to borrow animals from different areas in case of local disaster. Networks are efficient when they are built at a group level, but the introduction of more individualized forms of ownership that are leading to greater differentiation in terms of animal holdings is actually weakening their effectiveness.

Migration is one of the coping mechanisms among pastoralist especially during crises. Part of household members migrates to towns, mechanized scheme and urban centre so as to earn income and this is important strategy during drought and chocks. In this regard, for example, Egemi (1994) states that the case of Hadendowa pastoralists in Sudan, who are nowadays considering this strategy as an important outlet. He writes that migration for wage labor, which was not a tradition before, has now become increasingly significant for the Hadendowa local economy. Similarly, according to (Fasil et al 2001), the Afar and Borena pastoral groups of Ethiopia diversify their income during food shortage by creating employment opportunities for the youth in non-pastoral activities or by sending part of the household (young men) in nearby towns or to other foreign countries. The Afar usually sends their young men to Saudi Arabia, Djibouti and Yemen; the Borena youth migrate for labor to Kenya. This helps in the reduction of number of people from each household and in getting additional income for the family from labor.

The study concludes this section by saying that pastoral systems in arid and semi-arid lands used to cope effectively and in sustainable manner with the prevailing harsh and erratic ecological conditions of those regions. The ability to move their herds over large distances, grazing the diffuse and scattered
vegetation of the regions’ rangelands, and migrate to more favorable sites during droughts, was a rational strategies that help rural communities to secure their livelihood in such marginal areas for a thousands of years.

- **State Intervention in Pastoral Economy:**
  In the past most of the written literature about pastoralism reflected that the increase of animal beyond the carrying capacity of the rangeland was the main cause of degradation and led to social illness among pastoralists. Recently, this view has changed and state policy in land use is repeatedly blamed for degradation and collapse of pastoral economy. In this line (Egemi 1994) mentioned that the recent crises among Hadandowa in the red sea area (eastern Sudan) are not due to the drought or population pressure but to the economical and political marginalization as the result of the state policies. (A/Atti 1990) made a study in the same area using remote sensing (1970-1990), his main findings was that drought is a normal phenomenon in the semi-arid lands; therefore the recent changes are due to state policies, urbanization expansion, much need for fuel and building materials. The recent changes have impacts on traditional adaptation, pastoral lands, socio-economic changes, women working and massive migration. (Manger 1996) mentioned that Red Sea State is considered as marginal area, people adopted traditional strategies to cope with the limitation of nature. Political marginalization is a basic factor responsible for the recent changes. The solution should be in well planning for grazing land, local institutions should be considered in development, and ignoring policy from the state need to be stopped.

(Scott 1988 ) stated that studies on human ecology show how cultivators and nomadic pastoralists in the savannah sahelain zones have a adopted very finely adjusted system which employ a variety of adaptive mechanisms such as the use of micro-environment to grow stables, exploiting of different ecosystem and co-operation and exchange between herders and farmers. (Babiker 1984) who made his study in western Sudan showed that the development of commodity relation and capital accumulation practices has brought rural social differentiation. This has stimulated farmers to adopt attitudes of individualism which has in turn eroded traditional form of solidarity and co-operation among farmers. (Osman 1987) in (Ahmed 1994) studied the Rashida of kassala. The major finding of this work is that the unauthorized expansion of mechanized is at the expense of the available range land and the harsh condition resulting from drought have affected the mode of living of Rashida. Considerable
number of families migrated to the town in attempt to earn a living. (Hassan1995) study livestock in Sudan mentioned that this sector has been totally marginalized from the state policy as planning is always centralized.

Looking to the link between indigenous knowledge many researchers believe that any development effort that ignored their traditional knowledge may fail. (Watable 1992) studied traditional farming in developing countries mentioning that indigenous farming methods of the local community should become the starting point for a strategy to develop agriculture. The same author argues that by sharing the views of local communities in development projects, the traditional adaptation will remain sustainable and free from danger of causing environmental damage. (Prasads 1994) study on pastoralists in dry lands emphasized that arid land are essentially land of high risk where livestock is a very ancient form of adaptation. Pastoralists in the past maintained an ecological equilibrium by providing checks against excessive resource exploitation, mainly through less intensive land use. However, traditional adaptation is gradually breaking down due to increasing population growth in both human and livestock and irrational land use.

(Hogg 1997) described Ethiopia’s pastoral societies in transition as State incorporation has restricted mobility, while market penetration has increased dependence on markets for food. Many pastoral groups, such as Afar, have lost important grazing land due to the State and to their pastoral neighbors, which has increased their vulnerability to drought. Similarly, Borena in the southern rangelands are being shunted westward by the expansion of Somali speaking groups to their east. This has resulted in the loss of control over important well complexes. Throughout the rangelands agriculture is expanding, while former communal grazing areas are being enclosed. These changes are likely to have long term consequences for food security in these areas as old adaptations give way to new ways of doing things.

(Kamals 1993) study on drought in Africa showed that rural people are the most vulnerable to drought, so instead of relief strategies during drought, the writer mentioned that establishing basic infrastructure of essential services should be considered and awareness among rural people is more important as drought is not a new phenomenon. (Woiens1997) who studied the Massi pastoralists in Kenya pointed out that as the result of rapid expansion of agriculture the state applied a policy of sedentarization. They were pushed away from their traditional rights. This means that officials and planners are still continued to believe common ownership of land was the main cause of
environmental degradation. In Kenya, policies were enacted to solve the problem, by introducing ranches which were created out of the Maasai commons dry season pasture. In practice, however, the ranches were only sufficient in times of adequate rainfall. By 1984, twenty-nine of fifty-one group ranches in Kajiado district had subdivided or voted to subdivide. Other internal pressures contributed to the breakup of the group ranches. Individuals wanted to obtain individual title to use as collateral for access to credit. Credit can be viewed as a type of insurance (Wrdy, 1990). Further, the commons of the group ranch was going to be divided among more and more people as the population grew since under customary law children of members have interest in the land. This means that pastoralists' way of life has undergone severe changes.

People in the sahel are aware of the ecological limitations, so they adapted themselves by certain mechanisms which represented in livestock management and grain production. Traditional producers in most widespread economic activity in drier part of Sudan and sahel has been described as the most adaptive land use system in such dry environment. Changing land tenure system and state bias policy towards pastoralism in Sudan are the major factors behind the recent changes.

- **Collapse of Pastoral Economy**

Regarding the debate about impact of pastoralism on environment and the causes behind the collapse of pastoral economy, different views have been raised. The study area in particular and Sudan in general showed less literature written on this topic although it has been a hot issue in recent years. (Ayoub 1998) identified three causes of soil degradation in Sudan. He found out that overgrazing is the most widespread causes of soil degradation, particularly around permanent settlements and watering centers. Clearance of forest for firewood and charcoal making and overexploitation of vegetation is the second cause while cropping without appropriate nutrient input particularly in small scale farming and sandy and loamy soils are the third causes of soil degradation. Furthermore, he suggests that when these processes of resources mismanagement coincided with the recent recurrent drought, collapse of the economic bases of fragile areas took place. (Abdalla 1985) in (Ahmed 1994) showed that the arid area lies in a fragile ecological belt. The removal of trees for agriculture has accelerated the rate of desertification, loss of farming and soil deterioration. Moreover, the change in ecosystem manifested by disappearance of mature vegetation affected food supply. On the other hands, deforestation led to disappearance of wildlife, and the lack of charcoal and
Pastoral societies in the Sahel today have been caught in repeated crises that has its most dramatic manifestation in the frequent famine the latest in the early of 1980s, the decreasing capabilities to cope with degradation of the environment and general breakdown of pastoral way of life (Egemi 1994).

(Dejong 1990) reviewed environmental problem in Sudan showing that desertification is attributed to the problem of over cultivation, overgrazing and desertification. She suggested that desertification is reduced or combated if cultivation can be discouraged below the critical rainfall average. (Abdel Bari1977) in (Ahmed 1994) studied vegetation in Sudan giving evidence that there was green vegetation in the past (savannah zone). Due to the extensive cultivation and overgrazing however, this has in changed vegetation cover. Overgrazing is regareded as more dangerous in changing vegetation now than before. (Atta El Moula1985) studied natural resource management in Sudan. Pointing that environment and natural resources has been degraded and managed in most irrational way. He said Gedaref has suffered a lot from mismanagement of the soil which has been eroded and degraded. This has led to the depletion of wildlife, destruction of forest and rangeland and drop in yields.

• **Pastoralism in Sudan:**

Available information about Sudan indicates that out of a total area of the country (2.5 million km²), 44.3% (1,123,000 km²) is desert. Flood regions cover 11.6% (247,500 km²), while Hill Catena and hilly soil have an area of 4.4% (135,000 km²). Only 37.8% (842,500 km²) is low rainfall savannah on sand and clay soil and high rainfall savannah on ironstone. This last category is the high potential area where competition over land between farmers and pastoralists is widespread. 66% of Sudan is arid and semi arid lands which are suitable for pastorlism than any other land use sector.

The greater portion of livestock production in the Sudan belongs to the nomadic and semi-nomadic pastoralists. These groups constitute about 25 to 40% of the total population of the Sudan and own about 92% of the Sudan’s national herd (Abu Sin 1998). Thus, when one talks about the contribution of the livestock sector to the national economy, it is essentially referring to the contribution of nomadic and semi-nomadic pastoralists. As the name implies, agro-pastoral groups depend more on crops and less on livestock when compared to the nomadic or semi nomadic groups. In terms of the principal type of livestock herded, the nomadic and semi nomadic pastoralists in the
Sudan can be divided into two main types: Abbala and Baggara. The terms Abbala and Baggara have no any ethnic or geographical location, rather, they referred to Arabic words ibil and Bagar, which mean camels and cattle, respectively.

The important of pastoral sector can be organized as follows:

1. Pastoral communities constitute a considerable number of Sudanese populations. Thus securing livelihood for large population in the country.
2. They started to play an important role in the local and national policies.
3. Most if not pastoral area in Sudan have witnessed severe conflict and war (Darfur-Eastern Region)
4. pastoralism play vital role in food security as any fail in this sector will lead to famine and disaster compare to the failure of irrigated schemes.
5. This sector owns about 50% of the total national herd which is estimated around 130 million of heads (officially estimated in 2005 at 40.5 million head of cattle, 49.8 million of sheep, 42.5 million of goats and 3.9 million of camel).

**The Role of Pastoral Economy in Sudan:**

Pastoralism in Sudan is one of the most important economic activities from which millions of people derive their livelihoods. The pastoral economy in the Sudan play a considerable role in securing livelihood of over 16 million people or 70% of the rural communities and accounts for more than 20% to the Gross National Product of the country (Abu Sin 1998). Pastoral production which include both nomadism and traditional agriculture are considered the suitable land use and adaptive system in Sudan especially in arid and semi arid land where rainfall is not quite sufficient for mechanized agriculture beside the fragile nature of the soil. The Sudanese economy has traditionally depended primarily on the agricultural sector, which accounted for as much as 41.9% of GDP in 1996 and 36 % in 2002. Recently the contribution of agricultural sector to the GDP is decreasing by 5-10 percentage , and this is may be due to the growing of other economic sector such as oil. Livestock alone play a considerable role in GDP and it is account for 21.8 in 2000, 21.7 in 2001, 20.9 in both 2002 and 2003 and 19.8 in 2004 (population census 2005). The sector employs some 75% of the labor force, and about 60% of the population depends on agriculture for their livelihood (Tohami 2000). Farming and livestock production are also key from the point of view of food security and of foreign exchange reserves, as they provide most of the country’s food needs as well as over 90% of non-oil exports (notably cotton, livestock, and
Gum arabic). Moreover, the agricultural sector provides about 50% of the raw materials used by Sudanese manufactures. The cultivable land is mostly under rain-fed agriculture (14.1 million ha), while only about 1.7 million ha is under irrigation.

In the national strategy report of 1992-2002 the agricultural sector play vital role in the Sudanese national and local economy. For example 36% in growth domestic product with 75% labour and 95% of the export come from this sector. On the other hand this sector receives low support from the government in the same report receives only 26% of the government support (table 1.2). Table 1.2 shows clearly that the livestock sector although of it high contribution in demotic product it received only ten percent from the government support.

<table>
<thead>
<tr>
<th>Sector</th>
<th>Support out of (26%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigated agriculture</td>
<td>49.5</td>
</tr>
<tr>
<td>Rain fed agriculture</td>
<td>20.5</td>
</tr>
<tr>
<td>Livestock and fishery</td>
<td>10</td>
</tr>
<tr>
<td>Natural resources</td>
<td>5</td>
</tr>
<tr>
<td>Irrigation and water resources</td>
<td>15</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Source: National strategy Report, 2002

Traditionally, the Federal Government in Sudan has invested mostly in the irrigated and mechanized rain-fed farming sectors, rather than developing traditional forms of farming and livestock production. Moreover, in 2002 it formulated a 25-years strategy for the agricultural sector with the following objectives:

1. To achieve food security through the steady production of adequate quantities of healthy, nutritious, and affordable food to satisfy the needs of the majority of the population. In particular to attain self-sufficiency in the production of grains and establishing a strategic reserve of food to avoid famine crises.
2. To promote exports by increasing agricultural productivity and enhancing the quality of crops and livestock.
3. To develop natural resources and rationalize their use.
4. To reduce poverty by creating employment opportunities, raising the standard of living, and capitalizing on the comparative advantages of different states.

5. To link the agricultural sector with pre-production sectors (e.g. land preparation and input supply), as well as post-production sectors (e.g. product preparation, storage, processing, distribution, and marketing).

Table 1.3 shows that 13.7%, 2.6% of the total population in Sudan is considered as nomads in the 1955 and 1993 respectively. Although this figure is about the nomads as there is no real data about the number of pastoralists. But it shows the valuable contribution of this sector to the Sudan economy in general and to the rural livelihood in particular. (El Tohami, 2000) states that agricultural sector which includes both (animal and farming production) is the top contributor toward Sudan G.D.P of about 43% in 1994 to 48.7% in 1998 in addition to 63% of the export earning originate from this sector.

<table>
<thead>
<tr>
<th>Census /year</th>
<th>Total Population</th>
<th>Nomads %</th>
<th>Rural %</th>
<th>Urban %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1955</td>
<td>10,263,000</td>
<td>13.7</td>
<td>78.0</td>
<td>8.3</td>
</tr>
<tr>
<td>1973</td>
<td>14,819,000</td>
<td>11.5</td>
<td>70.0</td>
<td>18.5</td>
</tr>
<tr>
<td>1983</td>
<td>20,594,000</td>
<td>11</td>
<td>70.0</td>
<td>20.5</td>
</tr>
<tr>
<td>1993</td>
<td>25,588,000</td>
<td>2.6</td>
<td>68.5</td>
<td>29.3</td>
</tr>
</tbody>
</table>

Source: Population Censuses 55, 73, 83 and 1993

Table 1.3 shows the number of nomads in Sudan is decreasing as it reaches 2.6% from the total population in 1993. This figure does not represent the total number of nomadic people in Sudan. The study shows that most of the population in rural areas depend on this sector for their livelihoods whether under (nomadic, semi nomadic, pastoralist and agro-pastoralists or transhumant.

- **Ecological Zones and Pastoralism:**
  Most of pastoral productions in Sudan are practiced in arid and semi-arid lands which is ecologically marginal land that is only suitable for this sector under communal land tenure systems. This area is characterized by having...
shortage of rains and pasture over space and time. Thus, mobility is considered as suitable mechanism to cope with such harsh environment. As stated above, that rainfall is the main factor influencing the distribution of both human population and livestock. The annual rainfall ranges between 75mm in the extreme north to more than 500mm in the extreme south. Accordingly, four ecological zones with variable grazing potentials can be identified: desert; semi-desert; low rainfall savannah; and high rainfall savannah in the flood plain in the south (Hassan 2001) (see table 1.4).

Table 1.4: Ecological Zones of Sudan

<table>
<thead>
<tr>
<th>Ecological Zone</th>
<th>Location</th>
<th>Rainfall</th>
<th>% of Total area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desert</td>
<td>North of Lat. 16°N</td>
<td>&lt; 100mm</td>
<td>29.0</td>
</tr>
<tr>
<td>Semi-Desert</td>
<td>14°-16° N</td>
<td>100-300mm</td>
<td>19.6</td>
</tr>
<tr>
<td>Low-Rainfall (savannah)</td>
<td>10°-14° N</td>
<td>300-500mm</td>
<td>51.1</td>
</tr>
<tr>
<td>High-Rainfall (savannah)</td>
<td>South of Lat. 10°</td>
<td>&gt; 500mm</td>
<td>10.3</td>
</tr>
</tbody>
</table>

Source: Hassan, 2001

Table 1.4 shows that the semi arid zone of the Sudan encompasses about 70% the surface area of the country. Seventy percent of the Sudanese population lives in this zone with herding and farming as the main sources of livelihood. The majority of the rural population depends mainly on herding and small-scale rain-fed cultivation, which has been exposed repeatedly to hazards of drought. Seasonal mobility is therefore adopted to overcome the problem of shortage of water and pasture over space and time. Again mobility it helps in escaping biting flies and muddy conditions (Gedaref), and to avoid large-scale rainfed and irrigated farming thus avoiding conflict between farmers and herders.

- **Perspectives of the Commons:**
  Generally, there are three perspectives that mastered most of the planners and decision makers thus affecting their intervention towards pastoralists. These are the ("The Tragedy of the Commons, "Cattle Complex" and "New Thinking")

  **1. The Tragedy of the Commons:**
  Most of the state interventions in the pastoral sector have been influenced by theory of Hardin known as" The Tragedy of the Commons". 
Hardin argued that the rational herdsman concludes that the only sensible course for him to pursue is to add another animal to his herd. And another; and another…but this is the conclusion reached by each and every rational herdsman sharing a commons. Therein lies the tragedy. Each man is locked into a system that compels him to increase his herd without limit- in a world that is limited… freedom in a commons brings ruin for all (Hardin 1968).

The message of Hardin theory is quite clear, it concentrates on that resource without individual control and access to everyone it will lead to degradation. This theory become a guide for planners and decision makers and led them to apply policies of anti-nomads and privatization of the commons. This theory is not valid in the study as Hardin made confused between two different terms these are open access and common access. He is right if the title of his theory is the tragedy of the open access. Open access means land is open for all without any restriction. Thus, if five men all graze their cattle on the same piece of land, each man realizes that any land he does not graze his cattle on will be used by another, so he has a strong incentive to graze as much of the available land as possible. In the case of Butana land used in commons but not open for all and this type of land use is governed by traditional rules that every body respect it. Thus all members care of lands and do the best to conserve it, as simply because land is the main assets of livelihood in such harsh area. The allocation of full private property rights to a set of participants is considered as solution of the commons. (Welch 1983) mentioned that the establishment of full property rights is necessary to avoid the inefficiency of overgrazing. He believes that privatization of the commons is the optimal solution for all common-pool problems, and his major concern is how to impose private ownership when it is opposed by those using a commons. Other solution left to themselves, individual who are dependent upon common pool resources for essential inputs to their economic activities will work out a system that achieves regulation over the commons. Institutional arrangement developed will be determined by their uses of the resources. (Netting 1982) expresses this view: my contention will be that, in the absence of decisive legal or military controls from the larger society, the system of property rights in the peasant community will be directly related to the manner in which resources are exploited, the competition for their use, and the nature of the product products-more specifically, land use by and large determines land tenure.
This approach raised two points these are:
1. Assumes that people will able to devise institutional arrangement well matched to their situation and problems.
2. It acknowledges that communal ownership, rather than private ownership or central control, can be an optimal institutional arrangement for some types of commons resource problems.

2. The East African Cattle Complex:
Also not less important than the tragedy of the common, the Melville Herskovits’ theory of the “East African Cattle Complex” (Herskovits 1926) has also influenced the intervention of the state in pastoral sector. According to Herskovits, pastoralists keep an excessive number of animals as a matter of prestige rather than for the sustenance they provide. This theory play vital role in shaping the intervention of the state. Most of the policies made due to this theory were concentrating of how to benefit economically from pastoralism. Thus settling nomads and improve the veterinary services is the major intervention to help nomads to enter the market. With the reference to this theory planners ignore completely why pastoralist increases their number of livestock. Chapter four till us that increase of livestock number is the one of adaptation strategy adopted by the inhabitants of arid and semi-arid lands. The objective of having more animals it is not for the higher status as most of the planner's beliefs. It should be understood in the context of that increasing animal because it is the need to maintain large herd in order to produce enough subsistence products for the household during unfavorable environmental conditions. The study argues that pastoralist keep more animals in order to minimize the risk of harsh environment and at the same time to recover after. The general policy of the international institution (World Bank) as example was the imposition of compulsory limits on the ownership of livestock and increase agriculture. The argument for decreasing livestock number because pastoralist see animals as a sign of wealth rather than economic value thus, increase livestock that exceed the carrying capacity of grazing area and hence severe degradation was the out put.
In the study area this view is not true, livestock is limited by the family labour and available of pasture. Moreover, whenever herder realizes that the number of livestock is exceeding the carrying capacity he will move to the other place (mobility). In addition increasing number of livestock is one of the adaptive strategies for dry season or in other way is the risk spread strategy.
3. New Thinking on Range Management:

The general message of this theory is that overstocking is not always lead to degradation in the mobility system. During the 1980s and 1990s, a new understanding of range management was developed, challenging many previously held notions such as carrying capacity and range degradation. Much of this new thinking is summarized in (Scoones’ 1995) publication living with uncertainty. Scoones draws the important distinction between equilibrium and non-equilibrium environments. The former are characterized by gradual vegetation change and predictable rainfall patterns, where livestock populations are limited by the available forage and hence excessive numbers of livestock (i.e. above a ‘carrying capacity’) have a negative effect on vegetation. Non-equilibrium environments, in contrast, are highly dynamic, usually arid or semi-arid ecosystems with high rainfall variability. In these systems rainfall dominates the production potential of both grass and livestock, and hence livestock populations are limited by drought. Understanding the different characteristics of these two system types leads to three key propositions on range ecology:

1. Many arid and semi-arid ecosystems are non-equilibrium, in which external factors such as drought (rather than stocking numbers) determine livestock numbers and vegetation status. Grazing has a limited effect on grass production over time and therefore permanent degradation is unlikely.

2. Flexible movement is crucial to maintain the productivity of African rangelands, which varies greatly over space and time.

3. African pastoral production systems are geared towards a number of different livelihood objectives which include milk production as well as meat.

Scoones describes the process of ‘tracking’, matching the available feed supply with animal numbers at a particular site, and emphasis's the importance of mobility for maintaining opportunistic tracking strategies. This perspective is supported by White, who states that productivity per hectare and per unit of plant biomass are both high in the communal areas and concludes that ‘livestock in this zone are both biologically and economically highly productive’ (White 1993). These findings are reinforced by the body of data from elsewhere in Africa challenging the assumption that commercial ranching is more economically productive and more appropriate for Africa than traditional extensive systems (Scoones, 1995).
This approach suggests a numbers of key principals for management and policy in the dry lands of Africa. The high level of variability seen in dynamic ecosystem requires an emphasis on flexible responses to uncertain events, and mobility to allow the optimal use of a heterogeneous environment. Thus, flexibility, mobility and local institutions are highly needed for rangeland sound development.

This approach blamed planners in African countries for applying equilibrium solutions being imposed on non-equilibrium environment. Ranches with fenced, water points and reseeded rangeland are classic component of equilibrium system. Million of Dollars have been spent trying to make unpredictable environment predictable. For instance range privatization follows from the tragedy of the commons or ranch development follows from technology transfer and modernization approaches. Global solution (ranches) imposed on local problem do not work. The assumption that western science and technology can provides planned solutions to particular problem under condition of high unpredictability and immense variability is clearly unfounded (putting technical solution to political problem –poverty)

For this perspective supporting tracking system in non-equilibrium environment may achieve through:

1. Increase locally available fodder by importing feed or enhancing fodder production.
2. Moving animals where the fodder is available.
3. Reducing animal feed intake during droughts.
4. Destocking animals through sales in drought and restocking when fodder is available after drought.

The value of communal area cattle production far exceeds returns from ranching. If actual stocking rate are used, communal area returns are 10 times higher per hectare (scoones 1995).

This perspective is important for securing livelihood for rural communities. But why the ‘new thinking’ on rangeland ecology has failed to impact on government policy? This for the study has two answers: the first may be planners are not aware about this theory and the second which is important is that the international policy forced planners in African countries to adopt modernization of agriculture otherwise they will stop funding.
Chapter Two: Conceptual Framework and Theoretical Approach

2.1 Introduction:
This chapter covers two broad sections the first is about the definitions of some concepts related to the study and the second is about the theoretical perspectives of man-environment relationship. Written documents are the main source of data in this chapter with a little hint from the observation and views of the researcher.

2.2. Terms and Concepts:
The political ecology approach and cultural ecology perspective address the complex relationship between man and his environment covering various aspects such as social, economic and political institutions. Accordingly, these approaches utilize different concepts from different social science such as land tenure, adaptation, poverty, drought etc.

2.2.1 The Nomadism:
The dictionary definition of a nomad is "one of a race or tribe which moves about from place to place to find pasture; hence, one who lives a wandering life" (Oxford English Dictionary 1983). This means nomadism is a way of life in which a community has no permanent settlement but moves from place to place, usually seasonally and within a defined territory (www.iucn.org/wisp/pastoralism.html). (Hassan 1995) defined nomadism as the regular movement of people, whole families, with their animals in search for grazing and water during the dry and wet seasons within a usually defined compass of annual migration. Such people don’t have permanent houses, they live in tents. Each group of such people has traditionally exclusive rights of residence and exploitation over territory referred to as (Dar-homestead). In this study the term nomadism refers to the full mobile group that always in moving. This group migrates to the northern parts during the rainy season and to southern part during dry season. They are not allowed to stay more than three months in one place and do not necessary come back to their original place (starting point). The author believes that this is the cheapest type as it depends mostly on mobility. It is true to say that Ummbarraou tribe (Fellatta) is representing such group in the study area.
2.2.2 The Pastoralism:

Pastoralism is usually defined as a system of production in which human and livestock live in symbiotic relationship, making use of natural pastures on an extensive basis, the human population gaining the greater part of its support from the animals kept, both directly from milk and meat and indirectly through the exchange of livestock products for other goods (Toulmin 1983). The same author also argues that the stability of pastoral systems requires some degree of a balance between human population and the number of animals to which they have access, since their support comes largely from this source, and on the other between the animals population and the pasture from which they gain their own support, in the absence of supplementary forms of fodder. (Grigg 1974) stated that, pastoralism is a system of production as well as a way of living in which herding of domesticated animals in arid and semi-arid regions that are marginal to agriculture, is the dominant economic activity. For the purpose of the study pastoralism often refers to extensive husbandry of herds of different species (cattle, sheep, goats and camels) requiring periodic migration to access pasture.

2.2.3 Pastoralists:

A simple interpretation of a pastoralist is "one who lives by keeping flocks of sheep or cattle" (Oxford English Dictionary 1983). It is a generalized food-producing strategy with its main base relying on the intensive management of herd animals for their primary products of meat and skin, and for their secondary products such as wool or hair, milk, blood, dung, traction, and transport (www.britannica.com/eb/article-9056052/nomadism). According to (Sandford, 1983) Pastoralists are people who derive most of their income or sustenance from keeping domestic livestock in conditions where most of the feed that their livestock eat is natural forage rather than cultivated fodder and pastures. A commonly used definition in the literature is that pastoralist households are those in which at least 50% of household gross revenue (including income and consumption) comes from livestock or livestock-related activities (Swift, 1998).

2.2.4 Agro-Pastoralists:

Agro-pastoralism describes the coexistence of both agricultural and grazing activities, although there may be different degrees of integration of these activities, with specific consequences for land use. An economic
definition is that agro-pastoralists derive more than 50% of household gross revenue from farming and 10-50% from livestock (Swift, ibid). In the study area agro-pastoralist is characterized by permanent buildings and houses. It depends on family labour or hired person in grazing and cultivation. The family members are divided into smaller groups, a group of grazing (children) and group for practicing agriculture (elders). The Bataheen tribe prefers this system along their main wadis (Bahogi, Rawyan and Atshan) which is suitable places for cultivation and grazing at the same time.

2.2.5 Transhumance:
Transhumance refers to "the seasonal migration of livestock to suitable grazing grounds" (Collins English Dictionary, 1992), usually following quite precise routes that are repeated each year (www.britannica.com/eb/article-9056052/nomadism). In fact, different types of, or reasons for, transhumance can be found, including movements towards resources (e.g. water and pasture), movements away from risks (e.g. seasonal diseases) and movement for economic motives (such as to seek animal markets). Transhumance means some members of the group move the herd seasonally from one area to another, often between the areas that have witnessed shortage of pasture to areas of rich pasture. The rest of the groups are able to stay in the same location, resulting in longer-standing housing. In the African Sahel, different animals are taken to different regions throughout the year, to match the seasonal patterns of precipitation. In the study area Transhumance refers to the group of people that depend on the concept of Dar (homestead). Usually pastoralists graze and cultivate within their Dar system. The traditional routes are quite clear and it is most essential to come to back to the original place (starting point) where they have permanent houses (local tribe in Butana). The Shukriya tribe prefers this system most.

2.2.6 Land Tenure:
Land tenure is the relationship among people, as individuals and groups, with respect to land and other natural resources. This relationship may be defined by written law (statutory) or by custom (customary). Land tenure is an institution, i.e. rules invented by societies to regulate behaviour. The rules of tenure define how rights to land are to be assigned within societies. They define how access is granted to rights to use, control and transfer land, as well as associated responsibilities and restraints. In simple terms, land tenure systems
determine who can use what resources of the land for how long, and under what conditions (FAO 2005). For FAO land tenure is often categorized as:

1. **Private:** the assignment of rights to a private party who may be an individual, a married couple, a group of people, or a corporate body such as a commercial entity or non-profit organization. For example, within a community, individual families may have exclusive rights to residential parcels, agricultural parcels and certain trees. Other members of the community can be excluded from using these resources without the consent of those who hold the rights.

2. **Communal:** a right of commons may exist within a community where each member has a right to use independently the holdings of the community. For example, members of a community may have the right to graze cattle on a common pasture.

3. **Open access:** specific rights are not assigned to anyone and no-one can be excluded. This typically includes marine tenure where access to the high seas is generally open to anyone; it may include rangelands and forests where there is free access to the resources for all. (An important difference between open access and communal systems is that under a communal system non-member of the community are excluded from using the common areas.

4. **State:** property rights are assigned to some authority in the public sector. For example, in some countries, forest lands may fall under the mandate of the state, whether at a central or decentralized level of government. Most forms may be found within a given society, for example, common grazing rights, private residential and agricultural holdings, and state ownership of forests (FAO 2005).

### 2.2.7 Customary Land Tenure:

This tenure system refers to land ownership practices by ethnic communities under unwritten customary law. The traditional rules under such tenure systems are recognized by the legal system and are upheld to the extent that they are consistent with written land law. The system is mainly practiced by communities in rural areas. (Theodora 2006) mentioned some of the characteristics of customary land tenure systems that are common in most of the communities are:

1. Individuals or groups acquire guaranteed communal rights of access and use of community land by virtue of their kinship relations.
2. Rights of control (allocation, use, etc) including access to common areas (e.g. pasture) are vested in the traditional authority of the community.
3. Proprietary rights are restricted to the benefits and profits resulting from investment of capital and/or labour, and transmission rights (through inheritance).

2.2.8 Statutory Land Tenure:

Interests in land held under statutory tenure are administered and protected by statutory law. (Theodora 2006) mentioned some examples of statutory land tenure forms are:

1. Freehold tenure: This tenure confers the greatest interest in land. Ownership rights under this tenure are held in perpetuity. Freehold tenure can result from alienation of public land under the Government Land Act.
2. Leasehold tenure: This is an interest in land for a definite period of time and subject to the continued fulfillment of specified conditions (e.g. payment of ground rent). Leases may be granted by holders of freehold titles on private land, by the government on government land or by local authorities on trust land. The maximum term of government leases granted varies from country to another. Local authorities typically grant leases for shorter periods. Also it called Usufruct and can be defined as the right of using and enjoying benefits of land that the ownership of which belongs to another person. A person in use, possession or enjoyment of unregistered land with or without permission of the government is deemed to be a usufructuary.
3. Public tenure: This includes interest in land by the government for public purposes (e.g. roads, airports, etc), for the operation of government business (e.g. government offices) or land reserved for environmental conservation and related purposes (e.g. national parks, forests, lakes)

2.2.9 Security of Land Tenure:

Security of tenure is the certainty that a person’s rights to land will be recognized by others and protected in cases of specific challenges. People with insecure tenure face the risk that their rights to land will be threatened by competing claims, and even lost as a result of eviction (FAO 2005). Security of tenure cannot be measured directly and, to a large extent, it is what people perceive it to be. The attributes of security of tenure may change from one
context to another. For example, a person may have a right to use a parcel of land for a six month growing season, and if that person is safe from eviction during the season, the tenure is secure. However, a person with use rights for six months will not plant trees, invest in irrigation works or take measures to prevent soil erosion as the time is too short for that person to benefit from the investment. The tenure is insecure for long-term investments even if it is secure for short-term ones.

2.2.10 Resource and Natural Resource:

Resource is defined as means for attaining a given end. Therefore, man plays a vital role in changing every aspect of the environment into a resource. Features of the environment become resource only when man is in a position to use it to his benefit, or in other words, when man uses his abilities and technology to convert these elements from a form of which they are no use to him into one which adds the total of his support (Zimmermann 1951). Based on the above definition resources are not static, they are rather dynamic and can expand and control in response to human activities. So what is considered as non-resource sometimes may become a major one through increase knowledge, expanding technology as well as changing wants (oil discovery in Sudan). Resources are subjective, cultural, relative, operational and functional. They are defined by man’s perception and attitudes, technologies skill, legal and institutional arrangements. (Zimmermann 1951) mentions that resource is a cultural and relative concept. This is because what is to be considered as a resource in one culture may be not in other culture. Water and pasture are considered as renewable resources as they have capacity for reproduction and growth. The degree of growth and reproduction depend on the way of exploiting these resources. It cannot survive if the exploitation rate is more than that produced.

2.2.11 Resource Degradation:

The dictionary meaning of degradation is “reduction of lower rank”. Simply, degradation refers to the reduction of biological productivity in a particular area due to natural or human factors or both. (United Nation 1992) defines land degradation as the reduction or loss in lands of the biological and economic productivity resulting from land uses or from a process, or combination of processes including process a rising from human activities and habitation pattern.
(Blakie and Brookfield 1987) mention that any conflict over the use of land is degradation. It could be viewed not as one way street, but as the result of forces, or the product of an equation, in which both human and natural forces find place. So for them Net degradation = (natural degradation + human interference) – (natural reproduction + restorative management).

Due to the current environmental crises, the definition of degradation extended to include desertification. The term ‘desertification’ was first coined by (André Aubréville1949), who stated that deserts are being born today, in front of our eyes, in areas where the annual rainfall is between 700 and 1,500 mm. This means that desertification has no specific place it can occur in more humid regions.

Contrast this definition with that adopted by the (United Nation 1992) at the recently signed Convention on Desertification: ‘desertification is land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors including climatic variations and human activities’. According to this definition degradation is the decline or reduction of biological productivity of land while desertification is the total loss, where it is impossible to reproduce land again contrary to the case of degradation. Degradation has negative impacts on both humans and lands.

Conflict and dispute is the negative impact of scarcity of resources and degradation. Scarce resources frequently considered important enough to fight for include land, freshwater, and food resources which are thought to become even scarcer due to population growth. It seems that after the end of the Cold War, conflicts along ideological dividing-lines declined and many saw the war of resources as filling the gap.

2.2.12 Resource Management:

(O’Riodan 1981) defines resource management as a process of decision making whereby resource are allocated over space and time. Resource management is based on the needs and desires of man within the framework of his technological inventiveness, his political and social institutions and his legal and administrative arrangement.

The general theme of resource management is the use and extending life of resources for present and future time. The (United Nation 1992) states that land management consists of applying known or discovered skills to land use in such away as minimize or repair degradation, and ensures that the capability of the land is continued beyond the present crop or other activities, so as to be
available to the next generation. Resource management is quite different from community and other depending on the public aim behind resources. According to (Egemi 1994) the overall aim of resource management in the capitalists' countries is economic growth. This is attained by encouraging individual to invest money and hence to realize personal profits. While in socialists’ countries the government acts as sole entrepreneur and profits are to be distributed over the entire population.

Sound water management is needed especially for dry lands as water is most scarce commodity. (Grigg 1974) mentioned that water management means people’s control over water as it passes through the natural cycle with balanced attention to maximize economic, social and environment benefits. Water management is very political aspect especially in the third world. It follows that some understanding of politics is necessary for success. This doesn’t mean that successful water managers must be politicians. It means that they must be able to work in political environment.

2.2.13 Sustainable Development:

The World Commission on Environment and Development (WCED1987) defined sustainable development as a cater for the attainment of the basic needs for all people and to improve their opportunity to fulfill their objectives for a better life and to maximum their interests without depriving the future generation of their rights to meet their aspirations. The concept of sustainable development focuses attention on the urgency of managing natural resources. Sustainable development attempts to maximize benefits from using resources without endangering their existence, reproduction and use by all people presently and in the future (Pearce 1990).

The term sustainable development appeared as the result of environmental stresses and damage which resulted from the economic development and planning policies practiced by various countries. Sustainable development is a very complicated term, as it focuses on maximizing the benefit from resources with low cost and the same time extending the life of resources for unborn generation. Moreover, it aims at optimization of the use of the locally available resources in an integrative and complementary way to maximize benefits, minimize cost of production and enhance suitability and regeneration of resources (Bayer 1992 in Ahmed 1994). This concept is very difficult to define as it need deep understanding of different themes such as environment, cultural, socio-economic, technology used and political aspect.
2.2.14 Concept of Drought:

Drought is defined as a significant decline below the long term or expected a mount of rainfall and it is considered as the normal feature of the climate of the Sahel (Egemi, 1994). Fluctuating rainfall and the occurrence of drought are accepted features of arid and semi-arid areas. According to the (United Nation report of 1992) drought means the natural occurring phenomenon below normal recorded level, causing serious hydrological imbalances that adversely affect resource production. Furthermore, the United Nations Convention to Combat Desertification (UNCCD), Article 1, gave the following definition: “Drought” means the naturally-occurring phenomenon that exists when precipitation has been significantly below normal recorded levels, causing serious hydrological imbalances that adversely affect land resource production systems. ” It further gave the following definition for a measure relating to drought: “Mitigating the effects of drought means activities related to the prediction of drought and intended to reduce the vulnerability of society and natural systems to drought as it relates to combating desertification.”

(Lofchie 1975) defines drought as a natural climatic phenomenon, which involves absence of rainfall over an extended period arguing that drought in the arid and semi arid zones is a normal feature of the climate. The misleading idea among decision making is that drought is the major factor behind the recent resource problems in most of the dry lands. (Timbelake 1986) states that drought never resulted in famine in all situations. For example, the drought of the early 1980s that hit both Australia and United States causing severe losses in production, yet no one died of starvation. The message that saying famine is caused by drought needs revision. (Galantz 1987 and Mortimore 1989) mentioned four types of drought these organize as follows:-

1. Metrological drought which means a significant reduction in precipitation over a given time.
2. Agricultural drought which means a lack of adequate soil moisture to sustain crop growth production.
3. Hydrological drought that means a reduction in stream flow.
4. Ecological drought meaning decline in the productivity of the natural ecosystem due to the reduction of precipitation.

Different pastoral groups have their own description of drought based on its severity. For example in Ethiopia, the Afar pastoral groups describe drought in three main stages as mild, average and acute see table 2.1.
Table 2.1: Stages of Drought as Described by Afar Pastoralists

<table>
<thead>
<tr>
<th>Stages</th>
<th>Features</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>Occurs when the short series of showers fail to come after (main rainy months July to September) even if the pervious rains well.</td>
<td>Occurred from 1994 onwards (drought occurred not in all years but in few).</td>
</tr>
<tr>
<td>Average</td>
<td>Occurs if there is only partial rain in the Preceding rainy season (July to September) following the situation Explained above under mild.</td>
<td>Occurred from 1993 to 1994 (in this period people did not move out of their territory).</td>
</tr>
<tr>
<td>Acute</td>
<td>In addition to the mild condition, if there is total absence of the preceding rains during (July to September) this situation is expressed as acute drought.</td>
<td>Occurred from 1982 to 1985 (people died migrated and huge number of animals died).</td>
</tr>
</tbody>
</table>

Source: Fasil 2001

The study accepts that drought is the reduction of rainfall over specific time which is a normal situation on arid and semi arid lands.

2.2.15 Indigenous Knowledge:

The term (indigenous knowledge) appeared early in 1987 when the World Commission on Environment and Development (WCED) pointed to the urgent need to consider and value the indigenous knowledge of the traditional people as a significant variable and critical factor in achieving sustainable development. This concept is defined, as a local knowledge and experiences in a given community. This knowledge is understood, dynamic, flexible and adaptable. Moreover, it is understood to mean the sum of experiences and knowledge for a given group that form their basis for decision making, so it must be accepted as a source of knowledge (Ahmed 1994). According to (Warren 1992) local knowledge defines as “knowledge that is unique to a given culture or society”. (Tick 1993), on the other hand, stated that indigenous knowledge is used synonymously with ‘traditional’ and ‘local’ knowledge to differentiate the knowledge developed by a given community from the international knowledge systems or ‘Western’ knowledge systems generated through universities, government research centers and private industry.

Traditional cultivators and pastoralists were seen by some policy makers and development planners as primitive and lack of knowledge which led them to employ unsound natural resource management techniques. These ideas are rejected by many scholars. (Sandford 1982) states that there are numerous example in the literature showing that knowledge is not being the scarce
commodity among local producers, many of so called traditional farming and herding practices which were once regarded as primitive and misguided one now recognized as sophisticate and appropriate. Adaptation strategies adopted by local producer in the study area demonstrate how traditional producers possess systematic and sophisticated technical knowledge in such harsh environment. (Chamber 1983) states on that what we want to stress is that though indigenous knowledge has limitations, they are not archaic practices to swept a side. Traditional farming constitutes a foundation on which scientific improvement in agriculture can be built. Some characteristics and limitations of indigenous knowledge organize as follows:-

1. Indigenous knowledge will not able rapid population growth to meet their future needs.
2. It is not all documented like the modern sciences.
3. It passes to the coming generation orally.
4. It is not evenly or uniformly distributed in the society (some have access more and vise versa).
5. It is aiming to increase family security rather than maximizing outputs.

2.2.16 The Sahel Zone:

The name Sahel is Arabic word for (plain) and usually used to refer to the region along the southern margins of the Sahara. The Sahel zone refers to the dry lands where annual rainfall varies from 100 mm to 600 mm (Egemi 1994). The real Sahel zone is the northern fringe where the annual rainfall varies from 100mm to 300mm and where the ecological potentialities allow only pastoral economy. The southern region is dominated by agriculture (Millet, sorghum and ground-nuts) the annual rainfall varies from 300mm to 600mm (FAO). (LeHouerou 1989) divides Sudan into six ecological zones; he locates sahel between 100mm to 600mm of rainfall comprising three sub-ecological zones:

1. Saharo-sahelian with annual rainfall between 100mm to 200mm.
2. Sahelian with annual rainfall between 200 to 400mm.
3. Sudano-sahelain with annual rainfall between 400mm to 600mm.

The term Sahel lies in arid and semi arid lands. One crude definition is that areas with an annual rainfall of less than 200 mm are arid and with a rain fall of 200-600 mm are semi arid (UNCOD, 1977). Hassan 2001 divides Sudan into four ecological zones; he locates Sahel between 100mm to 500mm of rainfall. Instead of naming sahel or arid and semi arid lands Hassan mentioned desert, semi desert and low savannah (see table 1.4) in chapter one.
From the above discussion the study concentrates on that the study area lies in arid and semi arid lands where rainfall ranges between (less than 100mm- to less than 600mm).

2.2.17 Vulnerability and Resilience:

The dictionary meaning of vulnerability is “ability to be hurt or exposed to danger” in the study area this concept is associated with natural disasters and how different classes are exposed to it. (Susman 1983) defines vulnerability as a degree to which different classes at risk, both in term of the probability of occurrence and extreme physical event and the degree to which the community absorbs the effect of extreme physical events and help different classes to recover. This means vulnerability is a matter of degree i.e.; rural people are more vulnerable to disaster than urban people.

(Chamber 1989) defines vulnerability as the exposure to contingencies and stress, and difficulty coping with them. Vulnerability has thus two sides: an external side of risks, shocks and stress to which an individual or household is subject; and internal side which is defenselessness, meaning lack of means to cope without damaging loss. From the above definition, it means that having different assets is very important to recover after shocks and stress. There is different type of vulnerability depending on causes that led people to be vulnerable such as climatic changes. Thus, vulnerability can be defined as the degree to which a community and ecosystem loosing ability to cope and recover after climatic shocks.

The term ‘vulnerability’ is one of the key concepts in different term such as adaptation, resilience and livelihoods research. A livelihood can be defined as comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks maintain or enhance its capabilities or assets while not undermining the natural resource base (DFID, 1999).

By 'resilience' the study means the ability of a system to recover from the effect of an extreme load that may have caused harm (UK CIP, 2003). Other definition is the capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure. This is determined by the degree to which the social system is capable of organizing itself to increase its capacity for learning from past disasters for better future protection and to improve risk
reduction measures (UN/ISDR, 2004). Resilience refers to three conditions that enable social or ecological system to bounce back after a shock. The conditions are: ability to self-organize, ability to buffer disturbance and capacity for learning and adapting (Tompkins et al. 2005). For Tompkins vulnerability comes from a loss of resilience. Resilience is often weakened by external or non-place-based forces acting on the capacity of local communities to cope with the prospect or actuality of problems such as drought, crop failure or cash shortages. Such external forces might include the impact of structural adjustment policies, the impact of conflict, the impact of commodity price fluctuations, the impact of tariff or trade policies, or the impact of global environmental change.

2.2.18 Concept of Marginalization:

The beginning of this concept was found in the Latin America describing the squatter settlement in relation to the central city as well as lack of infrastructure, unsound construction, lack of services and overcrowding (O’sullivan 1980 in Tohami 2000). This definition covers the space marginalization but the concept cover the inhabitant of such area and named them marginal people. In the study, the concept encompasses all local producers that have no or less access to the main assets for suitable livelihoods. There are several types of marginalization in this study such as ecological, economic and political marginalization. In this research marginal land it means arid and semi arid land that have some physical limitation such as shortage of rainfall and repeated drought. Therefore, (Blaikie and Brookfielf 1987) describe the whole Sahel as an ecologically marginal region within which drought of great severity and lengths are expected.

Political marginalization is defined here as lack of right and neglect in planning and development besides lack of support especially during the crises. Also it may include the insecurity for the historical rights of pastoral lands (customary land tenure). Ecological marginalization in the this study refers to the displacement of pastoralist to a more fragile area with low productivity and this due to the rapid expansion of unorganized and organized expansion of mechanized agriculture. Economic marginalization means the unfair processes of the market on the side of pastoralists especially during crisis.

2.2.19 Concept of Poverty:

Poverty has recently become an area of debate for both laymen and policy makers. "Poverty: a human condition characterized by the sustained or
chronic deprivation of the resources, capabilities, choices, security and power necessary for the enjoyment of an adequate standard of living and other civil, cultural, economic, political and social rights" (United Nations Committee on Social, Economic, and Cultural Rights 2001). (World Bank 1980 in Tohami 2000) defined poverty as the status of not having sufficient material resources or wealth to enable a person a socially acceptable standard of living.

Poverty has been defined in both relative and absolute terms. The absolute term refers to the “inability to attain a minimal standard of living” while relative poverty, applies when satisfaction of the basic needs is less than adequate compare to that of the other therefore some people are poorer than other (A/Atti 1993). The relative poverty is said to exist if the satisfaction of the basic needs is insufficient or inadequate level than of other. While absolute poverty is the state of existence in which the overall needs of the individual are not satisfied due to the lack of enough purchasing power or means of self provisioning (Chamber 1981). The concept of poverty line permits quantitative measurement of poverty in that such things or indictor of poverty such as income can be determined in figure. It means the minimal amount of money that allow a person to get their basic needs and a person will caught by poverty if he /she below this poverty line. (World Bank 1980 in Tohami 2000) determines 370 dollar per year as the standard of poverty line if she /he get less it means that he/she is poor.

There is a hot debate about the main causes of poverty. (Timberlake 1986) states that poverty is major cause and effect of global environmental problem, since the poor occupy ecological marginal areas. They have little flexibility, and are often obliged to over exploit their resource base in order to survive against economic and political policies that make them poor.

Some writers especially Muslims think that poverty is an act of god as the matter of test, but others think is a man-made phenomenon. Ongoing underdevelopment is placing marginal people in marginal lands. The disasters resultant from such a process is not (Act of God). It is quite the reverse; the poor, instead of inheriting the earth, are being eaten by it (Cannon 1977).

2.2.20 The Concept of Adaptation:

In encyclopedia adaptation is defined as a long-term cultural process of maintaining a balance between population and natural resources within a given environment (www.wikipida.com).
Historically, the term adaptation has appeared in the science of Botany focusing on how species and organism maintain homeostasis in the face of short term environmental fluctuation and long term permanent changes. In biology, where the concept originated, it denotes processes by which an animal and plant becomes fitted to its environment. The concept of adaptation signifies a relationship between a given population and its environment. (Manger 1995) states that in dictionary adaptation means even simpler organism must be adapted in a great variety of ways; in their structure, physiology, and genetics; in their locomotion or dispersal; in their means of defence and attack; in their reproduction and development; and in other respects. A similar perspective is also found in the use of the concept for human society. They all see the social organization and culture of specific populations as functional adaptive mechanisms which permit the population to exploit their environments without exceeding their carrying capacity. If carrying capacity is exceeded the response will be mal-adaptation. Adaptation mechanism depends on the interest of people, information and resources available so it is differ from one person to another. Adaptation may often be seen as a means of maintaining conditions of existence in the act of change it is also possible for individual or group to modify and adjust to new conditions or improve the existing one (Ellis 1980 in Tohami 2000).

(Manger 2000) illustrates adaptation by East African Pastoralists and indicates that: The natural Environment in East Africa is a varied one, with variation in altitude, rainfall patterns in dry and wet seasons, river systems, soil types and vegetation cover. This varied pattern has in basic ways affected the distribution of settlements and population movements, and the distribution of productive activities such as cultivation and grazing. The human responses to this variation have been to develop adaptive patterns that have been flexible enough to cope with the variation and to minimize risk. This coping has been characterized by movements across zones in different seasons and by combination of many activities- cultivation and animal herding; hunting and gathering; wage labor etc. Such a mixed economy puts demands on the labor power of economic units, their patterns of development, and knowledge and organizational capacity. Mobility as away of adaptation in the African sahel is not just changing place to cope with vulnerable environment but it has also affected cultural and political boundaries.

There is a little different between two terms; these are adaptation and coping mechanism. By coping we mean the permanent change in the ways in
which food is required. Adaptation may take place after each period of severe drought as an attempt to recover after the crisis. When food insecurity has become chronic people might not be able to cope with the situation anymore. This might be the situation when pastoralists have lost their animals and hence their means of primary production. At this extreme, all behavior becomes coping. It is argued that this is the case in Borena where a combination of climatic conditions, civil war and impoverishment from repeated famines has rendered some groups incapable of surviving and dependent on relief aid (Fasil et al. 2001). The ability of recover after drought or any other natural or human disaster depends on the coping capacity. Coping Capacity means by which people or organizations use available resources and abilities to face adverse consequences that could lead to a disaster. In general, this involves managing resources, both in normal times as well as during crises or adverse conditions. The strengthening of coping capacities usually builds resilience to The study accepts that adaptation as all the processes and actions taken by rural community to access and secure their livelihood in marginal areas without harming the physical characteristics of such environment. These actions depend on their deep knowledge about surrounding environment. Their adaptation mechanisms increase their ability to recover after shocks.

2.2.21 The Sustainable Livelihoods:

The terms livelihood and sustainable livelihood are most essential for rural communities and it can be used in many different ways. The following definition captures the broad notion of livelihoods understood here: ‘A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base (Champers 1992).

There is a lack of applying holistic approach to study livelihood in rural communities, therefore DFID create diagram named it sustainable livelihood framework see figure 2.1. This framework includes different aspects concerning rural development (physical, social, economical and political). This framework is very useful in studying changes among rural communities. The sustainable livelihoods approach is broad and encompassing. It can, however, be distilled to six core objectives. DFID aims to increase the sustainability of poor people’s livelihoods through promoting:
1. Improved access to high-quality education, information, technologies and training and better nutrition and health;
2. A more supportive and cohesive social environment;
3. More secure access to, and better management of, natural resources;
4. Better access to basic and facilitating infrastructure;
5. More secure access to financial resources; and
6. A policy and institutional environment that supports multiple livelihood strategies and promotes equitable access to competitive markets for all.

The livelihoods approach puts people at the centre of development. The final message of this approach is that instead of applying top-down approach lets local people plan for themselves. Thus, for this approach people are equally important at higher levels when thinking about the achievement of objectives such as poverty reduction, economic reform or sustainable development. This view can be managed through:

1. Starts with an analysis of people’s livelihoods and how these have been changing over time;
2. Fully involves people and respects their views;
3. Focuses on the impact of different policy and institutional arrangements upon people/households and upon the dimensions of poverty they define (rather than on resources or overall output per se);
4. Stresses the importance of influencing these policies and institutional arrangements so they promote the agenda of the poor (a key step is political participation by poor people themselves);
5. Works to support people to achieve their own livelihood goals (though taking into account considerations regarding sustainability).

The livelihoods approach is concerned first and foremost with people. It seeks to gain an accurate and realistic understanding of people’s strengths (assets or capital endowments) and how they endeavour to convert these into positive livelihood outcomes. The approach is founded on a belief that people require a range of assets to achieve positive livelihood outcomes; no single category of assets on its own is sufficient to yield all the many and varied livelihood outcomes that people seek. This is particularly true for poor people whose access to any given category of assets tends to be very limited. As a result they have to seek ways of nurturing and combining what assets they do have in innovative ways to ensure survival.
2.2.22 the Concept of Social Change:

Change or transformation in general means things is getting different from the previous situation in specific period of time. Changes here it is a neutral term as it may be positive or negative or it leads to development or deterioration. It seems that the concept of transformation is more comprehensive than the concept of change. Changes may be partial covering some parts of the system while transformation is covering and change the whole system. Both terms are accepted in this research as distinguish between them is too difficult. In this study the overall objective is to trace the changes and transformations of pastoral economy thus, both terms are accepted in this research.

Social change describes the changes within society, or transformation aspect of society and social structure within time (Dgass 1987). (Guy Rocher in Dgass 1987) determines four characteristics to distinguish social changes from other changes these are:

1. Social change is a general phenomenon found among number of individual and has effect on their life style and ideas.
2. It has effect on the social structure as a whole or part of it and left remarkable changes in the society (family, economy).
3. Started and ended time is also important in order to trace the history of changes.
4. Social changes are a continuous and permanence phenomena thus it is clear among the society. Over night changes is not social change.
All transformation that affect the social structure in functions, values and social role within a period of time it may be positive or negative due to internal or external factors. There are some concept related to social change such as social progress, social evolution and social development. According to (Dgass 1987) by social progress we mean the processes that lead to positive change and always planned. While low step progress which lead to organize and successive transformation passes thought different levels each has the relation with the pervious one indicates social evolution. Social development means all effort for making a series of changes (function) for social growth thought increase the ability of man to exploit all the available energy to maximum limit in order to increase the standard of living in a way that is faster than natural growth. Social changes as mentioned above are caused by different factors include economic, demographic, ecological, technological and cultural factor. The details of these factors are organized as follows:

1. Technology: here technology play vital role in social changes. Introduces of technology lead to change time, social values, and division of labour. In the study introduce of tractor in Butana area have led to change traditional rainfed to mechanize thus, the whole social system transformed. In technology materialistic things change faster than non-materialistic thus create cultural gaps. The limitation is that always people are conservative and prefer customs in addition some new technology is difficult to use.

2. Demographic: there is close relation between increase and decrease of population and social changes. Dorkiem states that increase in population lead to the division of labour thus lead to radical change and transformation from mechanical solidarity to organic solidarity. Increase in population will lead to vertical and lateral mobility. Vertical mobility mean movement of individual or group between different socio-economic scale it called upwardly when move to the upper classes and downwardly when moves to lower classes. In the study area securing of livelihood depends mainly on the number of household. In Butana the number of animals that household can have depend on the number of the extended family.

3. Ecology: there is relation between human activities and the characteristics of the surrounding environment. No body will deny the role of natural factor in social change for example that drought that hit African Sahel has led to severe social changes among the inhabitant of
such regions Butana area has no excuse. Drought became severe when community is week depending mainly on environment but it is effect will be rare if the community use technology (drought of Australia see chapter one).

4. Economic: the role of economic factor is very essential in social changes for both when it is good or bad. When economic situation is getting better this will lead to increase the standard of livings and help in exploiting resources which is difficult to use before. On the other hand if the there is deterioration in economic situation this will lead to social change for example rural people migrate to work in urban centre thus the whole social system will change.

5. Cultural: cultural factor has it role in social changes and this happen through cultural diffusion or transformation. In diffusion means culture (not people) spread spatially while transformation reflects that culture passes through generation. This view sees social change as result of effect of other culture. As example the migration of rural people to cities has led to find both cultures in urban areas (ruralization).

2.3 Theoretical Approaches:

This section deals with some perspectives and approaches of man- nature relationships. Although there is a growing recognition and awareness of the important interaction between population and the environment, our understanding of exactly how these relations operate is still rather limited. Therefore, one of the objectives of this section is to discuss some of the current theoretical frameworks (perspectives) of Man–Nature relationships that are being used to understand this complex linkage. The main objective is to investigate the different views about the collapse of pastoral economy and again select the theoretical approach of the study. These perspectives include ecological, cultural, economical, political and social approach etc.

2.3.1 The Ecological Approach:

Ecology is defined as the scientific study of living organisms and their relationship to each other and their surrounding (Benton 1989). Thus ecology is a multi-disciplinary science as its focus on the higher levels of the organization of life on earth and on the interrelations between organisms and their environment, ecology draws heavily on many other branches of science, especially geology and geography, meteorology, pedology, chemistry, and physics (www.wikipedia.org).
The debate concerning this relationship between man and his surrounding has a long tradition in geography. According to (Glacken 1967) this relation maintained that human behavior and the ability of man to act are controlled by the natural environment in which he/she lives and he/she is subject to the limitation of that environment. This is the final message of Malthus (1798) an essay on population in which he stressed the limitation of nature of human life and cultural development. According to Malthus population growth is the major causal factor of poverty and those diseases, famine and wars are essential elements to reduce population to the carrying capacity of natural environment. The Malthusian message has been widely held in recent times and has been advocated by a large group of the Neo-Malthusians especially (Hardin 1968) for more details see chapter one.

The general message of this perspective is that the nature has a limited ability to meet human needs, and that population increase will at some point reach those environmental limits. This means that each region or location has a natural carrying capacity for sustaining human populations, which cannot be exceeded in the long-term without negative consequences. Population growth of limited resources is seen as a main source of environmental degradation and collapse of pastoral economy. As a result, population control is an essential element of efforts to protect the environment.

Although the study will not reject the role of population growth in declining the pastoral economy but it concentrates on that other factor related to population should be considered. These include social system, equal access to natural resources, access to credit and technology and explaining how these factors interact to determine the population-environment relationship. Population growth should not be considered as responsible factor behind the collapse of rural economy on reverse; it could be seen as essential factor for motivation. However, the study shows that there are signs that the Neo-Malthusian perspective is being questioned.

For example, the Rome Declaration on World Food Security (1996) signed at the World Food Summit in 1996 does not mention in any of its eleven items that population growth is a barrier to the goal of increasing food security worldwide, despite the present severity of the malnutrition, hunger and food distribution problems. Furthermore, the subsequent plan of action stated in its fifth item that “the 5.8 billion people in the world today have, on average, 15 per cent more food per person than the global population of 4 billion people had 20 years ago” (FAO, 1996).
This approach of the population and the limits of resources also have been criticized by the economist and modernization theories such as the cornucopian. The core of the cornucopian concern is to question the limits to the availability of natural resources. While recognizing that natural resources are theoretically limited, cornucopian stress that they are more abundant than realized by the Neo-Malthusianism, as evidenced by the phenomenon that the known resources of oil have tended to grow with consumption (Lomborg, 2001). Further, resources can be substituted and recycled if and when they become scarce, or simply as a consequence of technological development. Human ingenuity and the market economy are essential mechanisms in the cornucopian model. According to the (Homer-Dixon, 1999; Kahl, 2006) Neo-Malthusianism response to these points are that:

(i) Markets and institutions are frequently less functional in Third World states and thus fail to alleviate scarcities;

(ii) The techniques invented in the Green Revolution are too expensive for poor farmers and lead to further degradation;

(iii) Some resources, such as water, are non-substitutable; and environmental degradation often follows a non-linear pattern, making preventive measures hard to apply.

The development in the nature of the ecological theory extends to include analysis of man’s socio-economic aspects including his experience, perception, attitudes and adaptation. The ecological model offers an important step towards understanding the relationship between man and his environment. However, it suffers certain weaknesses that make it insufficient for tackling the problem of the collapse of pastoral economy in the study area.

The major weaknesses include the following:

1. It manifests man as a passive agent caught and controlled totally by the condition of the environment.
2. It neglects the role of man and his abilities through his culture and technology to adapt himself to the limitations of the natural condition.
3. It completely neglects the role of the political and economic factor in the creation of human poverty and the destruction of the habitat on which man lives.
2.3.2 The Cultural Approach:

The roots of cultural approach were traced back to the French school of human geography founded by the works of Paul Vidal de la Blache (1845-1918) "possibilism" and the Berkely School of cultural geography in the United States inspired by Carl sauer 1925. Cultural approach is reacting explicitly against the approach of Friedrich Ratzel (1844-1904) environmental determinism. Both school stressed the role of man in shaping the landscape through the agent of his culture. In general these two approaches shared the same common vision of the Man-Nature relationship and that, all things considered, they end up with very similar theoretical concepts of region and state. Vidal's theory showing how and to what extent man is a geographical agent who works and changes the face of the Earth. This theory considered man as mechanical action of natural factors on a purely receptive humanity (Febvre 1922). Ratzel's theory is based on the principle that man does not break free from his "profound dependence on nature" since human beings must take from nature what is necessary for their survival and development. Indeed, nature does not provide shelter, food and other goods or facilities without man's efforts. Thus, says Ratzel, the form of his action, as well as its effectiveness, depend mainly on man himself, on his will and on the stage of development of his ability to take advantage of the elements (Hunter 1983). This is why, according to Ratzel, the man-nature relationship depends on the type and on the level of development of the various groups living on Earth.

The main argument of this approach is that human culture is the major element for the explanation of human behavior (Ley 1979) and is the principle force for explaining any particular event. Following the above, environmental change and socio-economic transformation can only be initiated by the will power of man who is completely free in his actions (Cloke et al 1990).

In spite of the contribution of this approach to our understanding of man-nature relationship, this approach is suffers majors weaknesses, as far as this study concerned. These weaknesses are specifically related to the concept of man as a free agent while ignoring the environmental and political factors that greatly influenced the behavior of man and direct the relationship between him and surrounding environment. All this renders the cultural approach alone ineffective for dealing with research problem of this study and its explanation.
2.3.3 The Cultural Ecology Approach:

This approach by definition covers two type that are the cultural approach and cultural ecology approach. In geography, cultural ecology developed in response to the "landscape morphology" approach of Carl O. Sauer. Sauer's school was criticized for being unscientific and holding an inaccurate "superorganic" theory of culture. We are not concerned with energy, customs or believe of man but with man's records upon the landscape (Sauer 1925). Recently, this theory is associated with Anthropologist (Julian Steward 1955). Steward defines cultural ecology as the study of adaptive processes by which the nature of society, and unpredictable number of features of culture, are affected by the basic adjustment through which man utilizes a given environment. This approach focuses on how (ways) different social group cope with their natural environment in order to survive and change.

Cultural ecology began approximately in 1960s gave rise to Environmentalism (Moran 1982). (Hardesty 1977) mentioned that the natural environment sets certain possibilities or options from which cultures, conditioned by their history and particular customs, may choose. This 'possibilistic' view of culture-environment relationships has on occasion been categorized as a compromise between cultural (only culture determines culture), and environmental, determinism (environment determines culture) (Bennett 1976). Steward's overriding interest was not to define cultural ecology but rather to understand the processes or causes of the 'evolution' of culture. From a possibility perspective he sought to explain the choices made by cultures in the face of the options presented to them by their history as well as by their environment. He emphasized ecological factors as an important but not exclusive factor in determining culture change. Part of Steward’s legacy, is the emphasis in cultural ecology on processes. In this context, metaphors from evolutionary biology, such as 'adaptation,' have frequently been drawn on by cultural ecologists to describe the processes linking cultures and their environments. Generally, an ecological crisis occurs with the loss of adaptive capacity when the resilience of an environment or of a species or a population evolves in a way unfavorable to coping with perturbations that interfere with that ecosystem, landscape or species survival. Steward's method was to:

- Document the technologies and methods used to exploit the environment - to get a living from it.
• Look at patterns of human behavior/culture associated with using the environment.
• assess how much these patterns of behavior influenced other aspects of culture (e.g., how, in a drought-prone region, great concern over rainfall patterns meant this became central to everyday life, and led to the development of a religious belief system in which rainfall and water figured very strongly. This belief system may not appear in a society where good rainfall for crops can be taken for granted, or where irrigation was practiced).

Cultural ecology is the study of the adaptation of human societies or populations to their environments, emphasizing the arrangements of technique, economy, and social organization through which culture mediates the experience of the natural world to understand the adaptation of humans to their environment (Winthrop 1991).

The cultural ecology approach is very useful to this study as it shows how local communities cope with the limitation of nature which is the one of the main objectives of this study. Again it tells us that the top down policy is not useful for resource management especially in the rural areas. The important point is that in natural resource management local needs are addressed and that relevant local knowledge, practice, and values are part of management decision making. This approach also lack important point which is the neglect of the influence of the state interventions in the rural economy and land use system.

Therefore, cultural ecology have been adopted and built on by political ecology to address the problem of this research.

2.3.4 The Political Economy Approach:

According to Todaro (1989) political economy concerns itself with the relationship between politics and economics with particular emphasis on the role of power in economic decision-making, especially the role of the state. According to this perspective, man aided by science and technology, has ability to overcome all the limitations imposed by natural system (O’Riordan 1981). From this perspective, state’s development policies and its increase interference in land use planning and resource tenure are considered as the basic element that put environmental degradation in motion, and by extension the creation of the social problem related to land degradation. In direct constant to environmental determinism this approach believes strongly in the ability of
man to control natural environment for his benefits and that of the coming
generations (Todaro ibid).
According to this approach the unequal distribution of power within society
and related inequalities and disparities are function of the state policies, which
are usually seen as serving the interests of the more powerful groups (Egemi
1994). Following this approach, environmental degradation and socio-
economic transformation of the study area are not the result of man –
environment interaction, high population growth or bad climate but the result
of structural processes related to economic politics.
This approach criticizes the ecological approach as the supporters argued that
population growth has positive impact to the economy. For them population
growth is seen as a neutral factor in the cause of environmental degradation,
and indeed increased population may lead to increased innovation, which in
turn can act to minimize environmental impacts of humans. Allowing markets
to function properly is the most important means to ensuring environmental
protection see figure 2.2.
The general message of political economy perspective is that degradation of
pastoral economy and social change is a result of economic inefficiencies and
market economy rather than rapid growing population or natural factors. This
perspective holds that such things as common property arrangements or
agricultural pricing policies give the wrong signals to people, leading them to
misuse resources. It emphasize the institutional and structural forces through
which certain groups of economic and political elites influence the allocation of
resources for their benefit, but at the same time institutionalizing poverty,
leading to the marginalization of the excluded poor groups (Tohami 2000).
Political economy perspective is completely neglects the role of development
policies and the state interventions in land use. It also blames the victims for
being poor and irrational in divisions that concern their lives. The approach,
however, suffers major shortcoming, that makes it insufficient for explanation
of the research problem. These shortcomings are related principally to:
1. The neglect of environmental conditions in the analysis, the restriction of
   the focus on politics and economics.
2. Ignore completely the role of population growth.
3. Ignore the role of culture in adaptation with scarcity of resources.
4. neglect the external factor that lies outside the rural community
   (modernization policy)
2.3.5 The Modernization Approach:

Modernization, the process whereby a society moves from traditional, less developed modes of production to technological advanced industrial modes of productions. This approach suggests that the rise of capitalist institutions is the key in turning from traditional society into modern ones so the poor country of today are poor because they have not discarded their traditional way of organizing society as the result, modern capitalist institution cannot emerge. Modernization is concentrated much in two terms traditional and advanced society. This concept sees the development as transformation of traditional to advanced development. (Lairson and Skidmore 1993) suggest that before sustained and self-generating economic growth becomes possible in the South, Third World societies must undergo the same transition from traditionalism to modernity previously experienced by the North. The path to development thus lies through emulation of the North. The principle obstacle to modernization arises from the persistence of traditional cultural values and institutions in the South that are incompatible with economic growth and industrialization ((Michael 2000).

Modernization theorists see the obstacles to Third World development through the prism of the North's own development experience. Modern societies are creative and open to change. Also, one's place in a traditional society is determined by the status of one's parents. If one's parents are peasants, then
one becomes a peasant also. Status is inherited. Social mobility, however, distinguishes modern societies from traditional ones (Michael ibid). (Lewis 1954) defines modernization as growth of output per head of population and economic development takes place through:

1. Modernization of technology, leading to change from simple traditional techniques to advanced one.
2. Application of scientific knowledge
3. The commercialization of agriculture, which shift from subsistence to commercial farming (cash crops)
4. Industrialization process change from manual work into machine
5. Urbanization movement from villages to large urban centre.

(Tohami 2000) mentioned that the theory of modernization assumes that all resources users have a complete knowledge of the environment in which they are functioning, free to select among the opportunities open to them and aiming at maximization of their profits and utility over time.

The economies of traditional societies often rest upon either subsistence agriculture, where extended families produce only for their own needs. Modernization theory, therefore, suggests that the rise of capitalist institutions is the key in turning traditional societies into modern ones. The poor countries of today are poor because they have not discarded their traditional ways of organizing society. As a result, modern capitalist institutions cannot emerge. Modernization, in this context, referred to a profound transformation of traditional ways of life: namely, to the process “in which tradition-bound villages or tribal-based societies are compelled to react to the pressures and demands of the modern, industrialized and urban-centered world.” This process might also be called Westernization or Occidentalization.

(Thucydides 1996) stated that it is relevant to remember what the ancient Athenians said to persuade the Melians to join them in their war against Sparta: in the real world, you know as well as we do that... the standard of justice depends on the equality of power to compel and that in fact the strong do what they have the power to do, and the weak accept what they have to accept. This is my advice to poor countries: if you can't beat them, join them. And leave justice to God.

The modernization theory is useful in showing the external economic and political factors that have impacts on the rural economy. For example it reflects the role of World Bank in changing pastoral economy into more mechanized farming in Gedaref since 1940s. However, this theory lacks some weak points
and limitations. The main weakness of this approach related to the study is by assuming of economic and rational man who seeks for maximizing outputs profits. This assumption does not work among local communities where the prime social concern is survival based strategies that are geared principally towards minimization of risk rather than maximization of profit or the production of market (Egemi 1994). Modernization approach assumes that the inability of local producers to modernized their economic activities because of their religious and traditional values. This is not the case and it should be viewed as the gap between rich and poor countries or in the context of centre and margin. The center is composed of countries that have all elements of power while margin gets complete opposite.

2.3.6 Dependency Approach:

Dependency theory became popular in the 1960s and 1970s as a criticism of modernization theory. The dependency perspective shifts from a focus on economics or the environment, to a focus on political relations between people and nations, with an explicit emphasis on developing countries. The historically exploitative relationship between developed and developing countries has led to inequitable distributions of power and resources among the developing countries' populations

In (www.wikipedia.org), the free encyclopedia define dependency theory is the body of social science theories by various intellectuals, both from developed and developing nations that create a world view which suggests that poor underdeveloped states of the periphery are exploited by wealthy developed nations of the centre, in order to sustain economic growth and remain wealthy. The central argument of the dependency theory which was formulated as a critical response to the modernization theory, stressed on that economic disparities between the centre and periphery. According to (Mamdani 1996) the premises of dependency theory are:

- Poor nations provide natural resources, cheap labor, a destination for obsolete technology, and markets to the wealthy nations, without which the latter could not have the standard of living they enjoy.
- First World nations actively, but not necessarily consciously, perpetuate a state of dependency through various policies and initiatives. This state of dependency is multifaceted, involving economics, media control, politics, banking and finance, education, sport and all aspects of human resource development.
Attempts by the dependent nations to resist the influences of dependency often result in economic sanctions and/or military invasion and control. Many dependency theorists advocate social revolution to effect change in economic disparity. The positive side of this approach is that, “dependency theory was good at showing how Africans countries became victims of imperialism but gave useless advice on how they were to extricate themselves from such conditions.” (Apter and Rosberg 1994) mention that the shortcomings are that, the theory emphasized too much on economical realities, rather than interpreting African political fragmentation, and expand the notions of class and power within the African countries. This gap is now filled by the views of political ecology approach. The weakness of this theory is related to the lack of addressing the problem of state ownership control over resources. Also it neglects the internal factors of political elite (marginalization). In addition to that this approach ignores the role of environment and the scarcity of resources.

2.3.7 The Political Ecology Approach:

The research problem (as this study argues) is caused by the working of a multiplicity of factors, including environmental, demographic, economic and political, related to development and land use policies introduced by the state. It should also be stressed that these factors are closely interrelated each one accentuating the activity of the other factors. The above factors are collectively referred to by (Egemi 1994) as the political ecology approach which he traced back to (Blaikie 1985) work on the political economy of soil erosion in developing countries and (Blaikie and Brookfield 1987) work on “land degradation and Society”. Political ecology is defined as “combining the concerns of ecology and a broadly defined political economy (Egemi 1994). It is to identify the relationship between producers, land degradation and the political economy of development and underdevelopment. The increased integration of Third-World land users into global markets under unequal relations of power was viewed as undermining these land users’ keen localized environmental knowledge and long histories of successful adaptation to sometimes harsh and unpredictable environments (Watts, 1983).

The main views of this approach is that access to environmental resources is always socially mediated or constrained, usually involving multiple processes acting at different scales. A phenomenon like an environmental hazard,
therefore, needs to be analyzed both 'naturally' and socially. And what goes on in a farmer's field can be influenced by a flood or by pest infestation, but also by national policies on commercial agriculture, global commodity prices, and so on. (Blaikie and Brookfield 1987) mention that the phrase “political ecology” combines the concerns of ecology and a broadly defined political economy. Together these encompass the constantly shifting dialectic between society and land-based resources and also within classes and groups within society itself. They recognized that in many instances, arguments that blamed poor people for environmental degradation often did not reflect the full picture of the kinds of political and social inequalities that pushed people to manage natural resources in unsustainable ways (political marginalization).

With the reference to the study, the major argument of the approach is that traditional producers, cultivators and herders, in the third world are not in chronic state of crisis. It is the nature of the relationship between humans and the environment that has been changed as a result of modernization under condition of growing population numbers and a growing tendency towards aridity. These are to be blamed for the growing poverty of traditional producers their transformation as socio-economic system and their marginalization (Egemi 1994).

The main elements of the political ecology approach are

1. Contextual analysis of human-environment relationship at different levels of inquiry.
2. Historical stress emphasizing the transformation of indigenous resource management system in the process of modernization and market economy.
3. An emphasis on the influence of the state interventions in rural economies and land use system.
4. understand the decisions that communities make about the natural environment in the context of their political environment, economic pressure, and societal regulations
5. look at how unequal relations among societies affect the natural environment
6. look at how unequal relations (especially class) affect the environment

Some researchers blame political ecologists for their concentration in politics and completely ignore the role of ecology. (Vayda and Walters 1999) are correct that in some political ecology the social and discursive politics of access and control over resources take center stage while the biophysical
ecological implications of these struggles receive little explicit attention. Also the political ecology has been accused for the failure to address traditional adaptation and the way and mean by which traditional institutions regulate access to land, control over resources and securing livelihood in ecologically marginal area (Tohami 2000).

This approach although it helps much in understanding the causes and collapse of rural economy but it lacks some major things related to the study. It fails to address traditional adaptation and the role of local institution in regulating access and control over resources for securing livelihoods in rural area. Political ecology has also failed to recognize how cultural values and the moral economy that operate among rural communities to moderate the effect of drought hazard and to add to general resilience of the group (Egemi 1994). The study fills the gap by using both cultural ecology and political ecology as the approach of the study.

2.4 Conclusion

This chapter shows that man–nature theories are simplified explanations of how the interaction works in the reality and enhance understanding. However, the different types of theories explain the various interest and disciplines. For example, economic theories of human–environment interactions those draw from a neoclassical perspective focus on humans as economic actors, and tend to ignore other ways in which humans can act and interact, such as politics and culture.

These theoretical perspectives or frameworks are generally well developed in the literature; a significant problem is a lack of empirical evidence to test each of them. The lack of empirical evidence is due to the application of these theories in the fieldwork. Although these theories present very different broad views, they are not necessarily mutually exclusive. Each one presents a partial picture of why the collapse of pastoral economy occurs. Taken together, they suggest that attention to population growth (ecology) economic conditions (political economy), policies (political ecology), and cultural factors (cultural ecology).
Chapter Three: Geographical Environment of the Study Area

3.1 Introduction:
This chapter focuses predominantly on the physical and human environments in the Gedaref state as general with particular emphasis on Butana area that lies in the northern part of the state. This mainly to show how the study area is affected by physical aspects (Geology, climate, soil, and vegetation cover) and to what extent these factors determine the types of human activities (pastoral adaptation). The overall objective is to proof that the study area lies in the ecological marginal area thus, force people to develop their own adaptive mechanisms to cope with such marginal area.

3.2 Physical Environment:
3.2.1 Location:
Geographically, Gedaref state is located between longitudes 33° 34′ and 37°E, and between latitudes 12° 40′ and 15° 45′N. The state is bordered to the east by the Ethiopian and Eritrean frontiers, and it has borders with four of the other states of Sudan, namely Kassala state to the north, Khartoum state to the northwest, Gezira state to the west and Sennar state to the south. The total area of Gedaref state (about 72,000 km²) has been recently divided administratively into seven localities, namely Fashaga, Faw, Gallabat East, Gallabat West, Gedaref, Rahad, and Subaqh (El Butana) localities. Each of these localities is also geographically divided into smaller administrative units. Formerly and before the recent division, Gedaref state included only four localities (see Map 3.1). The north western part of the former Gedaref locality is now a new locality called Subagh, and the new Fau locality is part of the former Rahad locality. The area of the former Gallabat locality now accommodates two new localities, namely Gallabat East and Gallabat West. No official map showing the current administrative divisions of Gedaref state was available.

Butana of Gedaref is a part from the Greater Butana which roughly falls between latitudes 13° and 17° North and longitudes 33° and 36° East with a total area of about 80000 km² and Gedaref it self represent 30000 km². It is bound by the River Atbara from the North East and River Nile and River Blue Nile in the South and west. Thus it covers four states Namely River Nile, Khartoum, Kassala and Gedaref. The latter state is the area under study. This research focuses on the central Butana that lies in the northern part of Gedaref state and it was considered as administrated unit of El Gedaref Locality.
Recently in 2006 the government of Gedaref separated Butana from Gedaref locality, thus Butana becomes an independent locality with the capital of El Subagh.

**Map 3.1: The Location of Gedaref Area**

3.2.2 Climate:

Generally, Gedaref state lies within the semi-arid zone which is characterized by a wide variation in rainfall (Sulieman1968). The climate of the area is near tropical. (Pflaumboum and Krik1992) stated that the study area is located in the sahilian zone which is transitional zone from the semi-arid Sahara in the north to the humid savanna further south. Climatic factors such as rainfall and temperature have direct influence on the condition of water resources in the area through its impact on precipitation and evaporation.
Arid and semi-arid are the main characteristics of the climate in the Butana. It represents typical conditions of marginal lands where rainfall by definition is too low and varies over space and time. The general trend of rainfall is decreasing while we go north and vice versa. (A/Atti 1993) argues that rainfall represent the main source of surface water causing the flow of seasonal khors which in turn form the direct sources of recharge of sub-surface ground water sources and hand dug wells. Rainfall amount and distribution over space and time should be considered as it has impacts on the distribution of vegetation and water resources in the study area. Rainfall in the area can’t be understood unless the situation of Inter Tropical Convergence Zone (ITCZ) is considered. (Bhoalotra, 1963) described it as the broad zone spreading the North East Trade winds from the South West winds.

(Musa 1986) states that (ITCZ) enter Sudan in its southern border at the beginning of March and start moving North till August. It begins retreating in September leaving the country roughly at the end of November. In addition moving north is very slowly taking six months while retreating is very fast taking only three months. In April the study area is dominated by the north east trade winds from the Sahara and Arabian high pressure systems. Although it is dry, some rains maybe recording during April and March due to the influence of ITZC this time known locally as Seif (summer) where high maximum mean temperature is 40.2 C degree and the high minimum temperature is 25.1 C degree (metrology department 2005). During June up to September, the whole area is almost under the influence of the moist south westerly wind. Rainfall shows some variation as the southern part, which receives considerable amount of rains, start from June to October where as in the northern part it starts from July up to September. This period is known locally as kharif (Autumn) with maximum means temperature 31.6C and minimum mean temperature of 21C. Annual rainfall means in the southern part is about 400mm or more while in the northern part is about or less than 100mm (see map 3.2). During October – November no rain is recorded over the northern part, except for a few showers in the southern part which is covered by the (ITCZ) with high temperature due to the position of over head sun and clear skies. So the maximum mean temperature is 37.2C and minimum temperature is 22.9C. This period is known locally as (Darat). During this period the northern part is influenced by the north east trade winds which cover the area by mid of November. During December up to February the area is characterized by cool dry winter due to the influence of the dry north east trade winds and the position of ITCZ as it moves.
far south. In this period the maximum mean temperature is 35.3°C while the minimum mean temperature is 17.2°C.

Concerning Butana, the rainfall is higher in the southern and eastern parts of Butana than in the northern and western parts. Therefore the mean annual rainfall varies from around 75 mm in the northwest and extreme north to about 400 mm in the extreme south. The duration of rainy season is about three months and due to the flat nature of Butana there is surface runoff and usually wadis ended with Deltas. Some scholars mentioned that drought is a part of arid and semi arid nature. Rainfall which begins in July and ended up in September is not enough for practicing agriculture thus livestock rising is the major assets of livelihood in such region.

Regarding the temperature; Butana area is considered as hot area throughout the year with maximum temperature variations from 33 to 450°C and minimum temperatures from 11 to 320°C. The annual mean daily temperature range from 24 to 350°C. May and December are the hottest and coolest months of the year, respectively. Temperatures are comparatively consistent from year to year. Temperature has negative impact on animal; plant and human. Increase temperature lead to increase in demanding water for all.

3.2.3 Geology:

Generally, the study area divided into four main rocks types organized as follows:

1. **Basement Complex Rocks:**

These are the oldest rocks which date back to the Precambrian age underlying the whole of the western part. In some par of the area they are overlain by Nubian sand stone or Basalt. In the western part, particularly it is overlain by superficial deposits. Musa (1986) mentioned that this rock includes slate, phyllite, granite, schists, limestone, epidiorite, andesite, gneiss, soda grantee dagranite, basic and ultra basic rocks.
Map 3.2: Annual Rainfall Isohyets in Gedaref State

Source: Metrological Department (1994-2004)
This group covers the western border of the study area up to the central part. It has some outcrops in Qala En Nahal, Ban and balous (white man, 1971). (El Boushi and Ahmed 1975, in Musa 1986) noted the absence of the Basement complex rocks in the vicinity of Gedaref town. Five miles north of the town, however, there is occurrence of basement complex rocks at the depth of 832
feet (250 meter). In this area they are overlain by 804 feet 122 meter of the Tertiary Basalt and superficial clay deposits.

It is worth mentioning that the whole Butana is underlain by Basement complex rock thus, ground water is hardy to find or of high cost. The basement complex forms about 2/3 two third of the underlying solid geology of the Butana area, bears no water except in joints (Soboro 1985). These variation leads to variation in water resources in the study area. (Abusin 1970) stated that the Basement complex in the study area is considered as non water bearing while the Nubian sandstone is. This explains the unequal distribution of wells and boreholes through out Gedaref state, and the distribution of Hafirs constructed in non water bearing formation.

2. Nubian Sand Stone (Gedaref Formation):

This unit dates back to the Mesozoic age resting unconformably on the Basement complex (Eltayeb 1983; Musa 1986). This formation is form a narrow belt starting from the Southern part and extends to the Northern part up to the central part of the study area including the out crops of jebel kasamour, Umbiliel and Jebel Tamargo. El (Boushi and Ahmed 1975) discovered that Gedaref formation differs from the Nubian sand stone. Gedaref formation is composed of mud stone and sticky clays with the bed of loose sandstone while Nubian sandstone is formed mainly of hard iron and silica cemented mudstone, sandstone, pebbly sandstone and sandy mudstone. Moreover, mudstone is thinner than Gedaref formation.

3. Tertiary Basalt:

According to (Medani 1973) mentioned that this formation covers an area of about 8200km2 extending from Ethiopian border and overlies Nubian sandstone and /or basement complex. It occurs mainly as flows and dykes. (Suleman.1968) stated that this type of rocks occurs as the result of volcanic flows during the tertiary period and covered the south eastern part of the study area. (Musa 1986) mentioned that Basalt is the thickest in the south east and thins gradually towards the north west with an out-crop to an elevation of more than 600 meter serving as water divide between river Rahad in the west and river Atbara to the east.

4. Superficial Deposits:

This is the recent deposit composed of clay mineral of the montmorillonite group characterized by dark cracking clays with low organic
carbon content. (Musa 1986; tothill 1952) described it as the recent deposits of an intensive weathering of the parent rocks. Moreover, clay in Gedaref is considered as residual while Gezira it is regarded as alluvial. (El Khier 1980) estimated that clay deposits cover more than 90% of the surface of the study area. The remaining 10% is covered by sand, gravel and rock out crops. (Suleman, 1968) who studied Abu Naga boreholes in the southern part found evidence of a fault running North-South. It was observed that most of the boreholes which lies a long it are successful (AbuNaga and Iddetien). Suleman further divided the rocks into three types according to the potentialities of storing and transmitting water these are:-

1. Upper Basalt and Nubian sandstone. This forms an aquifer which yield significant amount of ground water

2. Aquicludes which absorb water but either transmits it very slowly or not able to transmit it at all. Superficial clay and plastic Nubian sandstone formation form the bulk of this example.

3. Lower Basalt, Basement complex and hard Nubian sandstone, aquifer which neither absorb nor transmit water.

Underground water is hence found only in upper Basalt and Nubian sandstones formation and upper Basalt stores water when there are intense fissures and cracks. Consequently, wells dug into Basalt have sufficient water especially after rainy season. This explains clearly why most of the wells in the area dry up a few months after the rainy season. Therefore the only suitable source of ground water in the area is Nubian sandstone whose distribution is very limited especially in the Northern part. The researcher however, is not support the idea that says the solution of water scarcity in Butana would be based on under ground water.

According to the climate and the geological structure one can mentioned three main types of water resources in the area under study these are:

1. Wells: Shallow or hand dug wells are not restricted to bed of water courses. They can be dug in many places especially where porous Nubian sandstone outcrops. Due to the geological structure of the area the number of wells in the northern part is 200 out of which 177 are working with daily production of 5m3. On the other hand the total number of wells in the southern part is 200, most if not all of which are operative (National Rural Water Corporation 2006).
2. Boreholes: Boreholes are deep mechanically dug wells into aquiferous geological units in the area. The southern part has more boreholes compared with the northern part. According to the National Rural Water Corporation 2006 the working day of each boreholes is around eight hours with yield around 7m³ per hour. The total number of bore holes in Butana is 8 only one is working while in the south part is about 326 most are working.

3. Hafirs: are artificially scooped out holes in the surface constructed manually or by machines, usually found in the area where underground water is not available. This explains why the northern part has a large number of hafirs 70 with annual average capacity of 13000m³. The southern part has 58 hafirs with annual average capacity 15000m³. This variation is due to the differences in the geological structure besides the ways of consumption and amount of rains which is decreasing northwards.

3.2.4 Drainage System:
The main component of the surface water in the study area is River Rahad and River Atbra which originate from the Ethiopian high lands. Both are seasonal; at least some parts of their courses dry up during the dry period. River Atbara has two main tributaries Bahr Salam which join it at Hillat Hakuma and Setiet. Both rivers supply sufficient water for both human and livestock in the area. Moreover, river Atbara supplies Gedaref with 9000m³ /day through the pipeline from the Showak station, 70 km north of Gedaref town. During the critical summer period this figure is reduced to 4000m³ and some times far less (El Hadary 1999). Both rivers help much in irrigating some of agricultural schemes in the area (Khashm ElGirba and Rahad), besides supplying villages around (vegetables-gardens). Added to the above they are considered as the important sources for pastoralist during the dry period. This explains why pastoralists late after rainy seasons move to the southern part. (UNICEF 1997) reported that 31 villages depend on both rivers for drinking and watering their animals.

Khors and wadis are types of drainage usually used to identify streams that flows only after heavy rains for only short time (Musa 1986). Khors and wadis are distributed through out the area in accordance with the nature of geological structure, hydrological and climate conditions. Wadis are scattered at the northern part due to the flat nature of the clay plain (Butana area) used
for grazing and cultivation (see map 3.3). It was considered the main source of water for pastoralist during the wet season. Usually wadis in the northern part end up with Deltas. Hence Deltas are sources of ground water especially when sediments are sandy and permeable. The researcher observed that water in wadis passes without applying any advance system of water harvesting except simple techniques (water spreading). Due to the physical conditions khors are distributed throughout the Southern part. The largest one is khor Abu Farga with annual yield of 2.9m3 million ending up to the River Rahad. Other khors include Magadin, Malik are of hydrological importance in the area (see map 3.3). As the result of clearance of vegetation besides the sticky nature of soil, the khors discharges have increased causing to severe damage and hazards.

The dominant topographical features of the Butana are extensive flat plains with few outcrop rocks and scattered small rocky hills. The drainage pattern of Butana is affected by the present of flat nature and distribution of rainfall thus, many khors and wadis distributed all over Butana and ended with Deltas. The general direction is varies based on the slope so the wadis that lies at the western part flows towards the Bule Nile River and the Eastern part flows towards Rive Atbara and in the south to the southwest towards the Blue Nile and Rahad River, to the northwest towards the Main Nile. The shaping of these wadis is largely influenced by rainfall regimes and soil types and to less extent by the relief. Khors and wadis provide the potential sources of water and land for agricultural and livestock production.

These wadis are seasonal and their sizes are varies in nature; most are small and few being large such as (wadi El Hawad). Wadis contribute significantly to the supply of surface water structures such as hafirs, natural ponds, dams and subsurface wells. Khors and wadis play a major role in the livelihood of the Butana people. Recently and especially during summer time wadis are the only source for grazing where still vegetation cover is exist. It is particularly along the beds and sides of these water courses that animals graze, agriculture is practiced and the main source of water supply. This makes the khors and wadis the focus of human activities and settlements. In some cases wadis is divided among several families. It is common in Butana to hear that wadis are carrying the names of families or geographic area. Efficient utilization of these resources such as water harvesting techniques is very important for securing livelihoods in the Butana.

One of the main topographic feature that exist along the both sides of River Atbara is Karrab land (kharab land) The land found along the upper Atbara
River until the border with Ethiopia and along the Blue Nile banks in the northern part of Gezira state. Karrab land or the irregular topography is composed of fined cracked or non-cracked surface and a lower clay content soil. The clearance of natural vegetation for traditional agriculture has accelerated water erosion, leading to the loss of arable land and development of bad land (Karrib) between the clay plain and alluvial flood plain bordering streams and watercourses.

Table 3.1: Wadis in Butana Area

<table>
<thead>
<tr>
<th>Wadis</th>
<th>Length in km</th>
<th>Basin km</th>
<th>Discharge10*6m3/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>El Rawyan</td>
<td>60</td>
<td>1500</td>
<td>4.5</td>
</tr>
<tr>
<td>El Atshan</td>
<td>25</td>
<td>3500</td>
<td>1.0</td>
</tr>
<tr>
<td>Abu Hashma</td>
<td>80</td>
<td>1500</td>
<td>7.5</td>
</tr>
<tr>
<td>Abu Jerad</td>
<td>80</td>
<td>2000</td>
<td>10.0</td>
</tr>
<tr>
<td>Abu Matariq</td>
<td>40</td>
<td>600</td>
<td>3.0</td>
</tr>
<tr>
<td>El Bahougi</td>
<td>30</td>
<td>250</td>
<td>1.0</td>
</tr>
<tr>
<td>Ga Budisa</td>
<td>87</td>
<td>1200</td>
<td>6.0</td>
</tr>
<tr>
<td>Abu Musran</td>
<td>35</td>
<td>150</td>
<td>0.75</td>
</tr>
<tr>
<td>Abu Ganafied</td>
<td>80</td>
<td>2000</td>
<td>12.0</td>
</tr>
</tbody>
</table>

Source: NRWC report 1997

Table 3.1 shows that the average discharge is 5 million m3 which needs sound management. Therefore, one of the recommendations of this study is to introduce sound water harvesting techniques in order to solve the problem of water and at the same time securing livelihood for the people.

3.2.5 Soils:

Generally, the dominant soil type is black to dark brown clay belonging to the Vertisol group which shrinks and cracks widely during the dry season and expands during the wet season. According to (Musa, 1986) this type of soil covers almost all the study area except the isolated inselbergs (Jebels) and outcrops spreading along Gedaref- Galbat and small isolated sandstone as (Azaza Hamra). absence of clay with no cracks. So the surface is stable, usually used for settlement purposes. The depth of the soils differs.
El Kheir (1980) mentioned that the isolated area have black or red soil composed of coarse granular material of very high permeability and very low or complete. According to Zien El Abdien and Robinson (1971) are stated that in the Gezira the depth of soil is 119cm and the width is 7.5cm but in Gedaref the depth of soil is 120cm (Musa 1986). According to the latter there is no
change in soil horizon until two meters because of the deep cracking and expansion phenomena which eventually lead to the mixing of materials from different horizons resulting in homogenous soil. This type of soil has clear impact in the process of infiltration system. At the beginning of kharif most water is lost through soil cracks and when it is covered the characteristics of clay affected the system of infiltration due to the capacitors of soil. (Musa in Abusin 1991) states that clay soils have potential problem, so the infiltration capacity and permeability when moist would be too low. When dry however, it would be greater as deep cracks would allow too rapid through flow. These Vertisols soils can be made very productive if properly managed. The management of vertisols is difficult, however, because of constraints caused by their physical and chemical characteristics. Their high content of montmorillonite clay makes vertisols very hard and deeply cracking when dry and very sticky when wet. Their use for agricultural production requires an optimum amount of rainfall and water harvesting in low rainfall areas. Land preparation for crop production in these soils invariably requires use of tractors and heavy ploughing equipment. It is difficult to properly cultivate vertisols by traditional methods involving use of hand hoes or animal drawn implements. For that reason, large-scale irrigated and rain fed mechanized farming schemes were established and encouraged by the government as a means for achieving productive use of vertisols for crop production purposes.

The compact nature of the clay soils covering most of the Butana accelerates runoff, which in turn makes for fast erosion and a high ratio of annual plants as compared to perennials (sorbo 1985). Clay non cracking soil is dominant in most of the Butana if not all. The geological structure, soil type together with characteristics of rainfall system of the Butana play vital role in determining the types and distribution of the water resources whether underground, surface or subsurface in the area.

3.2.6 Vegetation Cover:

Rainfall plays a vital role in the distribution of the vegetation cover in the area. There is a close relationship between rain and distribution of trees (type and dense) to shed light on this relationship the study adopted two classification of vegetation cover for the study area. These are the work of Lebon 1965 and the work of Badi, et al 1989 (see map 3.4).

Lebon (1965) divided Gedaref area into two major vegetation zones these are:

1. Zone one, which he named “semi-desert scrub and short grass land”, covers the area north of latitude 14N including the Butana region. The
most dominant trees in this zone are **Acacia mellifera** (Kitir) and **Acacia nubica** (Laot), and are found scattered along the water courses and on high grounds. The grasses in this zone include **Belpharis edulis** (Siha).

2. Zone Two lies south of latitude 14. This he named as “low wood land savannah” which is divided into sub-groups, namely:
   - Group One, where the amount of annual rainfall ranges between 400 and 575 mm, which is dominated by thorn scrub belt also **Acacia mellifera** (Kitir) forms dense forests with some grasses like **Sehima ischaemoides** (Dambulab).
   - Group two, where rainfall ranges between 575 and 800 mm, which is dominated by **Acacia seyal** (Talh) and some grasses, such as **Sehima ischaemoides** (Dambulab).
   - Group Three lies along the Sudanese Ethiopian border. The tallest trees in this group are **Anogessus schimperi** (Sahab) with **Hyparrhenia psendocymbaria** perennial grasses like (Anzora).

Badi, et al 1989 classified the study area into three zones these are organized as follows:

1. Semi desert grass land of Butana. Hence short grasses grow during the rainy season with acacia species around hill and water courses.
2. Zone of natural forest in the southern part of the study area, the most dominant trees are **Acacia seyal** (Talh), **Acacia senegal** (Hashab), **Acacia mellifera** (Kitir) and **Balanities aegyptiana** (Heglig), scattered at the foot hills and water courses beside **Combretum harmanianum** (Habil) and Sisaban which need high amount of water.
3. Zone of south eastern part here tree species grow around hills **Combretum harmanianum** (Habil) **Anogessus schimperi** (Sahab), **Acacia seyal** (Talh). On hill slope vegetation cover change into tree **Strrcuiliu setigera** (Umtalih) and **Boswellia pyperifera** (Luban).
From the above mentioned one can conclude that, rainfall is considered as the most essential factor in the distribution of vegetation cover in the area (tree and grasses). Therefore, vegetation round water courses is different from those on the hills due to the high amount of water received beside the good soil type. Looking to the Butana at the Northern part, the sparse vegetation consist of semi-desert grasses and Acacia shrubs, the later generally limited to the soils around the few inselbergs (jebels) and the narrow belts along seasonal water courses. Moving southwards, the vegetation gradually changes into Acacia trees, bushes and savannah type grasses.

Widespread degradation of the natural vegetation cover in Gedaref state has resulted from different reasons, including excessive exploitation of the natural vegetation for extraction of fuel wood and timber for building, charcoal making and other uses by different groups; The removal of vast expanses of the natural tree cover for the establishment and expansion of large-scale mechanized rain fed crop production operations is the principal reason behind degradation of land resources in Gedaref state.

3.2.7 Forest:

Generally, forestry in the Gedaref state plays a vital role in producing of fuelwood, charcoal, Arabic Gum of the Acacia Senegal tree and building materials. There are three types of forest in the study area, the first which is own by state which named (state forest) and the second Federal forest control by the central government in addition to the public forest controlled by local communities. In Gedaref (SKAP 1985) proposed 32% of the state area as forest but on the ground only 15% (2395807 feddan) is covered with forest. Moreover, 500 000 feddan is empty inside the reserved forest. Forest in Gedaref divided into rainfed (Daharra) which covers about 2 million and irrigated forest 5% from the irrigated scheme (Rahad). Table below shows the distribution of forest in the Gedaref state:-
Map 3.4: Vegetation Cover of Gedaref State

Source: After Lebon 1965
Table 3.2: Reserved Forest in Gedaref State

<table>
<thead>
<tr>
<th>Locality</th>
<th>Site</th>
<th>Area/feddan</th>
<th>Per cent %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fashaga</td>
<td>Fashaga</td>
<td>272 244</td>
<td>15</td>
</tr>
<tr>
<td>Galabat</td>
<td>Galabat</td>
<td>593 455</td>
<td>33</td>
</tr>
<tr>
<td>Rahad</td>
<td>Gala ElNahl</td>
<td>179 923</td>
<td>10</td>
</tr>
<tr>
<td>Gedaref</td>
<td>Gedaref</td>
<td>501 071</td>
<td>28</td>
</tr>
<tr>
<td>Faw</td>
<td>Faw</td>
<td>78 489</td>
<td>5</td>
</tr>
<tr>
<td>Faw</td>
<td>Hawatta</td>
<td>151 053</td>
<td>9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>1 776 235</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Source: Forest department - Gedaref 2006

3.3 The Human Environment:

3.3.1 Tribal Structure of Gedaref State:

The population of Gedaref state is more diverse, being composed of people belonging to many ethnic groups. A significant number of the present population is composed of people who settled recently in the region. The major ethnic groups composing the population in Gedaref state are Arabs (mainly shukriya, Lahawin, Kawahla) and migrants from western Sudan and West African countries (who constitute a large segment of the labor force in the state). With the reference to Butana area the most dominant ethnic group is shukriya. Settled in the state are also Eritrean and Ethiopian refugees most of whom are residents of camps that have received protection and support from UNHCR for decades.

The demography and social structure of the Gedaref state has been influenced by several internal and external factors as well as the effects of natural calamities. (SKAP 1985) states that the first influence occurred during the Mahdist 1884-1898 which caused a large exodus of people from western Sudan to the study area. The next major factor was the series of drought in the 70s, 84-84s and 89-90s which caused more migration. This immigration has also been compound by the exodus of Ethiopian and Eritrean as the result of both civil wars and drought (300 000 refugees) see table 3.3. In addition to the above mentioned factors Gedaref state has continued to attract considerable numbers of migrants for decades, because the potentialities of their thriving agrarian economies offer employment and land-related livelihood opportunities. There is a long history of arrivals and accommodation of outsiders more or less permanently through customary arrangements. Thus during wet season migrants from different parts of the country entering Gedaref
as schemes labour some of them move after harvesting other remaining in the state.

(El Tayeb 1983) mentioned that Abu Sin, the Nazir of Shukriya (1790-1870) was the first to settle his family in the Gedaref area. He formed the first nucleus settlement, and Gedaref began to grow as a tribal market developed. Fertility of the soil and sufficient rainfall enhanced growth of the area, and Gedaref began to gain commercial importance, attracting trade from the surrounding countryside.

Native administration system has a long history in Sudan and the study area alike. It became formally during the beginning of nineteenth century when Sudan has colonized by Truks. This system offers the Tribal leaders a power to mange and distribute resources equally overall member of their villages. Generally the system consists of three administrative tiers these are Nazir who are in charge of the entire tribal administrative and judicial affairs, Omdas those who supporting Nazirs and took the responsibility of tribal subsections and the third are sheikhs who are the village head man. All these have a power and work together to maintain security and order in their areas and collecting taxes from their followers. In addition to that they play vital role to settle disputes and conflicts between their followers and outsiders. There are five Nazaras in Gedaref state these are nazara of shukriya (Butana), nazara of Dubbanya (wad Zied), Nazara of Wad Bakur, Nazara of Al amir Yagoub (gala elNahal), and the deputy of Nazara of Beni Amir (see map 3.1) in this chapter.

3.3.2 The Shukriya:

The Shukriya are the principal inhabitants of the Butana region and are predominantly pastoralists. They are regarded as one of the Arabic speaking peoples who emerged as powerful tribes in northern Sudan following the downfall of the old Nubian Kingdoms. The Shukryia tribe has historically controlled vast areas of land in eastern and central Sudan (mainly in the Butana region). Their tribal lands are inhabited by other tribes, such as the the Bawadra, the Lahawin and the Kawahla. The **Omdas** and **Sheikhs** of these tribes are regarded as part of the traditional or native administration apparatus of the **Nazir** of the Shukriya. Prior to 1940 all members of the Shukriya tribes and their affiliates in the Butana region and beyond were under one **Nazir**. But in 1940 two Nazirs for the Shukriya were appointed by the condominium government. One of the Nazirs in Gedaref state (stationed in Gedaref town) and
the other is in Gezira state (stationed in Rufa’a town). The two Nazirs are close relatives; both of them are descendents of Awad Elkarim Abu Sin.

Table 3.3: Refugees in Gedaref State by the end of 2002

<table>
<thead>
<tr>
<th>Location</th>
<th>Origin</th>
<th>Females</th>
<th>Males</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mafaza</td>
<td>Eritrea</td>
<td>525</td>
<td>615</td>
<td>1,140</td>
</tr>
<tr>
<td>Karkora</td>
<td>Eritrea</td>
<td>2,865</td>
<td>2,869</td>
<td>5,734</td>
</tr>
<tr>
<td>Wad Awad</td>
<td>Eritrea</td>
<td>319</td>
<td>291</td>
<td>610</td>
</tr>
<tr>
<td>Hawata</td>
<td>Eritrea</td>
<td>879</td>
<td>849</td>
<td>1,728</td>
</tr>
<tr>
<td>Um Garger</td>
<td>Eritrea</td>
<td>1,835</td>
<td>1,794</td>
<td>3,629</td>
</tr>
<tr>
<td>Tenedba</td>
<td>Eritrea</td>
<td>57</td>
<td>57</td>
<td>114</td>
</tr>
<tr>
<td>Abu Rakham</td>
<td>Eritrea</td>
<td>635</td>
<td>645</td>
<td>1,280</td>
</tr>
<tr>
<td>Um Garger</td>
<td>Eritrea</td>
<td>1,315</td>
<td>1,872</td>
<td>3,187</td>
</tr>
<tr>
<td>Abu Rakham</td>
<td>Ethiopia</td>
<td>303</td>
<td>286</td>
<td>589</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>8,733</td>
<td>9,278</td>
<td>18,011</td>
</tr>
</tbody>
</table>


The presence of the Shukriya tribe in the Butana region has continued for centuries. They fought battles with other tribes in the past to consolidate their control of the entire lands of the Butana region. The tribal leader of Shukriya in Gedaref state keeps historic records of their rights over land in the Butana area. A copy of a 220 year old Charter issued by Sultan Badei of the old Sultanate of Sennar conceding control of the entire Butana region to the Nazir of the Shukriya Awad Elkarim Abu Sin was shown during field interview to the researcher. The shukriya especially the lineage of Sinab have played a dominant role in Butana since the (18-19) century. They acquired their power in prolonged battles against armies of Sinnar and against neighboring tribes, gradually driving them out of Butana. This process was accompanied by a cleaver marriage strategy pursued by the Sinnab, who married princesses of the matrilineal funj-kindom, thus establishing a "knighthly descent". This is still obvious in their aristocratic self-image and behaviour. Among the Sinnab are the most wealthy and influential shukriya.

All the tribes of the Butana have maintained a pastoralist life style and continue to practice a transhumant mode of range utilization moving from one
area to another along communally recognized migratory routes. Members of the Shukriya, the Lahawin, the Kawahla, and other tribes stay in the Butana plains for the rainy season and move out during the dry season, either to the area south of Gedaref, or to areas in the southeast. A significant proportion of these tribes graze animals on natural pastures in the Butana in the rainy season before taking them for long marches, to feed on crop residues from the surrounding rain fed sorghum and sesame fields in Gedaref, Showak and Kassala agricultural areas at harvest time in the dry season.

3.3.3 Population in Gedaref:

The total of population in Gedaref state is estimated to be 1,729,083 persons, of which 27 percent reside in Gedaref locality (see Table 3.4). The annual rate of population growth in 2003 was 3.8 which indicate a higher rate of population increase. However, the population density per unit area is about 23 persons in Gedaref state. The total population of Butana area is estimated to be 40 000 persons scattered on over 40 villages. The majority of population is rural about 70 percent depending on pastoral adaptation for their economy. All types of migration exist in the state as there is massive migration from rural to urban centre and from urban centre to other state (Khartoum as example). In addition to movement of displaced persons in large numbers from other states, and refugees from neighboring countries, because of the adverse impacts of drought, armed conflicts and impoverishment that have affected their places of origin and forced them to migrate.
Table 3.4: Population in Gedaref State by Locality

<table>
<thead>
<tr>
<th>Locality</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gedaref</td>
<td>240674</td>
<td>226005</td>
<td>466679</td>
<td>27.0</td>
<td></td>
</tr>
<tr>
<td>Algallabat East</td>
<td>170902</td>
<td>161601</td>
<td>332503</td>
<td>19.2</td>
<td></td>
</tr>
<tr>
<td>Algallabat Wast</td>
<td>113268</td>
<td>108400</td>
<td>221668</td>
<td>12.8</td>
<td></td>
</tr>
<tr>
<td>El Rahad</td>
<td>171531</td>
<td>162182</td>
<td>333713</td>
<td>19.3</td>
<td></td>
</tr>
<tr>
<td>El Fau</td>
<td>118573</td>
<td>113297</td>
<td>231870</td>
<td>13.4</td>
<td></td>
</tr>
<tr>
<td>El Fashaga</td>
<td>54196</td>
<td>53872</td>
<td>108068</td>
<td>6.3</td>
<td></td>
</tr>
<tr>
<td>El Butana</td>
<td>17777</td>
<td>16805</td>
<td>34582</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>Gedaref state</td>
<td>886921</td>
<td>842162</td>
<td>1729083</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Source: Bureau of Statistics, Gedaref, 2006

3.3.4. Human Activities:

1. Land Use in Gedaref State:-

The general land use in the Gedaref state is mainly Agriculture which consists of crop production, livestock husbandry, forestry and very few fishing. The total number of livestock in Gedaref is about more that five million heads (see table 3.5) There are two types of agricultural production in the state. These are irrigated scheme such as Rahad and rainfed cultivation (traditional and mechanized). Rahad scheme covered an area of about 120000 feddan or 50200 ha. This scheme produces cash crops of cotton, groundnuts and some subsistence crops of sorghum, fodder and vegetables.

Table 3.5: Livestock Number and Types in Gedaref State

<table>
<thead>
<tr>
<th>Type of animal</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camel</td>
<td>540,000</td>
</tr>
<tr>
<td>Cattle</td>
<td>1,120,000</td>
</tr>
<tr>
<td>sheep</td>
<td>2,550,000</td>
</tr>
<tr>
<td>goats</td>
<td>820,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5,030,000</strong></td>
</tr>
</tbody>
</table>

Source: Livestock Department, Gedaref State, 2006
The second type is rainfed cultivation with its both types (traditional and mechanized farming) which produce the crops of sorghum and sesames and other such as sun flower and Gowar (see table 3.6). This type of cultivation appeared early during 1940 in Gedaref state. The second type of rainfed is the traditional cultivation known locally as (Bildat, hariq) of the small size if we compare it with mechanized farming. Area under mechanized farming is estimated to be 8 million feddans.

<table>
<thead>
<tr>
<th>Area /season</th>
<th>Dura</th>
<th>Sesame</th>
<th>Dukhin</th>
<th>Cotton</th>
<th>Sun follower</th>
<th>Gowar</th>
<th>Others</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>95-1996</td>
<td>5231</td>
<td>1 100</td>
<td>30</td>
<td>25</td>
<td>6 .5</td>
<td>6 293 000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>96-1997</td>
<td>4 320</td>
<td>866</td>
<td>59</td>
<td>20</td>
<td>11 1</td>
<td>5 278 865</td>
<td></td>
<td></td>
</tr>
<tr>
<td>97-1998</td>
<td>4 744</td>
<td>720</td>
<td>38</td>
<td>2</td>
<td>7 6</td>
<td>5 520 397</td>
<td></td>
<td></td>
</tr>
<tr>
<td>98-1999</td>
<td>3 910</td>
<td>1 295</td>
<td>69</td>
<td>4</td>
<td>35 6</td>
<td>5 317 702</td>
<td></td>
<td></td>
</tr>
<tr>
<td>99-2000</td>
<td>3 771</td>
<td>1 069</td>
<td>80</td>
<td>7</td>
<td>3 2</td>
<td>4 933 783</td>
<td></td>
<td></td>
</tr>
<tr>
<td>00-2001</td>
<td>4 451</td>
<td>746</td>
<td>151</td>
<td>12</td>
<td>2</td>
<td>5 363 100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>01-2002</td>
<td>4 239</td>
<td>431</td>
<td>81</td>
<td>1</td>
<td>1 .7</td>
<td>4 754 135</td>
<td></td>
<td></td>
</tr>
<tr>
<td>02-2003</td>
<td>4 870</td>
<td>1 009</td>
<td>250</td>
<td>1</td>
<td>1</td>
<td>6 130 285</td>
<td></td>
<td></td>
</tr>
<tr>
<td>03-2004</td>
<td>4 620</td>
<td>1 008</td>
<td>150</td>
<td>1</td>
<td>1</td>
<td>5 743 254</td>
<td></td>
<td></td>
</tr>
<tr>
<td>04-2005</td>
<td>2 864</td>
<td>891</td>
<td>118</td>
<td>13</td>
<td>100 100</td>
<td>4 888 573</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Mechanized Farming Report, Gedaref, 2006

Regarding to Butana, people besides raising of livestock the also practice traditional farming as the secondary source of livelihoods in the area. This type of cultivation is for food subsistence and selling in null or too rare. Marketing is not a big issue and this maybe due to the small size of the farm, shortage of labor, using of traditional equipment. Rain-fed cultivation is practiced under three main types of traditional cultivations, namely terraces, wadis and Bildat. The selection of a particular type of cultivation is primarily dependent on the techniques of water harvesting, distance from the village centre and source of water used.

2. Livelihoods in Gedaref State:

Table 3.7 shows that more than have of population in the state depend on agricultural (crop & livestock) for securing their livelihood. In rural area
around 83% of the total population practices this sector. Besides these there are other activities such as trading, industry, transportation (see table 3.7). This table reflects that there is transformation towards other sector than agriculture especially in urban centre as there is only 28% of the total population involved in agriculture. Livestock raising was the centre of the economy for most of the population if not all in the Butana area. Rain-fed was considered as the second activity in Butana after livestock or together (agro nomads). Generally, there are different types of this activity such as Hariq, Trus, Bildat and Wadis cultivation. It worth mentioning that there is a sign of mechanized farming exist in the southern of Butana.

**Table 3.7: Human Activities in Gedaref State**

<table>
<thead>
<tr>
<th>Activities</th>
<th>% urban</th>
<th>% Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture activity</td>
<td>28.37</td>
<td>83.12</td>
</tr>
<tr>
<td>Mining</td>
<td>0.08</td>
<td>0.02</td>
</tr>
<tr>
<td>Industry</td>
<td>9.85</td>
<td>1.89</td>
</tr>
<tr>
<td>Water &amp; electricity</td>
<td>1.25</td>
<td>0.15</td>
</tr>
<tr>
<td>Building &amp; construction</td>
<td>3.8</td>
<td>0.99</td>
</tr>
<tr>
<td>Trade, restaurant and hotels</td>
<td>18.68</td>
<td>2.21</td>
</tr>
<tr>
<td>Transportation &amp; communication</td>
<td>9.19</td>
<td>2.73</td>
</tr>
<tr>
<td>Banking</td>
<td>1.37</td>
<td>0.08</td>
</tr>
<tr>
<td>General &amp; personal services</td>
<td>25.9</td>
<td>7.51</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Gedaref Encyclopaedia, 2004

**3.3.5 Services:**

**3.2.5.1. Education:**

Generally speaking there are four categories of education all are exist in Gedaref state. These are before school (Kahlwa & kindergartens), primary (Basic education), secondary and university. Table 3.8 shows that there are 302 kindergartens only three found in Butana. The percent of pupil involve in this type of education is very low as it reaches 22% in Gedaref and reduces sharply to 10% in Butana area.
Table 3.8: the Distribution of kindergartens in Gedaref State

<table>
<thead>
<tr>
<th>locality</th>
<th>Kindergartens</th>
<th>children</th>
<th>Teachers</th>
<th>Pop. less than 4 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>government</td>
<td>private</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gedaref</td>
<td>81</td>
<td>13</td>
<td>6115</td>
<td>191</td>
</tr>
<tr>
<td>Gallabat East</td>
<td>51</td>
<td>0</td>
<td>2652</td>
<td>66</td>
</tr>
<tr>
<td>Gallabat west</td>
<td>33</td>
<td>0</td>
<td>1716</td>
<td>44</td>
</tr>
<tr>
<td>Rahad</td>
<td>39</td>
<td>0</td>
<td>2823</td>
<td>58</td>
</tr>
<tr>
<td>Faw</td>
<td>52</td>
<td>1</td>
<td>3070</td>
<td>73</td>
</tr>
<tr>
<td>Fashaga</td>
<td>28</td>
<td>1</td>
<td>874</td>
<td>31</td>
</tr>
<tr>
<td>Butana</td>
<td>3</td>
<td>0</td>
<td>210</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>287</strong></td>
<td><strong>15</strong></td>
<td><strong>17460</strong></td>
<td><strong>468</strong></td>
</tr>
</tbody>
</table>

Source: Ministry of education-Gedaref State, 2006

Concerning basic school (Asas) in Gedaref there are 517 schools half of it or more are co-education. Table 3.9 shows that there is low percentage of pupils within the age of primary school involves in education. This I argue it reflects two things either pupils are not going to school from the beginning or left the school before finishing (withdraw-Tasroob). Moreover, it shows that the primary education in Butana received fewer amounts of both schools and students. In addition also there are 5 schools especially for nomads with 150 students.

Table 3.9: Basic Education Schools in Gedaref State by Locality

<table>
<thead>
<tr>
<th>locality</th>
<th>School boys</th>
<th>girls</th>
<th>Co-education</th>
<th>Total</th>
<th>Number boys</th>
<th>Girls</th>
<th>Co-ed</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gedaref</td>
<td>49</td>
<td>46</td>
<td>33</td>
<td>128</td>
<td>25669</td>
<td>22359</td>
<td>9576</td>
<td>57598</td>
</tr>
<tr>
<td>Gallabat East</td>
<td>17</td>
<td>16</td>
<td>53</td>
<td>86</td>
<td>6341</td>
<td>5084</td>
<td>14645</td>
<td>26070</td>
</tr>
<tr>
<td>Gallabat west</td>
<td>11</td>
<td>11</td>
<td>49</td>
<td>71</td>
<td>4452</td>
<td>4059</td>
<td>12188</td>
<td>20699</td>
</tr>
<tr>
<td>Rahad</td>
<td>19</td>
<td>19</td>
<td>52</td>
<td>90</td>
<td>6782</td>
<td>6513</td>
<td>12432</td>
<td>25727</td>
</tr>
<tr>
<td>Faw</td>
<td>22</td>
<td>28</td>
<td>21</td>
<td>71</td>
<td>8578</td>
<td>8053</td>
<td>6731</td>
<td>23362</td>
</tr>
<tr>
<td>Fashaga</td>
<td>5</td>
<td>7</td>
<td>36</td>
<td>48</td>
<td>2285</td>
<td>2150</td>
<td>7659</td>
<td>12094</td>
</tr>
<tr>
<td>Butana</td>
<td>1</td>
<td>1</td>
<td>21</td>
<td>23</td>
<td>306</td>
<td>206</td>
<td>2822</td>
<td>3334</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>124</strong></td>
<td><strong>128</strong></td>
<td><strong>265</strong></td>
<td><strong>517</strong></td>
<td><strong>54413</strong></td>
<td><strong>48418</strong></td>
<td><strong>66053</strong></td>
<td><strong>168884</strong></td>
</tr>
</tbody>
</table>

Source: Ministry of Education, Gedaref, 2006
Table 3.10: Percentage Distribution of Pupils in Basic Education by Locality

<table>
<thead>
<tr>
<th>Locality</th>
<th>6-13</th>
<th>Boys %</th>
<th>Girls %</th>
<th>Education rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gedaref</td>
<td>96308</td>
<td>63</td>
<td>29</td>
<td>60</td>
</tr>
<tr>
<td>Gallabat west</td>
<td>45746</td>
<td>51</td>
<td>39</td>
<td>45</td>
</tr>
<tr>
<td>Gallabat east</td>
<td>68618</td>
<td>44</td>
<td>32</td>
<td>38</td>
</tr>
<tr>
<td>Rahad</td>
<td>68868</td>
<td>41</td>
<td>33</td>
<td>37</td>
</tr>
<tr>
<td>Faw</td>
<td>47851</td>
<td>56</td>
<td>41</td>
<td>45</td>
</tr>
<tr>
<td>Fashaga</td>
<td>22302</td>
<td>62</td>
<td>46</td>
<td>54</td>
</tr>
<tr>
<td>Butana</td>
<td>7137</td>
<td>60</td>
<td>33</td>
<td>47</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>356830</td>
<td>53</td>
<td>42</td>
<td>47</td>
</tr>
</tbody>
</table>

Source: Ministry of Education, Gedaref, 2006

Regarding high secondary school there are 82 schools in Gedaref state 27 of it are found in Gedaref locality (see table 3.11). It worth mentioning that Butana is received only 2 schools from the total number. The table indicates that girls in Butana does not participate much in high education and this may be due to the local culture towards education of girls or because of the phenomena of early marriage.

Table 3.11: Secondary Education in Gedaref State

<table>
<thead>
<tr>
<th>locality</th>
<th>School boys</th>
<th>girls</th>
<th>Total</th>
<th>Number boys</th>
<th>Girls</th>
<th>Total</th>
<th>Teacher</th>
<th>Student teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gedaref</td>
<td>14</td>
<td>13</td>
<td>27</td>
<td>4749</td>
<td>4649</td>
<td>9398</td>
<td>554</td>
<td>17</td>
</tr>
<tr>
<td>Gallabat East</td>
<td>7</td>
<td>3</td>
<td>10</td>
<td>1190</td>
<td>486</td>
<td>1676</td>
<td>89</td>
<td>19</td>
</tr>
<tr>
<td>Gallabat west</td>
<td>7</td>
<td>8</td>
<td>15</td>
<td>804</td>
<td>867</td>
<td>1617</td>
<td>142</td>
<td>19</td>
</tr>
<tr>
<td>Rahad</td>
<td>4</td>
<td>4</td>
<td>8</td>
<td>959</td>
<td>794</td>
<td>1753</td>
<td>105</td>
<td>17</td>
</tr>
<tr>
<td>Faw</td>
<td>7</td>
<td>7</td>
<td>14</td>
<td>1465</td>
<td>1158</td>
<td>2523</td>
<td>164</td>
<td>16</td>
</tr>
<tr>
<td>Fashaga</td>
<td>3</td>
<td>3</td>
<td>6</td>
<td>628</td>
<td>425</td>
<td>1053</td>
<td>49</td>
<td>21</td>
</tr>
<tr>
<td>Butana</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>163</td>
<td>24</td>
<td>187</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>43</strong></td>
<td><strong>39</strong></td>
<td><strong>82</strong></td>
<td><strong>9958</strong></td>
<td><strong>8406</strong></td>
<td><strong>18364</strong></td>
<td><strong>1115</strong></td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>

Ministry of Education, Gedaref, 2006
In addition to primary and high secondary also we find the University of Gedaref with different faculties. These are faculty of education, economic, agriculture, medicine. The established of university was in year 1994. This is due to the revolution of higher education and the federal government system that applied in all northern states.

3.3.5.2 Health Services:

Table 3.12 indicates that there is deterioration in health condition in term of quantity and quality. Therefore widespread of diseases is distributed in the area such as Malaria, kalazar and even AIDS. The existence of AIDS in the state may due to the location and open boundary as the state bounded Ethiopia. The health situation getting worse in Butana as myself observed there is one hospital in the whole Butana which lies in Subaqh. It hardly to say hospital but it less or just small health centre. This centre lacks the basic things (medicine, beds and specialized doctors). There are two dispensaries, seven health units and six dressing stations. There are only twenty-two trained midwives. Delivery of births is still performed by the traditional birth attendant. Similarly, there is shortage of health personnel.

Fortunately, oral discussions have shown that Butana is empty from some diseases (malaria free zone) as they said the weather of Butana is very clean. But insects' bites (snakes) and child delivery are serious problems in the area. Other diseases do occur. The diseases present in the Butana include tuberculosis, typhoid fever, kalazar, gardia and nutritional diseases. Iodine and iron deficiency prevail. There is also high rate of infant mortality. Kwashikor is found in children.

Table 3.12: Health Services in Gedaref State

<table>
<thead>
<tr>
<th>Centre of health services</th>
<th>Number 2005</th>
<th>Details</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitals</td>
<td>17</td>
<td>Hospital</td>
<td>16</td>
</tr>
<tr>
<td>Health centre</td>
<td>32</td>
<td>s. doctors</td>
<td>16</td>
</tr>
<tr>
<td>Small clinic</td>
<td>266</td>
<td>g. doctors</td>
<td>54</td>
</tr>
<tr>
<td>Laboratories</td>
<td>35</td>
<td>Assistant doctors</td>
<td>210</td>
</tr>
<tr>
<td>Blood bank</td>
<td>2</td>
<td>Official midwives</td>
<td>414</td>
</tr>
<tr>
<td>X-Rays</td>
<td>4</td>
<td>Traditional midwives</td>
<td>141</td>
</tr>
<tr>
<td>Public pharmacy</td>
<td>6</td>
<td>Medical insurance/pop</td>
<td>9%</td>
</tr>
<tr>
<td>Private pharmacy</td>
<td>32</td>
<td>Bed in hospital</td>
<td>954</td>
</tr>
</tbody>
</table>
3.3.5.3 Water Supply:

Generally, there are two sources of water supply in Gedaref town (showak station and boreholes). Showak station lies 70 km to the north east. It was established in 1970 to be the permanent source from river Setiet (Atbara). This station provides the town with 9000m³/day during normal days and it reduces depending on the seasonality of the river. The second is the AbuNaja 1968 boreholes lies 13km southern of the town. The southern part depends on wells (200), hafirs(58),boreholes(125) and both river Rahad and R. Atbara (Rural Water Corporation). The average of hafir is about 1500m³ and daily yield of well is 5m³. In the northern part which is mainly Butana there are 70 hafir 45 owned privately and the rest belong to the NRWC and 200 wells with few borehole in Subagh see table 3.13.

Table 3.13: The Distribution of Water Sources in the Study Area

<table>
<thead>
<tr>
<th>Locality</th>
<th>Wells/dawnki</th>
<th>Hafirs</th>
<th>Dams</th>
<th>Hand Pumps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gallabatt</td>
<td>107</td>
<td>23</td>
<td>5</td>
<td>109</td>
</tr>
<tr>
<td>Gedaref wasat</td>
<td>36</td>
<td>29</td>
<td>3</td>
<td>48</td>
</tr>
<tr>
<td>Rahad</td>
<td>4</td>
<td>23</td>
<td>1</td>
<td>82</td>
</tr>
<tr>
<td>Faw</td>
<td>4</td>
<td>-</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Fashaga</td>
<td>6</td>
<td>1</td>
<td>-</td>
<td>28</td>
</tr>
<tr>
<td>Butana</td>
<td>1</td>
<td>57</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>158</strong></td>
<td><strong>133</strong></td>
<td><strong>15</strong></td>
<td><strong>277</strong></td>
</tr>
</tbody>
</table>

Source: Gedaref Encyclopaedia 2004

The shortage of water in Gedaref is an old phenomenon till the writing of this research there is no concrete solutions. From the table 3.14 it seems that the deficit of urban water supply is about 6 million cubic meters.

Table 3.14: Urban and Rural Water Supply in Gedaref

<table>
<thead>
<tr>
<th>Year</th>
<th>Urban water supply in M³</th>
<th>Rural water supply in M³</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Urban supply</td>
<td>demand</td>
</tr>
<tr>
<td>1998</td>
<td>4.933.728</td>
<td>9.000.000</td>
</tr>
<tr>
<td>1999</td>
<td>4.319.256</td>
<td>9.720.000</td>
</tr>
<tr>
<td>2000</td>
<td>4.518.073</td>
<td>10.440.000</td>
</tr>
<tr>
<td>2001</td>
<td>4.121.657</td>
<td>11.160.000</td>
</tr>
<tr>
<td>2002</td>
<td>5.730.371</td>
<td>11.880.000</td>
</tr>
</tbody>
</table>

Source: Gedaref State Encyclopaedia, 2004
3.3.5.4 Transportation and Communication:

As the result of mechanized farming and the existing of livestock wealth, Gedaref became of the important market difficult to pass over. Thus different road lines appeared to link the state internally and externally. These lines cover railway, paved, unpaved and seasonal lines. Only earth roads exist in Butana which make connection during kharif it too impossible. Externally, the tarmac road that connects Sudan with Ethiopia passes through Gadaref State. Other tarmac roads connect the state to Khartoum and to Port Sudan, Kassala State. These include the Gadaref-Medani-Khartoum road (415 km) and the Gadaref-Kassala road (220 km). The internal network of roads that link localities and administrative units is not paved. The telephone exchange capacity in 2001 was 7,940 with 7,916 customers, and had only 49 internet subscribers.

3.2.5.5. Other Services:

All cities in Gedaref state are connected with electricity networks. Generally the situation is okay as the state depends on Girba, Rahad. historically, in 1972 Gedaref town gets its electric power from Kasm El Girba Dam electricity plant at that time was about 1000-1200 K.W which was sufficient at that time. Of this 500 are used by water supply station at Showak during the day, but during the night the full capacity is directed to the town. With regard to banking system in the state there are 33 banks (see table 3.15). Within these banks nothing found in Butana area. Generally, there are 670 mosques, 32 churches and more than 80 police stations.

Table 3.15: Other Services Infra-Structure in Gedaref State

<table>
<thead>
<tr>
<th>Locality</th>
<th>Banks</th>
<th>Mosques</th>
<th>Churches</th>
<th>Police Headquarter</th>
<th>Police stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gedaref</td>
<td>21</td>
<td>175</td>
<td>10</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td>Gallabat</td>
<td>2</td>
<td>212</td>
<td>8</td>
<td>6</td>
<td>29</td>
</tr>
<tr>
<td>Fashaga</td>
<td>-</td>
<td>95</td>
<td>2</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Rahad</td>
<td>2</td>
<td>99</td>
<td>8</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Faw</td>
<td>4</td>
<td>89</td>
<td>4</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>33</strong></td>
<td><strong>670</strong></td>
<td><strong>32</strong></td>
<td><strong>30</strong></td>
<td><strong>54</strong></td>
</tr>
</tbody>
</table>

Source: Gedaref Encyclopaedia, 2004
Chapter Four
Land Tenure in Sudan and Pastoral Adaptations in the Study Area

4.1 Introduction:
This chapter covers two sections. The first is about the land tenure and land policy in Sudan. The second section is about pastoral adaptations in Butana area. The main objective is to show the formal and informal institutions that governed access to rangeland and how pastoralist access to land and natural resources under the system of tribal leader regime and the state ownership. Written documents are the main source of data in this chapter with more help from the fieldwork through group discussions.

4.2. Land Policy in Sudan:
The general policy of Sudan is to increase cash crops production whether it's through irrigation (irrigated scheme) or rain fed as mechanized farming. This policy is also supported by the international interest such as the (International Finance Corporation, IFC, of the World Bank Group). In 1968, the Mechanized Farming Corporation (MFC) was created to promote and regulate investment in rainfed mechanised schemes. This expansion was not confined to Gedaref, but also extended to cover different parts in the country these are Habila, Dali and mazmoum. Most of the expansion that has taken place in these areas, however, was not authorized by the MFC. In the particular case of Gedaref, for example, the total area total area under cultivation is about eight million feddan only 33.8% (2729500 feddan) is considered as authorized and the rest 66.2% (5347115 feddan) is unauthorized. This unorganized expansion of mechanized farming put some pressure on grazing land and pushed pastoralists to the area that of low productivity and thus increase the conflict between different land users (ecological marginalization).

In addition to rapid expansion of unorganized mechanizedg, the pastoral land has also witnessed considerable expansion in large scale irrigated schemes since independence. Three years following Independence, the Managil extension of the Gezira scheme was established. During the 1960s the New Halfa scheme was established in the Butana on an area of half a million feddans, cutting out large areas of pastureland and blocking traditional nomadic corridors and access to watering points during the dry season. During the 1970s, the Rahad Scheme was established in an area of 300,000 feddans, again
at the expense of the richest pastures in the area. The area taken over by the Rahad Scheme was part of the "Common Grazing Area". For more details see land tenure section in this chapter.

Sugar plantations along the White and Blue Niles have further reduced pastoral areas and, as in the case of Kenana Sugar Factory on the White Nile, resulted in the displacement of large numbers of pastoralists. Nomadic pastoralists have been partially compensated by the allocation of tenancies in the irrigated schemes. But those pastoralists to whom tenancies were allocated did not give up their pastoral activities. Rather, they try to combine involvement in the schemes with their established pastoral interests; and a new circuit of transfers of values (between tenancies and the livestock sector) was accordingly generated (Sorbo, 1977).

To have a clear picture about development policies in the Sudan, the study concentrated in different plan applied in the country. For example, the development of agriculture during Nemerí regime was based on the "bread basket strategy". The objective was to cause the Sudan to become independent of food imports and above all enable the production of surplus products which could be exported considering the notorious negative trade balance (Rahmann 1994). In 1986 of the 200 million feddan of cultivable land in Sudan, only 20.9 million were cultivated: 2.4 million feddan of irrigated agriculture, and 8.6 million feddan of rainfed agriculture, and 9.9 million feddan of traditional agriculture (ILO 1987). Credits were granted for investment, subsidies for agricultural inputs while imports could be affected duty-free.

Although some interests in livestock development were evident in the Ten Year Plan (1961-1970), the plan displayed a clear bias in favor of agricultural and industrial development. Nevertheless, this period witnessed a considerable increase in veterinary services and some livestock development projects. Towards the end of the plan in 1970, high fertility rates were recorded as a result of the introduction of modern medicines and vaccination and disease control campaigns. The 1980s were a period of stress, great anxiety and uncertainty among the pastoralists.

As the result of the negative intervention of the state and repeated drought in addition to the civil war in southern and western, all these put pastoralist under crises. At the present time, the government is more concerned with solving the problem of food shortage rather than with the recovery of pastoralism, which still continues to be the major source of livelihood of a significant portion of the Sudanese people. In 2006 the government raised the slogan of green
revolution (Al Nafra El Khadra) aiming to develop the agricultural sector. Oral discussion proved that 90% of the fund went to the agriculture (farming only).

4.3. Land Tenure Systems in Sudan:

Historically, access to land and water for pastoralists in Sudan associated with a particular tribal homeland (DAR), defined by customary rights. In this case tribal leader (Nazir, Omda and sheik) are the responsible person in offering and distributing land for both local villages and outsiders. Within the (DAR) each member or group within the territory has access to grazing land through the system of communal ownership. Dar system is suitable in such region and it helps in both reducing conflict and conserving the environment as each group knows their limits and boundary. This system showed its efficiency since the colonial time till the year 1970. During this time the government abolishes the system of native administration as it decelerated that land for all under the control of government.

As the result to land Act 1970, mechanized farming expands dramatically and trespasses over the grazing lines and reduced the dry season pastureland of the pastoral groups. This has induced disputes between farmers and pastoralists, particularly over land covered by unauthorized schemes. As the pasturelands in Sudan are not legally registered and as such considered the property of the State. This change in land tenure has led to severe conflict between land users; Darfur in western Sudan is the best example.

In Sudan, as well as in many other African countries, we find two systems of land tenure: customary and statutory tenure. Customary land tenure is governed by unwritten traditional rules and administered by traditional leaders. Active occupation or usage of a piece of land is the main evidence of ownership or an existing interest in the land. In customary tenure, access to land is contingent upon tribal or community membership controlled by the chief. Households have strong, exclusive residential rights, seasonally exclusive rights to arable land, and shared rights to grazing land and natural resources. Land is not alienable from community trust, but nonetheless usually an individual’s land use rights within are secure within the customary system, subject to certain conditions. Statutory land tenure system on the other hand, is governed by modern law and normally supported by documentary evidence, such as title deed or lease certificate, and administered by the government. Everywhere in Africa colonial regimes imported systems of common and statute law for their own purposes, operating them alongside existing systems.
of customary law. Sudan has no exception to this. Customary law prevailed in some areas, while imported common law prevailed in others. Then, after independence, it was believed that the nationalization of land together with the abolition of the Native Administration would have enforced a unified system of land rights that would have brought prosperity to rural and urban areas. But customary law and tenure proved resilient, and reforms aimed at strengthening state control over customary held land never were efficient. Today customary law, though in most cases not recognized by formal law, continues to regulate daily life, especially in rural areas and among the poor and underprivileged. The main consequence of encroachment of these two legal systems is insecurity of tenure, which is widespread in Sudan, many informants interviewed during the field work tended to maximize the problem by saying that “there is a problem with land tenure”. The customary system, when there is no interference from the statutory one, works pretty well. However when development planning begins or investment project are proposed, underlying conflicts come to the surface.

4.3.1 Statutory Legal Framework:

In order to understand the legal framework of land tenure in Sudan, five periods should be considered. These are Funj Sultanate, Turk-Egyptian, Mahadist, colonial and after independence period. This different ages show the philosophy and ideology in land tenure system in Sudan.

During the Funj period of (1405-1821), title to land was characterized by a Dar-based system of organization of access and entitlements to natural resources usually called the wathiga system, by which Muslim monarchs granted land, as a gift, to local tribal rulers and holy men (Spaulding, 1979). In the predominantly pastoral rain lands, tribes constituted the basic administrative units, and the charters were granted to the "power-centers", who were thereby given external legitimacy and support. Each tribe was assigned by the sultans a Dar, i.e. a homeland over which its members would maintain primary rights of access and use (both for farming and for herding). At the same time, the leadership of each Dar-holding group was made responsible by the Funj for tax collection and for maintaining order in its territory, notably by preventing or solving conflicts over land and other natural resources. The clear example is the (wathiga) of funj to Abu sin the Nazir of Shukriya. In this wathiga it was written that on of the noble of Funj Sultanate offer the tribal leader of shukria a land (Butana area). Recognition of Shukriya land by the
Funj period reflects the political situation at that time. This granted land was given to then after long fighting with neighbouring tribes. Further signs of the strong ties between Shukriya leadership and Funj state under the Dar system were frequent intermarriage between Shukriya tribal chiefs and Funj nobility, as well as the sultans’ practice of giving gifts of slave soldiers to Shukriya Nazirs, with a view to securing their loyalties as well as to supporting them against potential rivals within or outside their tribal confederation. The main task practicing by Nazir, was both the primary representative of the Funj in a given Dar and the main person responsible for administering land rights among nomadic and sedentary groups living in the area. This responsibility included overseeing land and other resource management within and among different communities, assigning land entitlements to nonlocals, and in rare cases revoking land rights by expropriating land plots from households or communities. Another main function of the Nazir is tax collection. It was in the interest of the tribal leadership to make land distribution and use as profitable as possible, so as to generate large amounts of taxes part of which could be kept by leaders at various levels of the tribal hierarchy, and part of which would be channelled to the Funj court and serve to secure its continued support.

An institution similar to the Funj wathiga also prevailed in Darfur in Western Sudan where the Keira kings granted hakura ("concession" or "monopoly"), but often for a specific period of time (O'Fahey, 1980). (El Mahadi 1979) mentioned that during Funj Sultanate the main uses to which land was put were cultivation, woodcutting, grazing.

The policy concerning land tenure in Sudan during the Turco-Egyptian rule (1821-1884), has applied the same policy of Funj Sultanate. Land tenure system during this time has two main forms of ownership. These are individual land ownership of riverain and urban. The second form was continuous recognition of the communal ownership vested in a "tribe" during Funj sultanate. During this period in order to get individual rights you need to prove the use of land for at least peaceable five years. This idea supported by (El Mahadi 1979) who states that the Egyptian law applied in the Sudan in relation to the duration of the prescriptive period was the provisions of article 16 of the Egyptian civil code in relation to the prescriptive period were applied (the period of prescriptive or limitation there were five years of peaceable, public and uninterrupted possession provided that possessor had a just title, and if could not prove a just title, then fifteen years of peaceable public and uninterrupted possession would be required). There was no different period of
limitation when person was claiming against the government irrespective of whether the land was riverain or rainland (Bolton1948). Improved cultivation during this time have led to the permanent settlement and trade in the area, but also brought new tribes. Trade links extended to the Egypt, mainly livestock were exchanged of sugar, cloth and other simple manufactured goods. Many villages on the riverine area became market centre and Rufaa in 1860 became the only town within the boundary of present Butana.

During the Mahdist rule (1885-1898) no changes were introduced to the basic structure of the land tenure system except in so far as they regularized the mode of collecting taxes from the cultivators. The practice of granting tracts of land to tribal chiefs, village sheikh and religious men continued on the understanding that paid whatever was imposed on them and their tenants (El Mahadi 1979). Nevertheless the ownership of vast territories was transferred by the Khalifa from disloyal to loyal groups; but this was soon to be reversed by the British colonial administration (Awad, 1971).

The colonial government did not declare itself the owner of all land in Sudan by right of conquest. But the view was taken that all native rights in land, particularly individual ownership, were to be recognized and safeguarded in every possible way (El Mahadi 1979). The statutory legal framework governing land tenure arrangements in Sudan is founded on the land laws that were issued in the pre-independence period by the condominium government of the Anglo-Egyptian Sudan which passed its first land law - *Title to Land Act* – as early as 1899. By this law the colonial administration announced that all land in northern and central riverain Sudan which had been continuously cultivated during the preceding five years, would be considered the private property of cultivators.

In 1925, another land law entitled the *Land Settlement and Registration Act* was issued by the government, according to which all land not claimed for registration was to be regarded as government property. Land was deemed to be government property if waste, forest or unoccupied and those criteria applied to most of the land areas in the different parts of the country. Section 16 of the land settlement and registration ordinance 1925 stated that: "all waste, forest, and unoccupied land shall be deemed to the property of the government until the contrary is proved" (El Mahadi 1979). The main policies of colonial towards land tenure in Sudan organize as follows:-

1. Recognition of the of Native Administration system as the responsible body for managing natural resources and again collection of taxes besides
spreading of security in the country and enforcing the regulations that govern grazing (Dar, grazing line, date of entering, common & special grazing, settle disputes). It worth mentioning that the colonial government was supporting of annual meeting held by Nazirs for discussing the issues of grazing and resolving conflict.

2. In order to regulate grazing for tribes inside and outside the Butana, the colonial government started to regulate grazing activities by delineating General grazing Area in 1904. Moreover, they are enforcing grazing line which was considered as northern limit for agricultural cultivation. No farmer was allowed to cultivate north of it, otherwise pastoralists would not be held responsible for crop damage. Similarly, pastoralists were instructed not to enter the cropping areas with their animals during the agricultural season, otherwise they would be liable to both fines and imprisonment in case of agricultural damage.

3. The movement of the southern pastoral groups to and from the northern part of their region, through the cultivated area, was also regulated to avert conflicts between farmers and herders. Sufficiently wide nomadic routes and corridors were recognized as part of the grazing domain, and no farming was allowed along them. In addition, local orders were annually issued stipulating the latest date for harvest, after which pastoralists were free to enter the cultivated area and graze the agricultural residues.

4. A further set of controls over nomadic movement devised by the British colonial government concerned the manipulation of water policy. The colonial government accordingly used to open and close watering points in order to influence the timing and direction of pastoral movement, normally away from sites considered poor and in need of rehabilitation. Range management was linked to water policy in a region and this promoted a high degree of direct control by government over pastoral movement.

The cornerstone of the post-independence land legislation was the 1970 Unregistered Lands Act which decreed for all unregistered land throughout the country to be registered as government property, and granted the government the legality of disposing of lands as it saw fit. That law was passed by the Nimeiri government to serve the purposes of his ambitious plan to make Sudan “the bread basket of the Arab world”. That plan required macro-structural changes that were intended for boosting food production, through direct involvement of government corporations and private large-scale rain fed
farming schemes, for export to the oil-rich Arab countries. Thus, policies involving large-scale investments in irrigated areas and the expansion of capital intensive mechanized rain fed agriculture were adopted by Nimeiri’s government with the aim of radically transforming Sudan’s traditional agricultural sector and modernizing farming operations. That transformation policy of Nimeiri’s government required radical changes in land tenure and natural resource use patterns, and the takeover by government of land that was cultivated under customary land use arrangements involving use of traditional methods.

The 1970 Unregistered Land Act was more disempowering to the customary titleholders than all of the colonial land legislation which preceded it. Most of the customary titleholders, for different reasons, were unable in the past to register their lands under the provisions of the 1925 Land Settlement and Registration Act, principally because of the overly complicated and lengthy land registration procedures, lack of awareness of about the existing land acts and their provisions, and the difficulty of getting exclusive property rights in situations involving complex usufruct land use arrangements. The 1970 Act was forcefully implemented although most of the affected population groups did not look upon the state as the legitimate owner of the unregistered land. The forceful implementation of the law was aided by the concurrent decision that was taken by the Nimeiri government to abolish the Native Administration, and thereby stripped tribal authorities of their formerly recognized functions concerning allocation of land, management of natural resource use and resolution of land-related individual, inter-group and inter-tribal conflicts.

With the abolition of Native Administration, an administrative vacuum ensued, and to-date no alternative institution capable of regulating grazing activities, or even of collecting herd tax, has been established. Simultaneously pastoralists have lacked an institution willing to enforce grazing lines. An unfettered expansion in unauthorized mechanized schemes has thus ensued crossing the formerly recognized grazing lines, blocking access to watering points and disrupting virtually all the nomadic routes in the country.

The last initiative relating to natural resource use that was passed by Nimeiri government, following his adoption of Islamic Shari’a laws, was the 1983 Civil Transaction Act that attempted to re-instate the Native Administration to participate in the regulation of natural resource user and the resolution of resource-use related conflicts. The 1983 Act (which was later on amended by Omer al-Bashir in 1990) reaffirmed state ownership of all unregistered land,
but gave the registered usufruct rights a legal weight comparable to that of freehold land ownership. In addition to ascertaining the land rights of the government, and thereby providing for it to continue its preferred practice of allocating land to private investors for establishing large-scale mechanized rain-fed farming schemes, the 1983 Act also provided a legal framework for regulation of access to pasturelands which gave the government the right to place restrictions on grazing in certain situations.

4.3.2 Customary System Regulating Access to Land:

Land is regarded as the most valued asset in the eastern region, especially among the indigenous tribal groups that have historically recognized territories, such as the Hadendowa and the Shukriya. In reference to customary land rights, two terms were invoked more frequently by interviewees during field discussions, namely Asl and Amara. The term Asl (“origin” in Arabic) refers to land that was historically acquired through customary arrangements by members of the indigenous tribal groups which first settled in the area. Wars have been fought in the past by tribal groups to protect such lands from being taken by other tribes. The Asl right to land entitlement is permanent and unchangeable under customary rules. On the other hand, the term Amara (temporary usage) refers to Asl land used temporarily by non-owners after being granted permission by the original owners. Use of Asl land for establishing an Amara customarily requires the payment of (a token rent in Eastern Sudan called Godab) to the owner. The continuity of use of Asl land as an Amara depends on the continuity of payment of godab and recognition of the land rights of the owner. According to the customary law, Amara right is unchangeable as long as the users continue to pay godab. However, Asl holders are expected in principle to preserve their land right and property constantly by preventing Amara users from cutting trees and opening new wells or repairing the old ones without permission. Landless outsiders and members of the indigenous tribe can access land through the system of Ukul-u-Goum which literally meanings eat and leave, that is to cultivate the land and then leave to the original owner after crop harvest. No rents are demanded by the land owners in this case, but the users (usually poor people in need) may be expected to leave the land immediately after crop harvest.

Lands in tribal areas are accessed under the umbrella of communal ownership rights. The tribal leader is responsible for assigning land for both cultivation and grazing and for settlement. Usually the land nearer to the
settlement is assigned for cultivation, while that away from the settlement is for grazing. The area reserved for grazing is known locally as Gifar (empty land). Members of the tribes have secured rights to use communal land, and that right can be passed to heirs. Under communal ownership, a person within the tribe can access land but under the supervision of the tribal leader.

Women in the eastern region in general and in the study area in particular are generally excluded from the system of land rights entitlement and they are not allowed to inherit tribal lands. The philosophy behind their exclusion is that women might marry outside the tribe, and their exclusion will prevent tribal land to pass to members from different tribes. Few mentioned that they did not participate in fighting and war against neighboring in order to access lands.

In open access areas, members of all tribes have recognized land use rights, and no body has the power to exclude others. In order to facilitate access to good grazing by all pastoral tribal groups in Butana, the colonial government demarcated an open access area, as early as 1904, in western Butana and designated it as general grazing land. This area is open for all tribes during the rainy season, but on condition that the non-indigenous tribes should leave it immediately at the end of the rainy season. To regulate this type of land use in the Butana and elsewhere, animal passage routes were created to organize livestock movement and prevent conflicts with sedentary population groups. A careful categorization of land into "common" and "private" grazing areas was introduced to contain inter-group conflicts. The common area was open for all pastoralists present in the dar during the rainy season. But outsiders were required to leave the dar by the end of the rainy season and return to their respective dry season sites. The private grazing areas were reserved for the tribal groups of the specific dar, and no tribe from outside were allowed to graze. The private grazing areas also contained the permanent water sources, from which outsiders were barred and their animals were expected to depend on rain water pools in low lying areas.

Recently the system of tribal leader regime is under crises and this may be due to several factors. Thus, the major factor behind the weakening of Native Administration, and indeed of customary institutions, is the socio-economic transformation of Sudanese society even in remote rural areas supported by state policy in land tenure. Other factors include environmental changes, the effects of the droughts in the mid 1980s, with the growth of local and regional markets and change of livelihood systems significantly in Sudan in general and the study area in particular. All these factors mentioned above have encouraged
growing sedentarization of formerly mobile groups; groups devoted to mobile pastoralism turned to agro-pastoralism, abandoned their various forms of mobility (including shifting cultivation) and settled in communities. Growing demographic pressure and market demand for certain agricultural products also played a role in encouraging the progressive abandonment of livelihood strategies based on communal tenure and in transforming individual or household-based usufruct rights into private property, particularly in fertile areas of Gedaref.

Since such changes are likely to continue in the foreseeable future, prospects for the revitalization of the Native Administration mechanisms for natural resource management are limited, but not negligible, as implicitly recognized by the signatories of the 2004 Comprehensive Peace Agreement, which envisions, among other things, some initiatives to revamp customary laws and practices concerning land tenure. Also in the Eastern peace agreement 2006 there are something about accessing to land and natural resources. Thus, Article 21 mentioned rules and regulation of land usage and ownership these organize as follows www.sudantribune.com:

1. The regulation of land tenure, usage and exercise rights in land is to be a concurrent competence at the appropriate level of government.
2. Right on land owned by government of Sudan shall be exercised through the appropriate or designated level of government.
3. All level of government shall institute a process to progressively develop and amend the relevant laws to incorporate customary laws and practices, local heritage and international trend and practices.
4. Land management structures and institutions shall be developed and legally supported to promote sustainable development and protect the environment.
5. The government of Sudan shall ensure that all citizens affected by the development of land and/or national resources are consulted. Persons whose property or livelihood is adversely affected by development of land and or national resources have a right to adequate compensation.
6. All persons arbitrarily or unlawfully deprived of their rights to land shall have those rights restored to them.
4.4 Pastoral Adaptations in Butana Area:

This section deals with the past adaptation to the scarcity of nature in Butana area. Generally, there are two types of practical adaptation: these include grazing and farming strategies.

4.5 Practical Adaptation-Grazing Strategy:

Having non-equilibrium environments of the Northern part of Gedaref State (Butana Area) where there is immature ecosystem; pastoralism is recognized as one of the major and most suitable land use system in such area. Traditional producers, mainly pastoralists have developed multiple strategies to cope with such a complex ecosystem. These strategies that include both practical and cultural practices have always been mobile, flexible and dynamic. Historical evidences show that these strategies survive people in such harsh regions for hundred of years and help them recover after the frequent droughts, outbreaks of famine and shocks. These adaptive strategies reflect the out come of long experiences, deep understanding and comprehensive indigenous knowledge. Generally, these strategies include livestock mobility, diversification of animals, risk management supplemented by other income generating activities such as labour wages, handicraft, etc.

4.5.1 Pastoral Mobility:

Moving over space and time among pastoralists reflects the shortage and mal-distribution of water and natural pasture in the arid and semi arid areas. Moreover, it explains the good knowledge and understanding of the local inhabitants in such areas as mobility is the most suitable mechanism to secure livelihoods in such unpredicted eco-system. Generally, in the study area there are two types of mobility: the mobility of internal tribe that inhabited Butana and the movement of non resident tribes (outsider) that spent the wet season in Butana. This strategy allows both local and non resident tribes (outsider) groups for the use of maximum available pasture sources; helps minimize the spread of animal diseases and recover after shocks.

4.5.1.1 Internal Mobility:

The discussion with old people have shown that the local tribes often graze their animals only inside Butana area and when it forces to go out of Butana especially to southern part of Gedaref, they believe their animals will not come back. Therefore, all the internal tribes graze their animals and follow mobility only inside Butana. This idea was approved during the drought of 84-1985 as a lot of livestock got lost because of moving far south in Gedaref state.
Generally speaking, people in Butana are fully mobile, so during the rainy seasons the whole family move to the Western part where rains and pasture are available, particularly they graze in the General Grazing Area (GGA). While during the summer season, they graze around their Dar. The idea behind this movement is to share the resources with non resident tribes (outsiders) in the Western part and reserve the rest of Butana for the dry seasons.

The villages that lie in the Eastern part graze around their homelands (Dar) during both rainy and winter seasons and move to the river Atbara during the dry seasons. Those in the Western part graze around their homelands (Dar) during rainy and winter seasons and move to the river Blue Nile during the dry seasons. Pastoralists in the Central and southern parts graze around their homelands (Dar) during rainy and winter seasons and remain around their water points during the dry seasons (Map 4.1).

Mobility is considered as a strategy rather than just a kind of movement. Therefore, several factors should be considered before the movement of livestock these include security of traditional routes, type of animals, availability of family member and the situation of rangeland in the destination area.

4.5.1.2 External Mobility:

The second type of mobility is movement of the non resident tribes (outsider) to and out of Butana area. This covers two types of movement: During rainy seasons to the northern part (Butana area) and during the summer to the area of origins. These types of movement organized as follows:

1. Rainy Season (kharif) Movements:

From late June up to the early July most of pastoralists if not all in Gedaref State move to the Butana area to escape from insects (biting flies) and muddy condition in the southern part and above all access natural and good pasture in Butana. During this time, the Butana becomes more suitable area for grazing with sufficient water and palatable grasses for grazing. Non resident tribes (outsiders) pastoralists stay in Butana till the end of October when the existing sources of water are dry up. Their grazing area is restricted to the General Grazing Area (GGA) which was determined by colonial people. In 1904, following a number of conflicts between the Western Shukriya and the kawahla and Rufa'a al Sherig, a grazing agreement was signed which defined a general grazing area which could be used by all ethnic groups visiting Butana during rainy season (Sorbo 1985). All remaining area was reserved for the indigenous tribes (Shukriya) and was called Butana special. That means the
Butana East of general grazing area was recognized as the exclusive grazing for the local communities of Butana. Mobility among pastoralists to the Butana areas does not happened haphazardly. Instead pastoralists with the help of traditional institutions and using their own indigenous knowledge select eight traditional routes distributed throughout the area (table 4.1 and map 4.2).

2. Summer Season (Seif) Movements:-

Proximately at the ends of October non resident tribes (outsider) pastoralists starts to leave Butana area. It was observed that scarcity of water in General Grazing Area (GGA) was the essential factor behind the early leaving from Butana. In addition to that, there was no problem of water in the southern parts of Gedaref state. Moreover, crop residues from mechanized farming schemes were attractive factor for moving. Immediately after harvesting, the farmers leave the residue for pastoralist to graze it freely. This type of mutual and symbiotic relation between farmers and herders is known locally as (TALK). By so doing farmers benefit from natural fertilizer of livestock (manure).
Map 4.1: Seasonal Movement of the Local Tribes in Butana

Legend
- Movement in dry Season
- Movement in Wet Season
- General grazing

Source: fieldwork 2006
Map 4.2 Animals Routes in the Study area

Legend
- Animal Routes
- General Grazing Area

Source: department of range and pasture-Gedaref
It is worth mentioning that moving in and out Butana is not something straight; instead pastoralists have to settle for few days (7-15) in their ways to and out. This system is known locally as Marheel or Nazla. Pastoralists justify that the main reasons behind that is to change the grazing to a better one, getting their daily needs (sugar, coffee, cloths) from closer areas, rest of animals, get some medicines for both and get rid of the weakest animals by selling them. Besides practice of their social services such as marriage, wedding, etc.

The study discovered that the selection of places for Nazala depends on some arrangements and understanding of the area. Always pastoralists select the area near and close to water points and pasture (khors, wadis, permanent water centre and forest). It was observed that Rwashda forest is the best area for practicing such processes.

### Table 4.1: Dominant Tribes and Animal Routes

<table>
<thead>
<tr>
<th>N O</th>
<th>Major tribe</th>
<th>Animal route name</th>
<th>Dominant animal</th>
<th>Distance in km</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hadandwa-Rashida-Halaween</td>
<td>Moqattah to Gallabatt</td>
<td>Camel and sheep</td>
<td>89</td>
</tr>
<tr>
<td>2</td>
<td>Shukriya-Bawadra</td>
<td>East Butana to Taya</td>
<td>Camel, sheep</td>
<td>156</td>
</tr>
<tr>
<td>3</td>
<td>Felatta-Jaleen-Dabainah</td>
<td>South Butana to Fazrah</td>
<td>Camel, sheep</td>
<td>140</td>
</tr>
<tr>
<td>4</td>
<td>Shukriya-Kenana</td>
<td>West Butana to Umm Kurah</td>
<td>Camel, sheep</td>
<td>183</td>
</tr>
<tr>
<td>5</td>
<td>RuffaElhoi-Kennanah-Kwahla</td>
<td>Central Butana to Umm Kurah</td>
<td>Sheep -cattle</td>
<td>170</td>
</tr>
<tr>
<td>6</td>
<td>Kennanah-Kwahla</td>
<td>West Butana to Hillatt Hasan</td>
<td>Sheep -cattle</td>
<td>82</td>
</tr>
<tr>
<td>7</td>
<td>RuffaElhoi-Kwahla</td>
<td>El Darab El Aswad</td>
<td>Sheep -cattle</td>
<td>74</td>
</tr>
<tr>
<td>8</td>
<td>Kennanah-Ruffa Elhoi</td>
<td>Umm Burush to El Khiyari</td>
<td>Sheep -cattle</td>
<td>75</td>
</tr>
</tbody>
</table>

Source: pasture and range Departmnet-1997 modified by researcher.

From the above mentioned about mobility one can conclude that mobility as adapting mechanism has many positive things which organize as follows:-
1. It helps in optimal utilization of the meager resources that varied over space and time and thus conserving the environment.
2. Efficient risk management strategy for example if some area affected by disease or other crises it is easy to move and save the rest of animal to more healthy area in condition that land use communally.
1. It is an easy way to avoid shortage in rainfall by changing the place and then recover after natural risk or famine outbreaks.
2. It plays a vital role in sustainable management of the resources as livestock not concentrated too much in one area.
3. Pastoralists mentioned that mobile livestock is more productive than the settle one reared in the same environment. As they said "Allah created animals with four legs so as to move not settle and stay long in one place"
4. Make the herders more accepting to changes as they pass through different cultures. Thus, the view that says pastoralists are restricted needs to be revised.
5. It helps in creating link and relation with others and hence created social network which help them secure their livelihood and absorb crises.

4.5.2 Diversification of Livestock:
This type of adaptation reflects clearly the knowledge of local producers and the deep understanding of immature eco-system. Thus, their concrete understanding about the variation in pasture and water over space and time together with attitudes (behaviour) of animals in grazing let them diversify their herds by breeding different species of livestock. In response to the question about the type of animal in the past around (83%) mentioned that they used to graze all four types of animals (camel, cattle, sheep and goats) and the rest (17%) mentioned more than two types. This strategy helps them know that camel and goats prefer browsing while sheep prefer to graze grasses. Having more than one type of livestock in such marginal areas has more vital things; these are:
1. Maximize the use of available and meager grazing resources (browsing and grassing).
2. Herd diversification is also used as a risk spreading strategy, since it enables pastoralists to minimize losses when livestock disease epidemics occur.
3. Offer a better chance of employment. Thus, all members regardless of their age and sex can find a job. In the study area, the young always move with smaller animals (sheep and goats) while adults move with high number and large animals (camel and cattle) and even women help in taking care of the small and milking animals.

4. Help in the redistribution of the animals among social group especially during crises.

4.5.3 Traditional Recovery Strategies:
Pastoralists in the study area and elsewhere in the African sahel pursue a variety of strategies to re-build their herds after drought or any crises. As mentioned in chapter two that drought is part of the nature of the semi arid lands. This study reveals that pastoralists are always aware of that so they developed their own strategies to recover after drought. During a crisis pastoralist adopt the strategy of reducing animal number through the system of social network. The group discussions have shown that pastoralists distributed their livestock among their relatives that live in different places aiming at that they will rebuild their stock when the crisis are over. Restocking is also another recover strategy, after drought pastoralists use their own breeding knowledge and try to maximize their animal number as soon as possible. The number of livestock increases when the rangeland situation is getting better and vice versa. It is worth mentioning that the number of livestock will not remain the same all over the time see table 4.2.

Table 4.2: Livestock Number and Types in Gedaref State in (000)

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Camel</td>
<td>186</td>
<td>282</td>
<td>597</td>
<td>179</td>
<td>435</td>
<td>450</td>
<td>113</td>
<td>540</td>
</tr>
<tr>
<td>Cattle</td>
<td>75</td>
<td>100</td>
<td>642</td>
<td>366</td>
<td>38</td>
<td>744</td>
<td>242</td>
<td>1,120</td>
</tr>
<tr>
<td>sheep</td>
<td>286</td>
<td>525</td>
<td>1589</td>
<td>1011</td>
<td>1164</td>
<td>1301</td>
<td>370</td>
<td>2,550</td>
</tr>
<tr>
<td>goats</td>
<td>-</td>
<td>368</td>
<td>925</td>
<td>827</td>
<td>539</td>
<td>611</td>
<td>435</td>
<td>820</td>
</tr>
<tr>
<td>Total</td>
<td>547</td>
<td>1257</td>
<td>3753</td>
<td>2383</td>
<td>2516</td>
<td>3106</td>
<td>1160</td>
<td>5,030</td>
</tr>
</tbody>
</table>

Source: Harrison, 1955; Abu Sin, 1970; 1993; range and pasture; 1995 Livestock department in Gedaref-2006
During the discussion the author has identified some hidden ideas behind the strategy of increasing animal number. These are organized as follows:

1. The process of recovery after drought does not happen over night so it takes a long time. Thus, maximizing animals' number will increase the speed of recovery.
2. Help much in buying fodder and water during shortage of rains. Moreover, during crises the price of animal's declines sharply, therefore pastoralist needs to sell more animals to buy few crops.
3. For fear of unexpected disaster; this idea has a loin share in the discussion (unpredictable environment).
4. For social position and this idea has little share in the discussion.

Traditional producers in such areas adopted several methods in order to increase their livestock number. Major among these is to increase female type among herds and still this strategy is going on. Roughly, the amount of female in each herd is (73%) while male is (27%). This figure explains that pastoralists always seek about increasing their livestock whenever they find a suitable chance and this may be due to harsh environment. Therefore, herd owners are interested in having larger numbers of females in all kinds of animal species since the female represents the reproductive type.

4.5.4 Grazing Management Strategy:

As a matter of adaptation, pastoralists select the most suitable time for grazing especially during the dry period. Usually pastoralists prefer evenings and mornings for grazing and a void high temperature during the mid-day. The philosophy behind selecting this time is to minimize drinking water, conserving resources and above all avoiding high temperature which has negative impact on female fertility, especially camel. Therefore, during hottest months locally known as (Manzil El Traya) most of the pregnant animals shade under large trees to avoid ultimate abortions. In the discussion most of local inhabitants of Butana blame the non resident tribes (outsiders) for clearing the trees as they said non resident tribes (outsiders) cut the trees to make fence (Zariba) for the smaller animals to protect them from high temperature.

Managing water seems to be a nightmare for all people in Butana especially pastoralists. To solve this problem they adopt some methods to cope with the scarcity of water by dividing the whole year into rainy season (kharif) and summer season (Seif). In kharif, pastoralists used to water their animals twice a day. During Seif they depend on watering point. They create many rules to
manage the existing water points in general and particularly during dry seasons. These are:

1. Watering interval decrease to once a day and in critical period it could be once every two days or more.
2. Create rational system to organize the movement of animals to permanent water sources from Butana. Therefore, sensitive animal to the shortage of water will leave early from Butana (sheep and cattle) usually at the beginning of January. The most resistance animal to drought will leave late from Butana area. The movement of these animals to the permanent water centres starts at March. From the movement of the animals it is easy to measure the situation of water availability so if the resistance animal starts to move early from the Butana, this means the situation is too hard and the vice versa.
3. Watering camel from Hafirs is forbidden.
4. Determine price of watering sheep and cattle from Hafirs in order to reduce the interval and collecting money for maintenances.
5. More feeding is needed for the lactating and pregnant females especially cattle and sheep.

4.5.5 Construction of Hafirs and Wells Strategy:

Local communities in Butana area are aware of the geological structure of the study area. Thus, construction of artificially excavated holes by machine or even hands is the main strategy of coping with water scarcity in the study area. (El Tayeb, 1985) mentioned that during 1940s and the end of 1950s 12 water points and 12 Hafirs were constructed in the area. To avoid concentration of animals around these water points the factor of distance was considered in selecting the location and the size of these water points. According to Lebon (1965), the average distance between water points is about 22.3 km. see table 4.3. Moreover, in 1955 around 18 large Hafirs were constructed in Butana area. They acted as additional water points, delaying the movement of animals to native wells which were the proper (damaring) centers. It is worth mentioning that, although other tribes had the right to graze their animals on the Butana, only shukriya were allowed to dig well. Thus, they monopolized access to water until recently when other ethnic categories were also granted rights.
Table 4.3: Capacity and Distance of Hafirs in Butana Area

<table>
<thead>
<tr>
<th>Hafirs types</th>
<th>Capacity in m³</th>
<th>Distance in km Lebon 1965</th>
<th>Distance in km 2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>30000</td>
<td>32</td>
<td>20</td>
</tr>
<tr>
<td>Medium</td>
<td>18000</td>
<td>21</td>
<td>12</td>
</tr>
<tr>
<td>Small</td>
<td>12000</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td>Average</td>
<td>20000</td>
<td>22.3</td>
<td>12</td>
</tr>
</tbody>
</table>

Source: Lebon 1965 + Fieldwork 2006

From the table above it is observed that distance between Hafirs is relative to respective capacities. The larger the Hafir is, the longer the distance and vice versa. This is meant to avoid degradation, but due to the recent changes the number of Hafirs has either increased or owned privately without consideration of the distances. This has increased the processes of degradation as will be revealed later in chapter six.

Whereas grazing is said to be communal for all members of the tribe, wells are considered private, or are generally in the hands of elite households. Thus grazing is only communal in the dry season, for those who have access to water. Digging wells is too expensive and hard in such geological structure of Butana. But wealthy households were able to command enough labour (partly by using slaves) to overcome such problems (Sorbo 1985). This idea is supported by (Eltayeb 1980) who explains that after having made a survey of settlement at 13 well centres, he found that the dominant Nurab, Sinnab or Aishab (pure Shukriya) were represented in ten of them whereas a number of other lineage were only represented in one settlement each.

Figure 4.1 shows the existing sources of water in Butana which include Hafirs, Traditional wells, Boreholes, Khors and Gloud (Gloud: natural holes in hills full of water). It reflects that around (66 %) of the total population depends on Hafirs as a source of drinking for both humans and animals.

4.5.6 Marketing Strategy:

Selling of animals is not a scarce commodity among pastoralists as seen by some researchers and planners. To cope with limited resources in the area the herders adopted a marketing strategy which aims at striking a balance between livestock number and available resources in the area. The group discussions have shown that the number of animals sold varies depending on the amount of
rainfall, availability of pasture and family needs. Even within the same year, the number of animals sold in dry period differs from that in wetter. The elderly people agreed that young and mature males have the biggest sharing in selling. Sales are due to many things: buying their basic needs, minimize pressure on water and pasture especially during crisis.

**Figure 4.1: Types and Percentage of Water Sources in Butana**

![Pie chart showing water sources in Butana](image)

*Source: Fieldwork, 2006*

Selling of livestock in Butana has two channels: local markets in their villages and the town markets (Gedaref and Tamboul). Village level markets which are of local importance only such as Subagh and El Adied. These periodic markets (once a week) serve the people of the same village and neighboring villages. In most cases traders from the surrounding location (Gedaref and Faw) come with their cars and lorries to buy animals and animals products in Butana. Also they can exchange animals with other consumer commodities (sugar, tea, medicine, clothes). One can conclude that there is no intervention from the state towards marketing, thus
selling and buying depends on the family basic needs and the natural events. The researcher has sum up the factors behind marketing and these organize as follows:

1. Selling of pastoral production so as to buy family basic needs (sugar, clothes, medicines and building materials.
2. Getting rid of the weakest, non-productive male animals.
3. Exchanging male animal with female in the process of restocking especially after dry season.

The study concludes this section by mentioning the adaptation strategies adopted by pastoral communities to cope with the scarcity of water in the area. Table 4.4 reflects that traditional producers developed their own strategies to adapt to the shortage of water among these are the reduction of consumption and mobility. Recently and due to the problems facing this sector, people added another new coping strategy which is buying water from mobile lorries.

Table 4.4: Pastoral Adaptation to the Scarcity of Water

<table>
<thead>
<tr>
<th>Adaptation Strategy</th>
<th>Frequency</th>
<th>percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced Consumption</td>
<td>169</td>
<td>56.4</td>
</tr>
<tr>
<td>Storage in small Hafir</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>Migration to other areas</td>
<td>16</td>
<td>5.3</td>
</tr>
<tr>
<td>Send animal to other areas</td>
<td>90</td>
<td>30</td>
</tr>
<tr>
<td>Make well more deeper</td>
<td>10</td>
<td>3.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>300</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Source: fieldwork 2006

4.6 Farming Adaptation:
4.6.1 Type of Lands under Cultivation:

This section deals with type of adaptation in coping with the fluctuation of rainfall, predominantly among farming system in the study area. During rainy seasons mobile pastoralists used to cultivate some crops around their Dars. Thus, the existence of wide spread of wadis and khors help much in cultivation through using traditional water harvesting techniques. The objectives of this farm are normally for subsistence purposes and always practice in a collective's way (Nafir: free local collective work). The sizes of the plots are hardly exceeding 10-30 feddan.
Generally, there are several types of rain fed cultivation in the study area. These include teras, wadis and Bildat. The selection of a particular type of cultivation is primarily dependent on the amount of rainfall, distance to settlement and pattern of surface runoff.

1. Teras Cultivation:
   Due to the scarcity of water in Butana area, traditional farmers adapt to develop a small scale of water harvesting techniques among these is Teras cultivation. Teras cultivation is probably the most important form of traditional rain-fed cultivation. Simply, this technique depends on making earth dams in order to get maximum benefit when it rains through the increase of soil moisture. It is a simple rectangular system of earth embankments which collects surface runoff water. It consists of one base embankment and two parallel wing embankments with the open side in the direction of runoff. The height of the embankments hardly reached one meter. Teras cultivation is widespread over much of Butana especially in the central area, where rainfall is too low. This system of cultivation also helps in showing the ownership of lands.

2. Wadis Cultivation:
   Due to the physical characteristics of Butana, wadi and khors are distributed all over Butana see map 3.3 in chapter three. This type of cultivation is always practiced along both sides of the Wadis and at the deltas in the end. It was considered as the most essential type of cultivation in the area. This is because wadis have very fertile soil and always end with Deltas. The annual flood makes the wdis more fertile and thus increases the productivity of crop cultivation. The size of the farm is range between one feddan up to 20 feddans. The distribution of size depends on an extended family basis. Access to cultivable land in wadis is governed by the tribal land tenure system and regulated by the local communities. Thus, wadis are usually divided into pieces of land, with each allotted to a particular household or family. Variations in the size of land allocated to individual households relate to the rainfall and flood levels in a particular year. The family size and the ability to farm also influence the size of the plot. The plot size per household is quite variable throughout the area. Through the discussion it appeared that each household has more than one pieces of land in various wadis. Having more than one plot is an efficient strategy to cope with the scarcity of rains and again to get maximum benefit from flooding as it varies seasonally. It was observed that most of wadis in
Butana are related to the tribal leaders families. (Eltayeb 1980) also studied land distribution in 15 wadis in Butana and found that the Sinnab (pure Shukriya) were represented in nine wadis and the Nurab in five and all other in one. This supported the view that tribal leaders are not completely fair in distribution of lands and also proved why influential tribes have access to tenants in irrigated scheme (Halfa and Rahad).

3. Small Plot Cultivation (Bildat):

The main point that distinguishes Bildat cultivation from other mentioned above is that Bildat always lie close to the village and usually consists of small plots of 5 to 25 feddans, which are cultivated manually. The objective of this small farm is for local consumption for both (human and animal) and always practices in a collective's way. In addition, an agricultural practice under such condition depends on family labour (extended family) and free local collective work known locally as Nafir. This type depends on the use of simple and traditional methods in cultivation such as Maloud, Salokka and Hashasha. Such simple techniques have restricted the plot size and have consequently determined the purposes of cultivation which are always subsistence with little for cash.

As mentioned by local communities' rainfall as the only source of water for cultivation and always in such area they said there is a missing of one or two rains at least per year. Thus local producers in such area developed their own strategies in order to get maximum use of water in practicing agriculture. The following were the main strategies adopted by local producer to benefit from the amount of existing rainfall these are:-

4.6.2 Sowing Strategy:

The study demonstrates that traditional farmers are aware of the limitation of the semi-arid environment; so they make out of the available soil moisture. Therefore farmers clear off the weedy plants earlier to reduce strong competitors for their crops. The discussions have shown that this system of growing crops starts early with the beginning of first showers. Traditional producers use their own indigenous knowledge in order to predict the condition of weather in the absence of available metrological data. They adopted simple methods for prediction of the weather condition known locally as (Manazil El Sana) year calendar. The general idea of it; is the division of the whole year into 28 groups (Manzil) each of which has 13 day except Manzil of El Jabha is
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14 days see table 4.5. This division is based on the appearance of some known stars. Moreover, the year has three major groups known as \( \textit{Ains} \) (Arabic for eye). This three \( \textit{Ains} \) are \( \textit{Ain} \) Kharif (eye for rainy season), \( \textit{Ain} \) Seif (eye of summer) and \( \textit{Ain} \) Shitta (eye of winter). This system helps them in selecting the suitable time for sowing, seeding and weeding. Based on oral discussion farmers always prepare and sow their lands before \( \textit{Ain} \) Kharif and start seeding after the farm has been cleared to avoid losses through unneeded competitors. Seeding before two days of the new coming Manzil (interference); known locally as \( \textit{Mashbak} \) is common strategy. They mentioned that two days before new manazil has no zero doubt leads to rains. By doing so traditional farmers gain a lot such as

1. Getting maximum benefit of early rains.
2. Avoiding losses of scarce moisture through clearing of unneeded plants.
3. Earliest and cheapest labours (Nafeer) usually available at the beginning of kharif.

Although this system is exposed to hazards (insects, rats, and birds) and risk, yet it has advantage in areas with unpredictable weather to avoid unnecessary losses of moisture. Also farmers adopted the strategy of increasing the crop intervals and reducing the number of seeds in the holes. Moreover, farmers weed whenever they find chances. All these are attempts to conserve moisture for their crops.

4.6.3 Fallow Strategy:

This system of adaptation is not far from the modern (agricultural rotation). Traditional farmers however, use it as a matter of changing land from one year to another. Therefore a household in Butana has more than one plot in different areas as noted in Wadi cultivation. This system is known locally as ‘\( \textit{Rahat Elarid} \)’ (shifting cultivation). The elderly farmers stated that the size of plot under cultivation in the past was not restricted; instead it changed from one year to another depending on the internal and external factors such as family need for crop, available family labour, crop stored last year, size of land tenure and above all the amount of rainfall. Therefore the concept of (\( \textit{Kifyatt Elyad} \)) means enough for hands was widely known in the area. The idea of this concept is to cultivate exactly what your family needs for the season. Rainfall is the most essential factor in determining the size of plot under cultivation. Farmers relied on their indigenous knowledge to predict the amount of rainfall.
This is normally through:

1. Early appearance of some special stars.
2. High hot summer.
3. If (Ain shitta) group extended for a long time and very cold.
4. Appearance of special type of insects and plants.
5. If the earliest showers start heavily.

Table 4.5: The Folk Calendar for the Year as Adopted by Traditional Farmers

<table>
<thead>
<tr>
<th>Folk Name</th>
<th>No. of days</th>
<th>Time</th>
<th>Group Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Saad Zabih</td>
<td>13</td>
<td>21/1-2/2</td>
<td></td>
</tr>
<tr>
<td>2 Saad Boluk</td>
<td>13</td>
<td>3/2-15/2</td>
<td></td>
</tr>
<tr>
<td>3 Saad Saoud</td>
<td>13</td>
<td>16/2-28/2</td>
<td></td>
</tr>
<tr>
<td>4 Saad Elakhbiya</td>
<td>13</td>
<td>1/3-13/3</td>
<td>Ain Sief</td>
</tr>
<tr>
<td>5 Elfart Elmogadum</td>
<td>13</td>
<td>14/3-26/3</td>
<td></td>
</tr>
<tr>
<td>6 Elfart Elmoakhar</td>
<td>13</td>
<td>27/3-8/4</td>
<td></td>
</tr>
<tr>
<td>7 El Hoot</td>
<td>13</td>
<td>9/4-21/4</td>
<td></td>
</tr>
<tr>
<td>8 El Natrah</td>
<td>13</td>
<td>22/4-4/5</td>
<td></td>
</tr>
<tr>
<td>9 El Biteen</td>
<td>13</td>
<td>5/5-17/5</td>
<td></td>
</tr>
<tr>
<td>10 El Tirya</td>
<td>13</td>
<td>18/5-30/5</td>
<td></td>
</tr>
<tr>
<td>11 El Dabaran</td>
<td>13</td>
<td>31/5-12/6</td>
<td></td>
</tr>
<tr>
<td>12 El Hugaa</td>
<td>13</td>
<td>13/6-25/6</td>
<td>Ain kharif</td>
</tr>
<tr>
<td>13 El Hunna</td>
<td>13</td>
<td>26/6-8/7</td>
<td></td>
</tr>
<tr>
<td>14 El Doraa</td>
<td>13</td>
<td>9/7-21/7</td>
<td></td>
</tr>
<tr>
<td>15 El Natrah</td>
<td>13</td>
<td>22/7-3/8</td>
<td></td>
</tr>
<tr>
<td>16 El Tarffa</td>
<td>13</td>
<td>4/8-16/8</td>
<td></td>
</tr>
<tr>
<td>17 El Jubha</td>
<td>14</td>
<td>17/8-30/8</td>
<td></td>
</tr>
<tr>
<td>18 El Kharasan</td>
<td>13</td>
<td>31/8-12/9</td>
<td></td>
</tr>
<tr>
<td>19 El sarffa</td>
<td>13</td>
<td>13/9-25/9</td>
<td></td>
</tr>
<tr>
<td>20 El Ewa</td>
<td>13</td>
<td>26/9-8/10</td>
<td></td>
</tr>
<tr>
<td>21 El Simak</td>
<td>13</td>
<td>9/10-21/10</td>
<td></td>
</tr>
<tr>
<td>22 El gafr</td>
<td>13</td>
<td>22/10-3/11</td>
<td></td>
</tr>
<tr>
<td>23 El Zabanan</td>
<td>13</td>
<td>4/11-16/11</td>
<td></td>
</tr>
<tr>
<td>24 El Eklil</td>
<td>13</td>
<td>17/11-29/11</td>
<td></td>
</tr>
<tr>
<td>25 El galib</td>
<td>13</td>
<td>30/11-12/12</td>
<td>Ain Shitta</td>
</tr>
<tr>
<td>26 El Shawla</td>
<td>13</td>
<td>13/12-25/12</td>
<td></td>
</tr>
<tr>
<td>27 El Naneem</td>
<td>13</td>
<td>26/12-7/1</td>
<td></td>
</tr>
<tr>
<td>28 El Boldah</td>
<td>13</td>
<td>8/1-20/1</td>
<td></td>
</tr>
</tbody>
</table>

Source: fieldwork 2006
4.6.4 Storage Strategy:

Since rain is not predictable in the area; local producers use strategy of storage for securing their livelihoods in bad years. The general theme of this strategy is to store some sacks of Dura in good years in order to compensate and to fill the gap of deficiency during bad years. Farmers immediately after harvesting select some sacks of Dura and store them in Matmaora or Tukl. The Matmoura is an underground pit (hole) ranging between 3-4 meters deep and approximately 2 meters in width. It is protected from the pests and moisture by using a layer of local materials (grasses and animal dung mixed with mud (Animal Manure: Ziballah). The storage capacity is of about 10 – 15 sacks. The hidden philosophy behind that is to open a chance for family member to find jobs during hard years and secure livelihood of household. This strategy does no longer exist in the area as it has been replaced in some remote villages by system of small huts (Tukl) made of grass for storing Dura. Recently and due to some factors Matmaora has lost its function completely. The disappearance of this system could be due to the emergence of free market policy. As observed in the markets small farmers are forced to sell their surplus crop for cash in order to buy their basic needs, pay school fees, pay labour cost and invest the rest in the market. The presence of market economy has resulted in the spread of poverty among small producers as they are forced to sell their crop at lower prices after harvest and buy it later on at double price or more.

In responding to the question about the adaptive mechanisms to the scarcity of water in practicing agriculture, local producers mentioned several strategies which include that around 42 % used the techniques of preparing farm land before rains, 13.7 % used teras cultivation to increase the soil moisture and 22.7 % mentioned Al Shalikh (putting more seeds in hole and when it grows part of it will cut over) see figure 4.2.

4.6.5 Moral Economy Strategy:

Local producers in practicing their economic activities depend on extended family member and free collective workers (Nafir). This means pastoral economy has less input and cost the producers nothing or very few. The study showed that the strategy among farmers in using family labour is to minimize the cost of agricultural processes. The hidden ides behind that is to spread the system of collectivism and to inherit this honourable job to future generations. This strategy is known locally as Nafir which is deeply rooted among traditional producers. This strategy also reflects the degree of
coordination among people that live in harsh environment. It is based on the invitation from sheikh, family leader or farm owner to the relatives, neighbours and all the youth of the village to attend Nafir meeting. After the morning meal (Aseeda with Weaka) the family head or sheikh tell them that one member of the village need help in weeding, harvesting, building etc. The invited people would agree to do this collective work freely and the owner provides them with local meals. Recently this strategy has undergone a drastic decline due to the emergence of market economy as people seek cash. The extended family labour has no longer existed in the area due to massive migration and the wide gap between the poor and the rich has led to the spread of selfishness among people. It was observed that still there is a little sign of the collective work in Butana but at very low scale. Today three categories benefit from this old system: women headed house and old people that have no sons plus orphans.

**Figure 4.2: Adaptation Mechanisms towards Farming in Butana Area**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grow in Hadabah</td>
<td>6.0%</td>
</tr>
<tr>
<td>Seeding after rains</td>
<td>3.7%</td>
</tr>
<tr>
<td>wadis cultivation</td>
<td>7.0%</td>
</tr>
<tr>
<td>Alshalihi</td>
<td>22.7%</td>
</tr>
<tr>
<td>Terrace cultivation</td>
<td>13.7%</td>
</tr>
<tr>
<td>Early weeding</td>
<td>42.3%</td>
</tr>
<tr>
<td>Avoid manzal tarfah</td>
<td>3.0%</td>
</tr>
<tr>
<td>Missing</td>
<td>1.7%</td>
</tr>
</tbody>
</table>

Source: Researcher 2006

**4.6.6 Institutional System and Acquiring of Land Strategy:**

Marginal environments forcing people to work and share natural resources in commons as if they are one body by creating a system of coordination. The
The author believes that whenever the environment is harsh people have no option than to live together as one community so as to stand together against harsh nature and crises. While the rich environment always creates the system of individuality because there is less need for social network.

The system of *Dars* played a vital role in regulating land tenure and reducing conflicts among local tribes and between local and non resident tribes (outsiders). The distribution of land among family members usually started after the eldest son assumed responsibility by getting married. The distribution of lands does not ignore the coming sons in sharing lands. First, the whole land is divided between the father and the first married son. Later, the whole land is further divided in three after the next son get married and so on. This system continues following this division till the father hold dies. Then every sons tenures the land he owns and the cycle starts again. Members on the other hand, look to the environment from moral perspectives. Thus all tribes are aware of their boundaries. Every member of the tribe feels that land belong to him/her and should use it in a very sound and rational way. The tribal leader is considered as the most essential character and so his words must be respected by all members. To see real role of the tribal leader in the area the researcher mentioned some notes as follows:

- The tribal leader has a right to grant land for not only local member but also for the non resident tribes (outsiders). Thus, strangers can access land in condition that not touching the ownership of land.
- He has power to stop any one from not using the lands if there is clear justification (resource management and avoid degradation).
- Determine the time and the area for non resident tribes (outsiders). Therefore, non resident tribes (outsiders) can access land only after signed agreement with tribal leaders.
- Source of full respectness from all within and without tribes and his yes is always yes and vice versa. Therefore, a herder or a grazer can pay taxes peacefully.
- Source of creating mutual relationships between people in side their boundaries and non resident tribes (outsiders).

Mutual and symbiotic relationships between tribes happen only through agreement between tribal leaders. For example, if one tribe faces a problem such as shortage of water, the other with sufficient amount can open its *Dar* to the needy group. This is usually under the control of the host tribal leader who determines time, place and number of days to stay.
Social network plays a vital role in accessing resources and securing livelihood in such hard environment. The social dimension of resources is more important than the economic dimension of resources. Thus people in such areas support each other especially during crises meaning that the problem of a single person become a problem of all. Treating the resources socially help much in sustaining the uses and conserve the environment. The discussion has shown that during the severe crises most of the people migrate to their relative in agricultural areas to share the resources all together. The study has identified some points reflecting the role of social network in human adaptation. These are:

1. Most of pastoral activities if not all is done by extended family labour or close relatives.
2. All members of the tribe have equal access to the water point and this remains the same during crises and in normal time.
3. Spatial distribution of relatives opens chances for people in Butana to distribute their animals among themselves aiming to restocking after crises.
4. Women are not allowed to marry out side the tribe at all.
5. Most of agricultural activities are done collectively (Nafeer).

The collapse of livestock sector has led to a decline in social networks as people migrated to urban centers and to some extent are affected by culture over there. Due to the role of market economy together with the trend of adoption of settled life style, social networks have profoundly transformed into market relations.

4.7 Conclusion:

The above adaptive strategies reflect the deep knowledge and reject the idea of ignorance of pastoralists. The pattern of land use promoted by government thus seems to undermine pastoralism as it focuses in rapid expansion of agriculture of both irrigated and mechanized. This chapter explains that the system of land tenure in Sudan has been changing through times. Many factors were responsible behinds these changes such as state ideology, external factors (international Donors), new technology, land use policy, drought.
Chapter Five

Current Socio-Economic Transformation in Butana Area

5.1 Introduction:
This chapter focuses on the current socio-economic transformation of the study area. The overall objective is to show some indicators and consequences of the recent transformation of the pastoral economy in Butana area. The data presented in this chapter is mainly collected from the fieldwork through a questionnaire and group discussion with less support from the written literature. The current indictors include changes in herd mobility, rangeland management and conflicts between land uses. Adopting the style of settled life is one of the current consequences of the collapse of pastoral economy.

5.2. Changes of Mobility:
One of the good indictors reflecting clearly the recent transformation is the changes in pastoral mobility. These recent changes in movement include both the movement inside and outside Butana. In addition to the appearance of new type of movement the study named it opposite mobility.

5.2.1 Changes of Mobility inside Butana:
Mobility strategy as presented in this chapter was profoundly changed due to internal and external factors. Sharp decrease in livestock number, settlement, collapse of native administration, unauthorized expansion of mechanized farming and the state policy all these factors working together under the stress of the repeated drought are the essential and responsible causes behind changing the pattern of mobility in Butana area.

Recently, most if not all of pastoralist in the Butana area graze their animals inside Butana around their own Dars with few that move to Gezira, Halfa State and to the mechanized schemes in the southern parts of Butana. Today livestock is not so much as in the past and family labor is not available, hence pastoralists use to graze their few animals near or a round their villages. Figure 5.1 explains the recent pattern of mobility among the tribes of Butana. It shows that now around (21.7%) of the households in Butana have been dropped out from this sector. This figure offers the study a chance to say that one fifth of the total population in Butana gave up pastoralism activity. Also it shows that during the rainy season, pastoralists graze their animals in their villages as there
is no problem in water and pasture. During summer which is considered as a critical time, the study observed that half of pastoralists also remain in Butana and the rest move to different areas depending on the rangeland situation and the geographical location of their villages. Therefore, around (18%) move to Gezira state and those are the pastoralists that lie at the north west of Butana (Geli). This explains the severe degradation that covers most of the northern part of Butana in addition to the stony nature of the soil. During the fieldwork the researcher observed that there is no even a single tree in such area expects some Acacia Nubica (Laout) trees scattered here and there across the wadi El Shebiek. Few people around (7 %) move to mechanized schemes at the southern part of Butana and this is because the pasture land in this area is better than that of the Northern part. It was observed that grasses such as Schoenefedia gracilis (Gebash) covered most of the southern part and remains till the beginning of the new rainy season. Halfa received a little number of pastoralists due to the problem of accessibility and the presence of Prosopis Glandulosa (Mesquite) tree. Decreasing numbers in livestock with wide spread of practicing agriculture (supplemented fodder) have led half of pastoralists to spent all the time in Butana area. During winter still the rangeland situation in Butana is of a little bit good so around (94%) graze in Butana and the rest move to Gezira, mechanized schemes and irrigated projects.

Figure 5.1: Grazing Areas in Summer-Butana Area

Source: fieldwork 2006
5.2.2 Changes of Mobility of Non Resident Tribe (outsider):

There are eight customary routes which organize mobility for non resident tribes (outsiders) pastoralists to move in and go out from Butana. It was observed that six of them are closed or their limits are not clear and the remaining two are too narrow and no services are provided along them. These open routes are:

1. Central Butana-Gedaref-Kasssab to Taya.
2. Central Butana-khor Abu Farga-Umm Sagatta to Umm Kurah.

In the discussions, unauthorized expansions of mechanized farming have been accused for closing routes and putting pressure on the rest. As a result of the taken of traditional routes, acute conflicts between pastoralists and other land users become the dominant phenomenon in Gedaref state. The discussions have shown that most of pastoralists in Gedaref adopted the strategy of buying crop residue (schemes) and graze their animals inside. Due to the recent changes in the movement pattern, pastoralists in searching for water and pasture have reached neighbouring countries. (El Hadary, 1999) mentioned that five herds belonging to the BaniAmir tribe were stolen by Ethiopian rubber (shiffta) near Taya. One can say that the reduction of herd size and the trend of increasing small ruminants have caused a decrease in pastoral mobility throughout Gedaref state. The remaining pastoralists move only in their past homestead of villages or do not move at all. Today even Fellatta Umbrarorw which was considered by this study as pure nomadic tribe now they have started to adopt a settled life in different parts of the southern Gedaref.

5.2.3 Reverse Mobility:

The fundamental indictor of the recent changes is the replacement of the pattern of the past mobility by new system the author named it reverse mobility. Before changing land tenure in 1970, livestock move in searching for water and pasture but now the situation has completely changed. Instead of taking animal to the water resources, such services are transporting to livestock. Water and fodder are transported to animals instead of moving animals to such services. Thus, pastoralists have been able to develop a new survival strategy to cope with the recent changes. The researcher observed that in each village there are big trunks for carrying water from the available water sources (urban centers, rivers and wells) to the area needed. This new coping strategy (reverse mobility) is originated and may be traced back to the Rashida group as this study believed. Those migrants people have no land and at the same time own
large number of livestock mainly camel, thus always in moving. In the past, control of water in Butana was the best management to stop non resident tribes (outsiders) Rashida has no excuse. Therefore, Rashida developed their own strategy and invest their money in buying cars and trunks in order to stay more in Butana. Indigenous tribes in Butana do not happy with them and called them cynically (zabood) relating them to their grand mother (Zobiydah). People in the Butana mentioned that they are facing two big problems: degradation of natural vegetation and widespread of Zabood meaning (Rashida group).

The Rashaida are a Bedouin group who migrated from Saudi Arabia in the nineteenth century and now are mostly concentrated between Kassala, Khasm al Girba and El Damer. Rashaida and other different groups (merchants) now have access to land in Butana and this due to the recent changes in land tenure which open doors for land marketing (phenomenon which was unknown before).

There are many justifications behind why the study believed that Rashida was the first group to adopt the reverse mobility in Butana these are:

1. Rashida group has no permanent Dar although they depend on animals for their livelihoods. Those groups migrate over long distances from inside the country up to Eritrea and Egypt and they are famous as camel traders and cross boundary smugglers.

2. The Rashaida also keep close contacts with their kin in Saudi Arabia and many young men go to work there for several years and send remittances to their relatives in the Sudan until they come back. They invest this money in buying large tankers that are used for watering their animals in rich pasture land.

3. Culturally, Rashida is restricted society which does not like to change its tradition thus having tankers will help them to graze in far area which is difficult to access by others.

4. Access of water resources in Butana is forbidden to the non resident tribes (outsiders) especially during dry period thus Rashida devolved this strategy to stay more in Butana.

5. In the written literature about pastoral adaptation in Butana no one mentioned this type of reverse mobility.
5.3. Change in Herd Diversification:

Concerning diversification strategy, most of the people if not all stated that in the past their herd consisted of four types of animals (camel, cattle, sheep and goats) in addition to donkeys. Recently, and due to causes stated in chapter six, pastoralists are now concentrated in one or two types particularly small ruminants (sheep).

Table 5.1 and figure 5.2 explains that there is a sharp decrease in cattle number while the average of sheep is increasing for each household. It shows that the recent trend towards small animals as the number of sheep and goats are increasing with an average of (110) sheep per household. In most of the Butana area goat is considered as a source of milk for each household thus, lacking this type of animal means deep poverty. This idea appeared in the discussion as one of the old people explains the situation after drought. He said we lost everything even the “goat for the morning tea”. Cattle represent the smallest type in the study area and this is due to the scientific hypothesis that cattle are the most sensitive to drought and shortage of water. In addition to that, people in Butana justify the sharp decrease in cattle to the unknown disease that is transferred from the southern part by non resident tribes (outsiders). There is a clear tendency in Butana areas to stick to increasing the number of small ruminants.

It was observed that restriction of small ruminants has both advantages and disadvantages. The researcher has identified the some negative points of having small ruminants these include:

1. Weakening the use of various and available resources exist in the study area. Therefore, waste of valuable pasture.
2. Restricted the herd in or near villages all times will lead to degradation if not soon it will be later.
3. The ability to recover after natural shock will be too narrow as there is a lack in number and types of animals.
4. Concentration of small animals is highly demanding especially for supplemented fodder thus, this will increase mechanized agriculture in fragile area and the final result will be acute degradation.

On the other hand, there are some positive points about the concentration on small ruminants; these organized as follows:

1. They are cheaper if compared with camel and cattle thus instead of buying one camel you can buy at least more than ten sheep.
2. Very easy in marketing and even you don't need to go to the market physically. It was observed that people coming to Butana from the surrounding towns (Trader and Butchers) are aiming to buy sheep.

3. Reproduction of these small ruminants is faster twice per year than big animals (camel-cattle).

4. Responding positively to the new transformation as division of labor among family has dramatically changes this type of animal need less herding management as it can graze long time around villages or in the schemes without more people to guard.

5. The new trend of Butana in having animals is concentrated on quality rather than quantity; therefore people prefer to rear fewer good quality animals rather than keeping larger herds of less quality and this is due to the role of market economy

6. Reduce the difficulties of long mobility and are useful in securing livelihood for local communities.

7. Step forward to make future integration of animals into agriculture and help in developing mixed farming system

**Table 5.1: Distribution of Livestock in Butana Area**

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Camel</td>
<td>58</td>
<td>1</td>
<td>100</td>
<td>27.69</td>
<td>23.52</td>
</tr>
<tr>
<td>Number of Cattle</td>
<td>102</td>
<td>1</td>
<td>100</td>
<td>18.20</td>
<td>25.54</td>
</tr>
<tr>
<td>Number of sheeps</td>
<td>172</td>
<td>5</td>
<td>300</td>
<td>110.87</td>
<td>95.89</td>
</tr>
<tr>
<td>Number of Goats</td>
<td>177</td>
<td>1</td>
<td>200</td>
<td>29.71</td>
<td>33.87</td>
</tr>
<tr>
<td>Number of Donkeys</td>
<td>234</td>
<td>1</td>
<td>3</td>
<td>1.68</td>
<td>.60</td>
</tr>
<tr>
<td>Valid N (listwise)</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: fieldwork 2006

Having decrease in herd sizes and sharp trend toward small ruminants, pastoralists have become more dependent on purchasing fodder from the market. The survey results have shown that there is tendency toward small ruminant and less number of animal in order to avoid pasture difficulties. Transformation towards small animals is more logical in such situations. Instead of concentrating in big animals they can rear small animals. So with the price of one cattle you can by more than ten sheep. Again this ten sheep could be expected after one year for doubling itself or more instead of having two cattle after two years. Moreover, raising of cattle has less economic value especially when it comes to the marketing of milk. Due to the bad
infrastructure in Butana accessing markets of the surrounding urban centers to sell milk are too difficult or impossible.

**Figure 5.2: Average Number of Livestock per Household in the Area of Study**

![Average Number of Livestock per Household in the Area of Study](source: fieldwork 2006)

### 5.4 Transforming of Pastoral Land Use into Agriculture:

The type and pattern of land use in Butana area has profoundly changed into rapid expansion of unauthorized agriculture on pastoral lands. The study discovered that the state policy towards agriculture and the problem on the recognition of customary land tenure have a considerable share in current land use changes. For example, farmers have documents to secure their lands if not for whole life; at least for long time (25 years); where pastoralists lack this type of land security.

The recent transformation in land use is supported by data collected during the fieldwork. Figure 5.3 shows clearly that the Shukriya and their affiliates in Butana are currently being gradually transformed from nomads to farmers and sedentary agro-pastoralists. It explains that around (71%) of the total households in Butana area are now practicing agriculture as the major job which was considered as secondary activity in the past. Also, there is a sharp decrease in pure pastoral sector as only (9%) mentioned that pastoralism as a major job. This figure confirms that Butana communities are currently agro-pastoralists.

The discussions have shown that the changes in land use and shifting from being herders into farmers are attributed to the following reasons:

1. As the state only recognize the right of farmers' lands so pastoralists shift to cultivation in order to acquire this right before other (State, investors and merchants) can claim it. Recently there is a trend in the Sudan for
documenting pastoral land (Darfur as example) thus, Butana has no excuse.

2. Lack of recognition of traditional property rights systems based on communal land tenure by both laymen and officials. Therefore, practicing agriculture means securing and registering lands in Sudan.

3. Stop big and large attacks from Mechanized farmers and merchants into spreading in Butana area.

4. Recently, access to residue has been blocked by the farmers, who started to demand high price. Moreover, crop residues are believed to be more nutritious than the available natural grasses.

5. Local availability of mechanical cultivation tools and tractor hire services have encouraged people to cultivate more land for the dual purpose of producing grains for household consumption and crop residues for their animals. Thus compensate the sharp decline in animals' numbers.

6. All above working together and supported by repeated drought conditions that degraded the natural pastures in the area.

Figure 5.3: Percentages of Major Jobs in the Area of Study

Source: fieldwork 2006

Figure 5.4 shows that agriculture in the study area faced many difficulties and this appeared when the study raised a question about how farmers compensate the loss if there is sharp decline in crop production. (26%) mentioned that selling animals is a better strategy for compensation. This for the study means
several things: first the dramatic change towards agricultural practice; secondly still people practice herding but in low scale and thirdly securing livelihood through herding are better than through agriculture.

Transformation toward agriculture has some negative consequences in such marginal areas. These are organized as follows:

1. The expansion of agriculture into non-equilibrium environment has considerably augmented pressure on the fragile soil and acute degradation is one of the main outcomes.
2. Increase the conflict between different land users competing for scarce resources.
3. Collapse of pastoral economy and thus increase poverty among local communities.
4. Open a chance for non resident tribes (outsider) to access and buy lands and thus put more pressure on poor people.
5. Agriculture is not the best activity as it has many problems thus transforming all these negatives (soil degradation, bankrupts and marketing) to the Butana area.

Responding to the question about the decrease and increase in land size, most of the respondents mentioned that their land plots are increasing. Increasing of land size in the study area is due to the fact that in the past land was used in commons and all land was for all people. Recently, the government introduced the Act that land is for all, thus people have tried to claim land in Butana individually before strangers does (land for all). The size of area also increases dramatically as it ranges from (3 up to 2000 feddan) with an average of (150 feddan) per households. Really, this figure reflects clearly the new trend of land use in the study area. Based on this figure the study states that Butana area which was a pure rangeland in the past now has changed into what the study called mechanization of pastoral lands. This transformation has a negative impact in short term and in long term for Butana in particular and Gedaref state in general. By short term the study means the degradation of land in pastoral area and its consequences on the local inhabitants. By long term it means the impact on the whole Gedaref state as Butana has two major roles, the first one it is an area of livestock concentration in rainy season and secondly it is considered as the northern belt for stopping degradation not to move south.
Figure 5.4: Alternatives Being Resorted-to During Crop Failure.

Table 5.2 reflects the various ways for acquiring land in Butana area. It seems that there is a new type of accessing land in Butana which is not existed in the past when the system of native administration is working properly. Recently as table 5.2 shows many people try to acquire land through the mechanism of new open (faith jaded) means that land never used before (forest or a common grazing area).

Table 5.2: Current Means of Acquiring land in Butana Area

<table>
<thead>
<tr>
<th>Means of Acquiring Land</th>
<th>Frequency</th>
<th>Percentage %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buying</td>
<td>5</td>
<td>1.7</td>
</tr>
<tr>
<td>Renting</td>
<td>2</td>
<td>.7</td>
</tr>
<tr>
<td>Inheritance</td>
<td>238</td>
<td>79.3</td>
</tr>
<tr>
<td>Wad Elyad (Put Hands)</td>
<td>9</td>
<td>3.0</td>
</tr>
<tr>
<td>Inheritance + Buying</td>
<td>22</td>
<td>7.3</td>
</tr>
<tr>
<td>Open New (fatih jadeid)</td>
<td>22</td>
<td>7.3</td>
</tr>
<tr>
<td>Gifts</td>
<td>2</td>
<td>.7</td>
</tr>
<tr>
<td>Total</td>
<td>300</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: fieldwork 2006
5.5 Conflict between Land Users in the Study Area:

Historical evidences showed that conflicts over resources are an old phenomenon. These conflicts are always associated with disputes regarding land ownership, land use rights and the rules that governed access to land. The disputes among different land users in general and between farmers and grazers in particular have been recorded since long time.

Koran told us about the damage of crops by livestock and also showed the mechanisms for solving such type of conflicts. (Sorrat al Anbia (the prophets.) "And Dawood and Sulaiman when they gave judgment concern the field when the people's sheep pastured therein by night, and we were bearers of witness to their judgment. So we made Suleiman to understand it; and to each one we gave wisdom and knowledge; and we made the mountains, and the birds to celebrate our praise with Dawood; and we were the doers". In the translation of the meaning of these versus, it explains a case of certain herder that grazed their animals at night in the farm of a person. Those two were coming to the prophet Dawood. He judged the herder by giving their entire animal to the farmers as a matter of compensation but his son Suleiman mentioned that the right judgment is to give the animal to the farmers to get benefit from it and this will continue till the herder repaired the farm and it becomes as before. This Koran story showed that competition over resources will lead to conflict and always people in such sector developed their own mechanisms to solve such a problem. Really, all these scenarios have been observed in the area under study.

The discussions have shown that there are different types of conflict which existed in the area. These include the conflicts between indigenous tribes such as Shukriya and non resident tribes (outsider) tribes, farmers against farmers and farmers against herders in Butana.

5.5.1 Conflict between Indigenous Tribes and Non Resident Tribes:

The study observed that the conflicts between land users inside Butana to some extent is manageable but the situation becomes acute when the conflict is between local tribes and non resident tribes (outsiders) and it become unsolvable if the conflict between local and non- Arab speaking group such (Umbaroro-Fellatta). Figure 5.5 shows that one third or more (35%) of the problems facing agriculture in Butana is related to the conflicts between indigenous tribes and herders of non resident tribes (outsiders). Through group
discussion the researcher has identified several factors behind such type of conflict organized as follows:

1. People in the Butana are not happy to have non resident tribes (outsiders) with them who have no customary rules. They mentioned that there is no common area to regulate the use of resources in Butana.

2. Local communities benefit nothing from non resident tribes (outsiders) as their livestock will not move to the areas of non resident tribes (outsiders). In addition they think that most of the recent diseases of both animals and humans (Kalzar) are transferred by them.

3. Non resident tribes (outsider) don't appreciate the old system of Dar that governed access to resources in Butana. Moreover, they graze closer to the houses of local communities and thus touch a very sensitive issue (women).

4. Non resident tribess (outsiders) are accused of increasing degradation and depletion of some palatable grasses due to their shorter stay and large animal they have.

Also there is a especial conflict between local tribes and the group of Rashida (Arab). The origins of this conflict is related to that Rashida spent much time in Butana and use their money to force poor people to sell them water. In addition to that Rashida invest their money in buying big tanks for watering their animals thus can access remote and very far area (hard for local) and stay more in Butana especially during dry season. Again Rashida have no customary rule, therefore both talk different languages. There is a local say that Prosopis glandulosa (Mesquite) tree and Rashida are most dangerous factors for environment in Butana. According to the Nazir of the Shukriya in Gedaref State, the Rashaisa are causing great damage to the pasturelands because of excessive grazing.

The survey results show that beside the rejection of non resident tribes (outsider) tribes mainly Rashida and Umbraro there are acceptances of some other groups. The acceptances of these tribes are due to some social and business factors these are organized as follows:

1. As the matter of benefit as livestock will not move to the southern part of Gedaref state, therefore there is no need to create symbiotic relationship with those coming from such places. One the other hand and for the same logic, tribes which are coming from Halfa and Gezira are accepted as there is mutual benefits between them.
2. Non Arabs tribes are not fully accepted because of their languages, beliefs and values. In the discussion they mentioned that these tribes can graze more closer to our houses without respecting the privacy of our families. Thus, people who have customary rules can respect these values and traditions therefore; they are allowed to be in Butana.

3. There is concrete social network and blood relations between people who settled in Butana and those in Halfa and Gezira (extended family). It was observed that parts of family will takeover the responsibility of farming tenant in such areas while the other took the responsibility of pasturing animals in Butana.

**Figure 5.5: Problems Facing Agriculture in Butana Area**

![Pie Chart]

Source: fieldwork 2006

From the above mentioned points one can say that all tribes that they have customary rule (salif) are accepted in Butana and who lack it will face a lot of troubles. I was told by the police in El Subagh centre that two persons from Fellatta umbararou have been killed last season. According to him Fellatta groups are always facing troubles (it may reach blood shed or at least steeling). Recently, Steeling of livestock as locally known as (Hambatta) is becoming widespread phenomena.

The study reflects that the conflicts between indigenous people and non resident tribes (outsiders) are very complicated and really it needs to be addressed soon or the situation will be as Darfur or more. Non resident tribes
(outsider) pastoralists believe that they can graze anywhere in Butana based on the land Act 1970 and they are justifying their rights by paying taxes to the government for this purpose. On the other hand, local people in Butana still respect their traditional rights and believe in the system of tribal leaders. When responding to the question about the abolition of native administration. People agreed on that but they said we still believe on our tribal leaders as one of them mentioned "they have changed the rule but not concept (Tagieer al Ganoun wa lays Al Mafhoum). Again non resident tribes (outsiders) stated that we had paid double or more fees of animal tax (Gottan) than the local people thus, they have right to graze every where in Butana as its governmental land. In addition to the above mentioned, local tribes are very sensitive when it comes to the issue of women. The discussion results have shown that non resident tribes (outsiders) violates the old traditions by grazing closer to the settlement (Haram Elgaria) of Shukriya which is five to eight km around villages. As one of the elder people mentioned that, non resident tribes (outsiders) now can graze near the windows of our houses and use even Hafir El Nogor (small Hafir use mainly by woman as it is very close to their houses).

As a consequence local herders can destroy Hafirs so as not to be used by non resident tribes (outsiders), as they think that animals coming always bring new diseases. Range and pasture have selected some areas in the Butana as conserved fenced land to reproduce palatable plants again Blepharis Edulis (Siha). The fence is often taken away by pastoralists. This explains the negative impacts of open grazing system in the limited and scarce resources. In few cases, pastoralist tends to set fire on their grazing land to avoid non resident tribes (outsiders)

During the fieldwork I tried many times to access quantitative data or any written information about this conflict from the police office in Subagh but I did not succeeded and this may be due to the fact that this issue is politically sensitive. But the police stated orally that every year we will receive about one hundred fifty cases concerning land' conflicts and due to that the government increases the capacity of police in the area. Moreover, he mentioned that the number of the cases will increase sharply during rainy seasons. Table 5.3 shows some recorded conflicts at police stations.
### Table 5.3: Reported Conflicts: Farmers/Herders in Gedaref State

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Gedaref</td>
<td>61</td>
<td>45</td>
<td>45</td>
<td>35</td>
<td>67</td>
</tr>
<tr>
<td>Gadambalya</td>
<td>95</td>
<td>60</td>
<td>43</td>
<td>-</td>
<td>52</td>
</tr>
<tr>
<td>Showak</td>
<td>65</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Doka</td>
<td>-</td>
<td>161</td>
<td>288</td>
<td>198</td>
<td>102</td>
</tr>
</tbody>
</table>

Source: Al Awad 1990

### 5.5.2 Conflict between Farmers and Farmers:

This conflict has appeared in the surface more recently due to the high competition over land use in the area of study. There is a close relationship between this conflict and the old system of cultivation in the area. As mentioned in this chapter that distributions of land for both local and non resident tribes (outsiders) were the responsibility of the tribal leaders. Due to the nature of Butana area farmers are used to cultivate in wadis, near khors and other sources of water locally known as *(Alyeed and Al Hadabbah)*. Moreover, area under cultivation, not static, changed annually depending on the availability of rainfall and family needs. The discussions have shown that in some cases the gap between cultivation of the same area is around ten years. Due to the long interval and the collapse of tribal leaders system some new comers (within and outside) claim lands. This explains why most of the cases in the police centre at Subagh are over land concerning this issue. Still solving the problem locally is working but in few cases this type of fighting reaches death. It is reasonable to mention that there are some factors aggravating this situation:

1. The abolition of native administration and no replacement of tribal leaders' authority to organize fair access to land.
2. The contradiction of the two laws, land for all and the continuity of Dar system. Therefore new farmers based on the act 1971 and claim their access to land.
3. Long migration for the local people and when they return they discovered that their lands have been occupied.
4. The current trend towards settlement forced people to cultivate more land.
5. All these happened without any positive intervention from the state as if there is a hidden policy behind this conflict.
5.5.3 Conflict between Farmers and Herders inside Butana:

Due to the collapse of the pastoral economy in the area, the dropout pastoralists and other land users adopted the new livelihood strategy. This strategy is based on growing crops for nothing but to sell it for pastoralists as they have no other option than to buy because these crops are grown on their routes. Pastoralists feel that these are their traditional routes and no body is allowed to use them away from their main purpose so they damage the crop whenever they get chances.

This conflict typically happens in the western parts of Sudan and at the end has led to foolish war. In Darfur an increasing number of grazing land enclosure were seen during the dry years of mid to late 1980s. Such areas provided restricted access grazing to particularly powerful kin groups of settled farmers in the El Fashir region. Simple thorn fences were used to exclude others, including migrant herders (Scoones 1990.)

5.5.4 Conflict between Farmers and Herders outside Butana:

One of the main factors behind the conflict between herders and farmers is the rapid expansion of unauthorized expansion of mechanized farming in the southern part of Butana area. During the dry seasons, pastoralists were forced to leave Butana and move to the southern part due to the scarcity of water in the former area. At this time crop will be in the harvesting time so, farmers stop pastoralist from passing by closing all possible options of movement. Therefore, pastoralists are forced to graze their animals inside the schemes causing severe damage and thus; conflict arises leading to blood-shed sometimes.

Generally, there are eight routes for moving and going out from Butana in the written documents but the reality is different. During the field work it was observed that six of them were closed or their limit was not clear and the remaining two are too narrow and their limits are surrounding by mechanized farming. There is a long debate between both pastoralists and farmers; pastoralists claim that these are their customary routes while farmers concentrate on the idea that passing by livestock will damage their crops. To this pastoralist stay more in one and small area (manazil) causing severe degradation or move fighting with farmers. Pasture and rangeland department made some points to solve this acute problem and these are through:

1. Determine the width (one km) and the distance of route.
2. Use packim and labeling saying that name and number of route for example (route no1).
During the field work it was observed that some packims are destroyed and removed by farmers. Farmers believe that most parasites are transported by animals such as *Stirga Hermonthica* (Boda) and *Rottboellia Exaltata* (Adar). It is apparent that in the past there was a mutual cooperation between farmers and pastoralist. Farmers used to open their farms for free grazing immediately after harvest. This system is known locally as *(Talak)*. Today farmers can open their farm for pastoralists soon after harvesting not for free as in the past but for cash.

5.5.5 Mechanisms for Resolution of Conflicts:

In the past most land use conflicts in eastern Sudan in general and the study area in particular are resolved locally with little or no involvement of government authorities. The native administration, at all levels (Nazir, Sheikhs and Omdas) used to be actively involved in the resolution of conflicts. These were through the effective negotiations, involving time to reduce tensions, exchange of livestock and alliance through marriage and social relations. However, the abolition of the native administration by the government since the early 1970s has weakened the position of tribal leaders and their ability to control land conflict situations in their tribal areas. It was observed that still the tribal leaders continue to participate informally in the resolution of conflicts, and the government has recently passed a law for reinstatement and limited empowering of Native Administration to enable them to participate more effectively in resolution of conflicts situations. The Nazirs are appointed by the government as members of the National Assembly (the Parliament) and are represented in state level legislative bodies. The Nazirs and their subordinates in the native administration hierarchy are receiving salaries and/or other forms of financial remuneration from the government.

As the result of the great shock in 1971 and the recent ideological changes, leaders found themselves very weak to enforce the rules that govern land use in the past. Lack of power among leaders was due to the changes in land tenure thus all financial supports coming from land are ended (Animal tax-Gottan). Moreover, the new generations do not fully like this old system and they have tried to get rid of it.

The study concludes this section about land conflict by mentioning the causes of the conflict in Darfur (2003) at the western region of Sudan aiming not to repeat itself in Butana. Resource access in pastoral areas is a critical element in understanding the 2004-07 crises in Darfur, which has displaced an estimated 2
million persons, while leaving some 9,000 dead (Newspaper 2007). Due to the severe degradation in the northern part of Darfur as the result of recent climatic changes (rains move south) in addition to the repeated drought beside the passive state intervention and the weakening of tribal leaders. All these together have forced pastoralists to move to the south creating conflict with settled farmers over there.

5.6 Gender Issues:

The changes of the subsistence economy into market orientation productions in Butana have negative impact on pastoral population in general and on women in particular. As the result of this transformation woman lost their economic position that they used to play in the pastoral economy and become more dependent on man. For example, in the past selling of milk was considered as taboo in the Eastern region thus, milk production was one of the major assets of women in such area. Due to the role of market economy pastoralists need to sell milk in order to buy basic needs and supplemented fodder for their herds. Therefore the economic situation and social position of women has declined dramatically. It was observed that the price of milk in Butana is the same as in the market of Gedaref town. It is worth mentioning that women become marginalized in the society as in the past women took the responsibility of some pastoral productions such as collection of fuel, taking care of small animals and milking. But, due to the recent changes women lost those major contributions hence, becoming passive agent in livestock decision. Responding to the question about who is responsible for bringing firewood currently and in the past. (37%) of the respondents mentioned that in the past this was the duty of women but for today none mentioned them (see Figure 5.6 and 5.7). These figures confirm clearly the absence of trees near or around villages and at the same time reflects the changing roles of women as they are too busy in (cooking (flouring Dura), taking care of kids and doing other hard job (making bricks). Also building mobile houses were the duty of women in the past. But today and due to the changes from nomadic into settled life the role of women in doing such jobs are replaced completely by market. Changing such roles and lack of economic participation in household has led to socio-economic marginalization of women among local communities. Economic marginalization is due to the fact that women in the past had considerable economic contribution to the pastoral family. For example, women made some
handicrafts such as spinning wool, leatherwork and tent roofs for accessing cash. Recently, and due to some cultural and economic changes their handicrafts are no longer needed. They are largely being replaced by industrial consumer goods (plastic containers and wooden cupboards). It seems that the younger generation no longer practiced the old techniques. They said that those tasks were old fashioned and dirty and no longer compatible with a sedentary lifestyle.

Although market economy put more socio-economic pressure on woman it offers her more valuable things. For example, women today can access schools, express their views, demand their rights and are free in making decisions. This idea is supported by (Holter 1994) who mentioned that in 1991 the UNDP project was started and two young lady teachers tried to teach the women the alphabet and new cooking recipes, the women were very much interested. They had specific reasons why they wanted to learn how to read and write and express their ideas clearly: they hoped for more freedom in making decisions and in defining their own affairs and interest, such as choosing a marriage partner, or in legal matter as they said treatment was unjust here.

**Figure 5.6: Means of Collecting Firewood in the Past**

![Bar chart showing the means of collecting firewood in the past.](image)

Source: Fieldwork 2006
5.7 Change in Building Materials:

The survey result has shown that people in the past used mobile tenet for their moving houses. They mentioned that there was no problem in accessing such types of materials as most of it was found locally and the rest were available in the neighbouring towns such as Halfa, Kassala, Tanboul and Gedaref. All respondents agreed on that, in the past there was no problem concerning the access and availability of materials and the only problem that faced them was heavy wind and rains. These situations continue until the people loss their livestock due to the repeated drought and other factors will be revealed in chapter six.

It was observed that the pattern of settlement in some villages in Butana is in form of groups. Each group forms a separate cluster with wide distance between each. This for the study means three things; firstly it explains the old system of social network among local communities as extended families in each village live in a cluster. By so doing, they will help each other in daily work and stand as one body in front of harsh nature. Secondly, distance between different clusters may also be a sign of social distances and closeness as people of the same blood or have same grand father are living together. Thirdly, it also reflects the traditional types of nomadism as livestock need an open space for grazing and to be around their owners' huts. In some villages such as El Sufia still grouping settlement was observed but it is hard to find this type in the villages along the eastern part of Butana (El Saddah village as a good example).

There is a linear relation between type of houses and the economic activities. Thus, a normal person can distinguish between the house of labor in a factory.
and the director of it. This is what happens in Butana after shifting from being nomads into agriculture or agro-pastoralists. People have changed their building houses. Figure 5.8 shows that currently there are different types of building materials in the area. These materials include mud, bricks, stones and woods. Accordingly, the study confirms that huts and rooms are the recent houses that replaced the old moving tenets.

**Figure 5.8: Current Type of Building Materials in Butana Area**

<table>
<thead>
<tr>
<th>Building Material</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mud+Bricks</td>
<td>18.7%</td>
</tr>
<tr>
<td>Straw</td>
<td>29.7%</td>
</tr>
<tr>
<td>Straw+Mud</td>
<td>12.0%</td>
</tr>
<tr>
<td>Bricks</td>
<td>28.0%</td>
</tr>
<tr>
<td>Stone+Bricks</td>
<td>6.7%</td>
</tr>
<tr>
<td>Other</td>
<td>5.0%</td>
</tr>
</tbody>
</table>

Source: Fieldwork 2006

The study justifies the varieties in building materials for several reasons these are organized as follows:

1. Affecting by the building system of the neighboring settlements for example, there are similarities between houses in the southern part of Butana and those of Gedaref (Huts: Gottiya) and between western Butana and those found in Gezira (Room: Oudda) and also villages in the Eastern Butana have the same building as Halfa (Bricks: Mona Hura).

2. Availability of building materials for example, the existing of mountains in El Subagh offers the residents in such place a chance to use stones for building. In the area where there are no trees or too expensive it was observed that people replace it by mud or Green bricks which are dangerous especially if there is high rainfall.
3. Depend on the economic situation of the inhabitants as it was observed in same settlement (Village) some people use mud for building materials while other use bricks and wood (always merchants and expatriates).

4. Reflect the degradation of the natural vegetation cover in the area as in the past people used the surrounding materials for building their houses. Today all the respondents mentioned that they can access building materials but in nearby markets.

5. All above causes explained the phenomena of the farewell of mobile houses and the recent trend towards settled life.

5.8 Change of Tribal Structure in the Area:

Changing of the tribal structure is one of the major consequences of the recent transformation in the area under study. As mentioned in chapter three, Shukriya is the popular indigenous tribe of the Butana area and this has been documented two hundred years ago during Funj sultanate (see chapter three for more details). Recently, and due to the factors mentioned in chapter six the tribal compositions of the area have profoundly changed. The survey results have shown that the number of pure shukriya in Butana is decreasing sharply for example Sinnab represents only (0.3%) while the number of Shukriya sub-tribes and tribe of non Shukriya are increasing remarkably (Table 5.4).

Table 5.4 shows that there are new tribes or tribes other than Shukriya dominated Butana area such as Lahaween and Bataheen while the original Shukriya is decreasing (Sinnab). In searching for the reason behind the sharp decline in Shukriya-Sinnab the study made some investigations. The findings reflect that most of the previous Naziirs of Shukriya who usually settled in Gedaref town were from such tribe. This means Sinnab tribe have got a lion chance in education thus for continuing their studies they need to settle in towns (Gedaref). Moreover, being the tribe of Naziirs offers them a chance to access irrigated lands in Halfa and Rahad. Therefore, their existing in Butana is of no use especially if one understands that always there are some people who become the happiest when they serve Naziirs and their extended families.
Table 5.4: The New Tribal Structure in Butana Area

<table>
<thead>
<tr>
<th>Sub-Tribes</th>
<th>Frequency</th>
<th>Percent %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shukriya Hasanab</td>
<td>23</td>
<td>7.7</td>
</tr>
<tr>
<td>Shukriya Norab</td>
<td>75</td>
<td>25.0</td>
</tr>
<tr>
<td>Shukriya Eshab</td>
<td>26</td>
<td>8.7</td>
</tr>
<tr>
<td>Shukriya Gaborab</td>
<td>7</td>
<td>2.3</td>
</tr>
<tr>
<td>Shukriya Balalab</td>
<td>35</td>
<td>11.7</td>
</tr>
<tr>
<td>Shukriya Khawaldah</td>
<td>7</td>
<td>2.3</td>
</tr>
<tr>
<td>Shukriya Sinnab</td>
<td>1</td>
<td>0.3</td>
</tr>
<tr>
<td>Shukriya Mihadat</td>
<td>21</td>
<td>7.0</td>
</tr>
<tr>
<td>Shukriya Ma'ashrah</td>
<td>16</td>
<td>5.3</td>
</tr>
<tr>
<td>Shukriya Shawyab</td>
<td>26</td>
<td>8.7</td>
</tr>
<tr>
<td>Shukriya Shamashah</td>
<td>15</td>
<td>5.0</td>
</tr>
<tr>
<td>Shukriya Najmab</td>
<td>8</td>
<td>2.7</td>
</tr>
<tr>
<td>Bataheen</td>
<td>15</td>
<td>5.0</td>
</tr>
<tr>
<td>Lahaween Edab</td>
<td>13</td>
<td>4.3</td>
</tr>
<tr>
<td>Fadniya Najmab</td>
<td>12</td>
<td>4.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>300</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Source: Fieldwork 2006

5.9 Change in Land Tenure:

One of the major consequences of the recent transformation is the changes in accessing to lands in Butana. As noted in the past the tribal leader was the only one responsible for allocating and distributing lands. As the result of the land Act of 1971 this system was profoundly changed. Accessing land today is governed by "law of forest" thus who comes first take more before else. Moreover, the system of exclusive right among the indigenous people has no longer existed, and therefore, Butana is opened for all as it became the property of the state.

The study has identified some consequences of state property system these are organized as follows:

1. Land open for all thus, Butana is converted from common property to open property and this holds all features of the tragedy of the common theory (see the perspective of Hardin in chapter one).
2. Collapse of pastoral economy which replaced by agriculture or agro pastoralists which is harmful to the fragile soil in the study area.
3. Acute dispute and conflict between land users and between indigenous people and new comers. In addition to the acute conflict between local communities and the State.

4. Cultural conflict between parents and their sons' thus social disruption exist in Butana.

5. Non resident tribes (outsider) pastoralist took advantages of the Act land for all which gave right to graze everywhere without obeying the customary law of resource utilization in the area.

6. There are signs of socio-economic and environmental degradation all over Butana area in general and with special emphasis at the Northern and Central parts.

5.10 Changes in Water Sources Ownership:

Recently and due to the existing of large farming beyond the grazing line and the current process of land reform, most of natural water resources are difficult to access by herders. It was observed that livestock concentrated much time near water points whenever they find chances causing severe degradation. Old pastoralist stated that the phenomenon of robbery and Mosalafa (bargaining to return your stealing animals) is now widely spread and locally named it (Hambatta). The idea of Mosalafa is the stealing of some animals and hiding it in isolated places. The role of salif is work as mediator between herd owner and thefts to show the owner their animals after paying him a ransom.

Regarding the new transformation in water supply it was observed in each Hafir there is guard selling water to local communities a phenomena which was unknown before. The idea behind such fees is to reduce water consumption, avoid non resident tribes (outsider) and overall pay fees for the government. Also there is a change in the responsibility of fetching water to the household. This chapter showed that bringing water to the household was the responsibility of children and women. Recently, traders and hired persons share this type of duty with sharp decline in the role of women. Local communities of Butana respond to the question about who is responsible for brining water by mentioning children, mobile tankers (traders) and hired person see figure 5.9.
Concerning the current transformation in water sources ownership, the study observed that there is a trend in privatization of water sources. The oral discussion has shown that in Butana there are some wells and *hafirs* owned privately but in a very low scale. Recently, it was observed that rich pastoralists dig their own *hafirs* and wells and it becomes widespread phenomena. As in El Hajar villages, Haj Babikr mentioned that his own hafir cost him 17 million Sudanese pounds. The study gathered some points to show factors and causes behind the privatization of water resources in the area these are:

1. Follow the process of privatization as common property has gone with removal of native administration system. Thus, the only way to avoid strangers not to come and graze near their villages is through the privatization of water resources.
2. Access to government *hafir* is not free; it was observed that a guard selling water to the herd owners. The government charges each Hafir very high fees ranging between 3 -5 million Sudanese pound a year. The justification of this figure is for maintenance although some Hafirs were dug by UNDP-ADS programmes.
3. During critical situations or when water gets scarce it becomes the only available source for human use. As private Hafirs are a little bit small and well fenced.

4. Distribution of an old Hafir is now not suitable for grazing due to the recent changes and expansion of unauthorized mechanized farming. Added to that the recent trend towards settlement

The study tries to justify why non resident tribes (outsiders) believe that water sources in Butana is for all and they have right to graze anywhere, everywhere and at anytime. This is because of the land act of 1971 and again they believe that they pay more fees to the government than local pastoralists. Non resident tribes (outsider) pastoralists understood that animal tax is only for receiving services such as water and pasture.

Wells are considered the only source of pastoralists during the dry seasons as most of them are owned by National Rural Water Corporation (NRWC). This explains the high concentration of animal around well during such seasons. Again large animals are forbidden to drink in Hafirs so the only option for camel and cattle is wells. During the fieldwork it was observed that some wells also are own privately and it's allowed to sell it to other even stranger. I had witnessed a fighting between a local tribe and a Rashida group concerning this issue. The Rashida bought well (water for one season) from the local person and said they will not move unless it finished. It comes to my knowledge that local people in the study area have begun to sell water to the non resident tribes (outsiders) since the drought of the eighties. Although selling water is recognized by local communities as prohibited but, for poor families it is one of the alternatives of income sources. Shukriya families use their monopoly in wells to keep unwanted groups from utilizing the grazing land in their region as long as possible. It is worth mentioning that still local communities are able to determine some rules of access to the natural resources particularly water and this is through:

1. Creation of some accessing rules include exclusion of non resident tribes (outsiders) through payment of fees and restriction of access to the communities members;

2. Enforcement of some mechanisms such as determines the time and location of access as well as the number, species, age and special characteristics such as lactating animals.
5.11 Spontaneous Settlement (Sedentraization):

Settlement of nomads is one of the good indictors of the recent transformation in the area of study. Figure 5.10 shows that there are different causes behind the current settlement in Butana these include drought, access to better services, lost of animals and acculturation. It shows that around (21%) adopted settled life because they have lost their main asset (livestock) and (39.7 %); (9.7%) settled due to the access of basic services education and water supply respectively. From the discussion it was observed that decline in livestock in addition to the access of basic services such as education are the most essential factors behind the current settlement. The researcher fully agreed with that the pastoralists adopted recent settlements because they lost their main assets (animals). This idea is supported by Sheikh Mohmed Awad the tribal leader of Eltakoon village “he said irony we had settled simply because we have no wealth to follow as in the past”. The repeated droughts of mid eighties and then 1990s in addition to the role of market have led to a great loss in animals thus people have no option than to settle. Discussions with key informants confirmed that the drought of 1984-85 has forced to settle most of the villages in Butana. Again around (8.7 %) mentioned that they settled because of "Hadara" meaning acculturation this indicates that there is a dramatic cultural change as people in Butana believes what others say "being nomad means primitiveness while civilized people have always permanent settlement". Also modernization is considered as one of the external factors behind sedentarization of nomads. Modernization or westernization (see chapter two) forced African leaders to apply land reform in order to create a suitable environment for modernized agriculture.

As observed and supported by quantitative data that pastoral people are now transformed into agro-pastoralist or pure farmers. Due to the collapse of pastoral economy and decline of mobility, pastoral households depend on cultivation of crop for their livelihood. In addition to that, farming system offers local communities a chance to gain some security of tenure over land; besides supplementing declining productivity from their herds.
From the above discussion the researcher sees the negative impact of settlement in Butana as follows:

1. The spatial mobility has changed into social mobility, thus two major social classes exist in the area. These are the elite who have different assets including large number of livestock and the losers who serve the wealthier.

2. Searching for other alternative sources of livelihood away from pastoral economy. Massive migration to the urban centre and to the rainfed or irrigated schemes. Therefore, all negative impacts of migration found in both the study and arrival areas.

3. Environmental degradation especially around the settled villages. As Butana area cannot support permanent agriculture because of dry conditions or fragile soils. Therefore, permanent settlement may rapidly result in grave environmental problems.

4. Acute conflict between different land users and between the inhabitant and the state. The role of the state is to provide them with better basic services after settlement if not the arms conflict will be the result especially the role of traditional mechanisms for solving conflict has become weakened.
5.12 Dropout from Pastoralism:

Empirical and oral evidences showed that today there is a sharp decline in the number of pastoralists in all African sahel and Sudan in particular. The drop out from pastoralism sector is due to the several factors such as drought, state policy, market relation and changing of land tenure. Therefore, some of the losers’ pastoralist still practicing pastoralism but instead of being the owner they have changed into being hired herders for the rich people in Gedaref. Table 5.5 shows that there is a sharp decline (dropout) in nomads number in Sudan as around (13%) of the total population was considered as nomads in 1956 compare to the only (2.6%) in 1993.

Table 5.5: Distribution of Nomadic Population in Sudan

<table>
<thead>
<tr>
<th>Census year Total</th>
<th>Total population</th>
<th>Urban</th>
<th>Rural</th>
<th>Nomads</th>
<th>Nomadic Pop. Per cent</th>
<th>Rural Percent</th>
<th>Urban Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1955</td>
<td>10,263,000</td>
<td>845,000</td>
<td>8,003,000</td>
<td>1,405,000</td>
<td>13.7</td>
<td>78.0</td>
<td>8.3</td>
</tr>
<tr>
<td>1973</td>
<td>14,819,000</td>
<td>2,606,000</td>
<td>9,878,000</td>
<td>1,630,000</td>
<td>11.5</td>
<td>70.0</td>
<td>18.5</td>
</tr>
<tr>
<td>1983</td>
<td>20,594,000</td>
<td>4,220,000</td>
<td>14,109,000</td>
<td>2,265,000</td>
<td>11</td>
<td>70.0</td>
<td>20.5</td>
</tr>
<tr>
<td>1993</td>
<td>25,588,000</td>
<td>7,504,000</td>
<td>1,742,400</td>
<td>660,000</td>
<td>2.6</td>
<td>68.5</td>
<td>29.3</td>
</tr>
</tbody>
</table>


The study observed that employment as a salaried herdsman now appears to be the major method available for the dropout herders to return to a pastoral life style through acquiring livestock and thus securing their livelihood. It is hardly possible as a casual worker to accumulate enough saving to build up new herds. The same is true in the case of the hired herdsmen who are indeed sometimes paid in the form of young animals, but who are forced, by the power of market economy, to sell them in order to purchase their basic needs. Therefore, the outcomes of this strategy are deep poverty and increasingly stratified of pastoral communities. This idea is supported by (World Bank 1992) who stated that there are correlations between common resource management and rural poverty: a growing segment of the poor in the world is exclusively or mainly dependent upon common utilization of resources. The
endangerment and destruction of these systems without those concerned being able to gain access to rights of utilization of another quality such as private ownership of land is simultaneously a major cause for the increasing of the material poverty and economic social differentiation.

5.13 Diversification of Income Sources:

Having alternatives sources of income besides pastoralism was an adaptive strategy adopted by pastoralists to cope with the scarcity of nature in dry areas. These alternative activities lie within the type of pastoral economy products such as making handicraft, selling of animal's products and cutting wood from the surrounding environment. Recently, this strategy is still going on but transformed to a new type of alternative activities out of pastoral economy. As the consequences of the recent changes in Butana local producers in such area diversify their income sources. These alternative strategies include seasonal workers in mechanized and irrigated schemes, generating income from non pastoral activities, herdsmen for rich pastoralist inside and outside Butana (See map 5.1). Figure 5.11 shows that people in Butana besides being farmers or herders they have other alternative sources of income. These include traders, daily workers, animal sellers, etc see.

Figure 5.11: Diversified Sources of Income in Butana

Source: fieldwork 2006
5.14 Declines in Crop Production:
On of the major consequences of the recent transformation is the dramatic decline in crop production. To show the reduction in the crop yield two variable were computed to examine the correlation between them. These variables are average rainfall and crop production (Dura and Seasame) in the Gedaref state for period of 25 years (Elhadary1999). The findings showed that there is a positive low relationship between Dura and rainfall (+0.2) and a negative low relation between sesame and rainfall (-0.3) this leads to the conclusion that increase in rainfall doesn’t mean high production. Therefore, some factors should be considered such as soil fertility, spatial and temporal distribution of rainfall and parasitic grasses *Striga Hermonthica* (Boda). The negative correlation between the sesame and rainfall support the intelligence of traditional farmers who always grow sesame in high well drained area to avoid much rains and logy condition. The group discussion has shown that farmers in
Gedaref area cultivated in same season more than one scheme in different places. The philosophy behind is to cope with unpredictable weather thus, if one fails the other will compensate. This strategy has a negative impact on the production since farmers care much about horizontal expansion rather than vertical expansion. In addition controlling more than one scheme in the same season is very difficult especially the distance between the two is too far as farmers prefer one in the north and the other will be in the south.

Concerning Butana area there is a sharp decrease in production per feddan. Table 5.6 explains that the average per feddan was around 9 sacks in mid eighties and recently it decreases into three or less sacks per feddan.

<table>
<thead>
<tr>
<th>Times</th>
<th>Minimum Production/feddan</th>
<th>Maximum Production/feddan</th>
<th>Means of Production/feddan</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980s</td>
<td>2</td>
<td>15</td>
<td>9.4</td>
</tr>
<tr>
<td>2006</td>
<td>1</td>
<td>10</td>
<td>2.8</td>
</tr>
</tbody>
</table>

Source: fieldwork 2006

Regarding Gedaref state as a whole Table 5.7 shows that there are rapid expansions of mechanized farming from 100 000 feddan in 1953-54 to 2 000 000 in 1968-69 and in 2007 it reached around 8 million feddan. It reflects that there is a decline in production of Dura from (4) sacks in 1980 to (1.1) in 2005 and for Seasame from (3.4) gonttar/feddan in 1980s to (1.5) in 2005.

The study justifies the decline of the crop production by several things these are organized as follows:

1. The Northern part (Butana) is not suitable for extensive farming due to the less amount of rainfall and the fragile soil.
2. In the past people cultivate in wadis which are more profitable as soil renew its fertility annually but today people cultivate everywhere.
3. Recently people try to increase the size of land so they are interested in securing land rather than increasing production (land tenure issues).
4. Some farmers practice agriculture just to feed their livestock and they don't care about harvesting crops.
5. Shortage in labor as most of the youth at the time of harvesting work in mechanized schemes or irrigated schemes near by.
6. In the past farmers used their traditional tools now all are replaced by machines.

Table 5.7: Production of Sorghum and Sesame in Gedaref State (1995-2005)

<table>
<thead>
<tr>
<th>Area /season</th>
<th>Dura</th>
<th>Sack/feddan</th>
<th>Seasame</th>
<th>Gontar/feddan</th>
</tr>
</thead>
<tbody>
<tr>
<td>95-1996</td>
<td>5231 000</td>
<td>1.8</td>
<td>1 100 000</td>
<td>1.5</td>
</tr>
<tr>
<td>96-1997</td>
<td>4 320 000</td>
<td>2.8</td>
<td>866 000</td>
<td>2</td>
</tr>
<tr>
<td>97-1998</td>
<td>4 744 694</td>
<td>2.8</td>
<td>720 618</td>
<td>2.3</td>
</tr>
<tr>
<td>98-1999</td>
<td>3 910 325</td>
<td>2.5</td>
<td>1 295 227</td>
<td>1.7</td>
</tr>
<tr>
<td>99-2000</td>
<td>3 771 000</td>
<td>1.4</td>
<td>1 069 637</td>
<td>1.9</td>
</tr>
<tr>
<td>00-2001</td>
<td>4 451 000</td>
<td>1.9</td>
<td>746 800</td>
<td>1.7</td>
</tr>
<tr>
<td>01-2002</td>
<td>4 239 215</td>
<td>1.2</td>
<td>431 145</td>
<td>1.6</td>
</tr>
<tr>
<td>02-2003</td>
<td>4 870 615</td>
<td>1.8</td>
<td>1 009 670</td>
<td>1.8</td>
</tr>
<tr>
<td>03-2004</td>
<td>4 620 000</td>
<td>2.6</td>
<td>1 008 254</td>
<td>2.7</td>
</tr>
<tr>
<td>04-2005</td>
<td>2 864 668</td>
<td>1.1</td>
<td>891 855</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Source: Department Of agricultural statistics mechanized corporation 2006

5.15 Changes in Energy Consumption:

Change in energy consumption is one of the consequences of the recent changes. As noted in this research that pastoralists in the past depended completely on the surrounding environment for building materials and firewood. All the respondents mentioned that in the past there was no problem in collecting firewood. Due to the easy accessibility children and women were responsible for doing this duty. Recently, acquiring firewood and building materials is considered as a nightmare for people in such areas. Today in searching of firewood people can go longer distances (Forest and Wadis) or can buy it at high price. It was observed that there are many changes concerning this issue. Majors among these are the disappearance of useful trees, people use some trees which are not used before and the most dramatic change is the use of gases instead of all these see table 5.8. This table explains clearly the current energy use in Butana and the main causes behind such changes. It shows that the disappearance of the trees is the most essential factor behind using other alternative types of energy such as gases.
Table 5.8: Current Types and Causes of Changes in Energy used in Butana Area

<table>
<thead>
<tr>
<th>Current types of energy</th>
<th>percent</th>
<th>Causes of change</th>
<th>Frequency</th>
<th>Percentage %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firewood</td>
<td>70</td>
<td>Remoteness of Trees</td>
<td>8</td>
<td>2.7</td>
</tr>
<tr>
<td>Gaz</td>
<td>24</td>
<td>Availability of Gaz</td>
<td>15</td>
<td>5.0</td>
</tr>
<tr>
<td>Charcoal</td>
<td>6</td>
<td>High cost of firewood</td>
<td>20</td>
<td>6.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Disappearance of Trees</td>
<td>257</td>
<td>85.6</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>Total</td>
<td>300</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: fieldwork 2006

5.16 Urbanization:

One of the consequences of current transformation is the rapid growths of urban centres in Gedaref state. This has mutual effects of both thus dropout pastoralist move to the urban centre in searching for work on the other side urban centres are demanding for pastoral goods (fuel-wood). The expansions of urbanization in the state have led to increase the pressure on pastoral lands. Gedaref town has grown rapidly from 247202 persons in 1995 to the 281737 persons in 2006 and covers (72 %) of total urban population in the state. Increase urban population means increase urban demands such as building materials, firewood and charcoal see table 5.9. Therefore, most of these materials needed are coming from the rural area. This is proves that why forest closed to the urban centre is severely degraded (Rwashda forest as the best example). It was observed that several Lorries carrying wood from Butana area to supply the urban centre.

Table 5.9: Consumption of Charcoal and Firewood in Gedaref State

<table>
<thead>
<tr>
<th>Sector</th>
<th>Wood/year metre ton</th>
<th>Charcoal/year</th>
<th>Wood/person/kajm</th>
<th>Charcoal/person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>60 000</td>
<td>43 200</td>
<td>250</td>
<td>180</td>
</tr>
<tr>
<td>Rural</td>
<td>478 500</td>
<td>5 875</td>
<td>830</td>
<td>1 022</td>
</tr>
<tr>
<td>Refugees</td>
<td>170 000</td>
<td>7 150</td>
<td>772</td>
<td>325</td>
</tr>
<tr>
<td>Total</td>
<td>708 500</td>
<td>56 225</td>
<td>1 852</td>
<td>22 272</td>
</tr>
</tbody>
</table>

Source: Gedaref invest map 2002
Historically, there were six settlements (Hai) Deim Hamad, Deim El Nour, El Maidan, El Nazir, El Ganain and El Asra. Now there are more than thirty (Hai) and the number of plots is increasing rapidly. This dramatic increasing in settlement is due to the natural growth and rural urban migration. As the result, there is massive growth of urban people in the State see table 5.10. Due to the collapse of pastoral economy people have no option than to move and search work in urban centre.

<table>
<thead>
<tr>
<th>Towns</th>
<th>Number of population</th>
<th>Per cent from urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gedaref</td>
<td>281,737</td>
<td>72.7</td>
</tr>
<tr>
<td>Hawatta</td>
<td>27,999</td>
<td>7.2</td>
</tr>
<tr>
<td>Doka</td>
<td>22,540</td>
<td>5.8</td>
</tr>
<tr>
<td>El Showak</td>
<td>21,929</td>
<td>5.5</td>
</tr>
<tr>
<td>Faw</td>
<td>16,547</td>
<td>4.3</td>
</tr>
<tr>
<td>GelaEl nahal</td>
<td>8,694</td>
<td>2.3</td>
</tr>
<tr>
<td>El Mafaza</td>
<td>7,840</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>387,286</strong></td>
<td><strong>100.00</strong></td>
</tr>
</tbody>
</table>

Source: Gedaref encyclopaedia 2004

5.17 Social Transformations:

At the social level, one key consequence of the transformation of pastoral livelihood systems due to the changes in land tenure specially the development of irrigated and unauthorized expansion of mechanized farming in Butana since the 1970s has been the weakening of relations among the local communities in such area. As noted in the pervious chapters that harsh environment forced people to hold everything in commons especially land in order to guarantee its continuity. Recently, the solidarity and symbiotic relation among local producers have in fact been increasingly transformed or in some cases replaced by market relations. It was observed that market economy; changes in land tenure together with passive state intervention have encouraged socio-economic stratification within and between kinship groups, to the benefit of elite families, merchants, and investors. These new rich people benefit from the policy of the land reform thus put their hands on one of the main economic assets (Lands) besides their influence in political decisions. As a result, the rich people become richer as they have multiple assets thus securing their livelihood. On the dark side of the moon, new poor who benefit negatively
from land reform policy were dropout from pastoral economy are increasingly dependent on local markets, serve the wealthier people (hired herders) and work as wage labor in the surrounding centers. Thus, the gap between poor and rich has been widening eroding most of the good social values that existed before such as the financial and social support from the former and help in economic activities from the later.

The decline of pastoral economy has put remarkable negative changes on social values. There is a close relation between economic system and socio-cultural values. For example adopting the economic system of capitalism the society will change into materialistic' people and market relation replace all. In the past the whole system in the study area was working in harmony, for example rich can support poor and poor provide rich with labor and above all access to land was not a problem for both. This social system is under stress simply because people who need assistance are more than those capable for assisting. Although some rich household still assist the needy especially during crises, these support mechanisms are now on decline. This may be due to:

1. Rapid increases of poor people who have less support from their relatives working in towns and schemes.
2. The adoption of market economy forced the people to count everything mathematically.
3. Severe decline in the main asset such as livestock and lands.
4. Absence of Native Administration which was responsible for making social justice between its members.

5.18 Environmental Degradation:

Environmental degradation due to the changes in land tenure and market relations is considered as one of the major consequences of the recent transformation in Butana. Generally, forestry in the study area plays a vital role in producing of fuel wood, charcoal, Gum Arabic of the Acacia Senegal tree and building materials. (SKAP 1985) in their final recommendations proposed that (32%) from the total area of Gedaref state should be covered with forest. According to the department of forest in Gedaref (15%) of the total area in the State is now coved by forest. The study observed some signs of severe degradation (desertification) mainly in the far North of Butana around Geli and at the central parts around Subagh. In the rest of Butana, trees are only found along the seasonal wadis and khors and near the end of wadis (delta).
The earliest studies by (Harrison and Jacksons 1958, Worrall 1959, Lebon 1965 and Abu Sin 1971) all agreed that Butana was the best and largest grazing area of the Sudan with wide-spread of palatable and nutritive grasses species such as Belepheris edulis (Siha). The group discussions have shown that the most palatable species for their livestock now is Schoenoeididia gracilis (Gabash) and little mentioned Belepheris edulis (Siha). They concentrated on that Belepheris edulis (Siha) does not disappear completely from Butana area but it exists in some remote areas where water resources are not available.

One of the major consequences of the rapid expansion of mechanized farming into former pastureland has been increasing pressure of pastoralists on forest resources in Butana. Therefore, pastoralists have no option than to bring their livestock to the forest after spending the wet season in the Butana. This is because at that time their traditional routes were closed and they were not allowed to move until farmers harvested their crops. This explains clearly the severe degradation of El Rawashda forest, which is the available public grazing for pastoralists during rainy seasons. The location of this public forest (open for all) has made it extremely attractive to pastoralists. In addition to that, the forest has become one of the main sources of livelihood for local villagers (open access). As noted in this research that people in Rawshida village are very rich. And this is due to the fact that people in such villages have own both mechanized schemes and livestock together, so, when it rains their animals graze in the Rawshda forest and move to the schemes immediately after harvesting. Thus, they pay nothing for feeding their livestock and also if crop fails the other sector will compensate and when the season is good they invest their money in livestock.

Table 5.11 shows that there is a massive change in natural vegetation cover in Butana as some trees and grasses disappeared and a new invaded the area prosopis Glandulosa (Mesquite) tree as an example. It was observed that trees mainly Acacia Melifera (Kitir) and Acacia Nubica (Laout) are found along the khors and Wadis with bare soil all over the northern part of Butana and very little trees around El Subagh. The situation in the south is better compared with the north as there are existences of some grasses and trees.
### Table 5.11: Natural Vegetation Cover Changes in the Study Area

<table>
<thead>
<tr>
<th>Trees in 1980s</th>
<th>Trees 2006</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Acacia melifera</strong></td>
<td><strong>Acacia nubica</strong></td>
</tr>
<tr>
<td>kitir</td>
<td>Laout</td>
</tr>
<tr>
<td><strong>Acacia seyal</strong></td>
<td><strong>Acacia melifera</strong></td>
</tr>
<tr>
<td>Talih</td>
<td>kitir</td>
</tr>
<tr>
<td><strong>Acacia Senegal</strong></td>
<td><strong>Calotropis procera</strong></td>
</tr>
<tr>
<td>Hashab</td>
<td>Ushar</td>
</tr>
<tr>
<td><strong>Capparis deciduas</strong></td>
<td><strong>Acacia-nilotica</strong></td>
</tr>
<tr>
<td>Tondob</td>
<td>Sunt</td>
</tr>
<tr>
<td><strong>Balanitis aegyptiaca</strong></td>
<td>prosopis Glandulos</td>
</tr>
<tr>
<td>Higleeg</td>
<td>(Mesquite)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grasses in the 1980s</th>
<th>Grasses 2006</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Belepheris edulis</strong></td>
<td>Siha</td>
</tr>
<tr>
<td><strong>Ipomea cordofany</strong></td>
<td>Tabar</td>
</tr>
<tr>
<td><strong>Acalypha indica</strong></td>
<td>Tamaleika</td>
</tr>
<tr>
<td><strong>Sehima ischaemoides</strong></td>
<td>Dambalab</td>
</tr>
<tr>
<td><strong>Arstida pallida</strong></td>
<td>Gaw</td>
</tr>
<tr>
<td><strong>Rottboellia exaltats</strong></td>
<td>Adar</td>
</tr>
<tr>
<td><strong>Indigofera hochstetteri</strong></td>
<td>Um harya</td>
</tr>
<tr>
<td><strong>Echinochola colona</strong></td>
<td>Difra</td>
</tr>
<tr>
<td><strong>Cymbopogon nervatus</strong></td>
<td>Nal</td>
</tr>
<tr>
<td><strong>Tribulus terrestris</strong></td>
<td>Draisa</td>
</tr>
<tr>
<td><strong>Oeimum</strong></td>
<td>Rahan</td>
</tr>
<tr>
<td><strong>Cassia tora</strong></td>
<td>Kawal</td>
</tr>
<tr>
<td><strong>Sporobolus helvolus</strong></td>
<td>Ankoj</td>
</tr>
</tbody>
</table>

**Unpalatable**

- **Indigofera hochstetteri**
- Um harya
- **Rottboellia exaltats**
- Adar
- **Ischoemum brachyantherum**
- Boos
- **Stirga-hermonthica**
- Boda
- **Cassia senna**
- Sekarana

Source: fieldwork 2006

Through the discussion the study gathered some causes behind the degradation of vegetation cover and elimination of some palatable species these are identified as follows:

1. The long and repeated drought which hit the area in mid of 1980s and at the beginning of 1990s.
2. The collapse of pastoral economy left trees as the only accessible and easy alternative source for income generation for livelihood of the local inhabitants. This leads to a mass removal of trees for charcoal making, thus resulting in deforestation. This idea is supported by local people as they mentioned that in the past fire wood and building materials were brought from surrounding village which is now completely bare.
3. High demand of trees for building materials in the area. Due to the sharp decline in livestock people in Butana change their settlement style from tenets or mobile houses into permanent houses. It was observed that due
to the absence of trees for building in some villages people use green bricks instead of wood. Using green bricks also has negative impact to the environment as mud bricks need burning in order to be strong. The study states that the old system of building (Huts: Gottiya) has damage the environment through the removal of trees and the remaining trees are now used to burn green bricks.

4. Daily consumption of fuel wood and charcoal also is one of the factors behind degradation. The study considered it as the most essential factor in the clearance of vast area, since the demand for fuel wood and charcoal is increasing progressively due to the expansion of town and urban centre in the study area. In addition to that food habit in the study area whatever Kisra or Bread are wood consumption.

5. Clearance trees for agricultural purposes as stated in this chapter pastoralist now in transitional stage towards agricultural practise. This sector needs to remove trees for cultivation. As mentioned farmers prefer not to find trees in their farm as trees attract birds, insects and become obstacle in using machine. The shift of grazing line from the south to the central Butana is a good example of rapid expansion of mechanized farming. (Abdel Bagi 1983 in Elawad 1990) mentioned that 200 trees and bushes per feddan are cleared for mechanized farming in a similar way in the Nuba Mountain. If this formula is applied in the study area it means 1600 million trees and bushed were cleared for mechanized farming as the total area is eight million under cultivation see table 5.7 in this chapter.

6. Complete absence of institution to protect trees from cutting. It was observed that many people come and cut trees without having permission among them are the military people. In the past trees were protected by tribal leader but after 1970 it became open for all. During fieldwork it was observed the military cars full of wood in the southern part of Butana.
5.19 Past and Current Land Use in Gedaref State:

To reflect the change in land use, the study uses two maps: map 5.2 of the mid eighties and the map 5.3 of 2006. Map 5.2 shows clearly that there are two major types of human activities in Gedaref state: partrolasim in the Northern part of the state and farming in the southern part of the state. These two activities are well distinguished by the presence of the grazing line. It also shows the location of the General Grazing Area which is founded in the western part of the Gedaref. GGA is the only area used by non indigenous tribes coming to Butana during wet seasons.

Comparing between the current land use map (map 5.3) and that of 1980, the study has discovered major changes; these are:

1. there is a large shift in grazing line toward far North in Butana
2. The boundary of (GGA) has no longer existed thus; Butana becomes an open area (for all).
3. Rapid expansion of unauthorized mechanized farming beyond the first grazing line.
4. Heavy clearance of vegetation covers in Butana area.

5.20 Conclusion:

This chapter also concludes that the Shukriya and their affiliates in the Butana area are currently being gradually transformed from nomads to more sedentary agro-pastoralists. Indictors and consequences of the recent changes have been seen in many aspects of their lives. Changes in mobility, herd management and the collapse in pastoral economy are some of the recent indictors. The consequences of the recent transformation manifested itself in several things such as decline in livestock number and dropout of pastoralism besides the severe environmental degradation. As the result of the recent changes in land tenure Butana has transformed from common property to an open access area. Thus non resident tribes (outsiders) can graze anywhere and at any time without any restriction causing severe damage (ruin for all). Sharp decline in livestock together with the reduction of available manpower due to the access of basic services (education) brings more and more pastoralist families to adopt settled life style. There is a great trend among agro-pastoralist towards rising of small animals (sheep) of good quality instead of having large numbers of animals of less quality.
Map 5.2: Land Use Pattern in Gedaref State in 1980s

Legend
- General grazing

LANDUSE
- Grazing Area
- Agro-pastoralism
- Gadaref: Mechanized farming
- Horticulture
- Mechanized farming
- Mixed Activities
- Pure Pastoralism
- Rahad Scheme

Source: after Elhadary 1999
Map 5.3 Current Land Use Pattern in Gedaref state

El Hadary 1999, GPS 2006
Chapter Six
Causes behind the Collapse of Pastoral Economy and Mitigation Measures

6.1 Introduction:
This chapter covers two broad sections. Section one focuses mainly on the causes of the current transformation and changes in the study area. The overall objective is to uncover the real factors responsible for the recent socio-economic transformation. And section two deals with the designing of rangeland information system. The main objective is to provide planners and local people with up to date, accurate and on time range information for sustainable development. The data utilized in this chapter is basically primary data collected during field work supplemented by secondary data in order to proof some ideas. Empirical investigations of the factors underlying the recent transformation among local producers in the area reveal that a number of closely interrelated physical and human factors are operating. Prominent among these are: drought, population growth, market economy and state policy.

6.2 The Role of Drought:
The role of drought and its impact on eco-system cannot be overlooked, especially in arid and semi arid land-Butana. It is apparent that there is a fluctuation in the mean annual rainfall in the area as there is a shift of isohyets towards the south figure 6.1. By definition, drought is part of nature of dry lands, thus people developed their own mechanisms to cope with the scarcity of nature and recover after drought (see chapter five). Thus blaming drought as the only major factor behind the recent transformation is questionable and need to be revised.

The role of the continuous or repeated drought in aggravating the situation has a lion share in the profound changes of pastoral economy. To reflect the role of drought in the recent changes, the study adopted the real story of an old man from El Idied village. Mohmmmed Awad El karim is a man over (65) years old from Shukriya –Shawyab living in El Idied El Saminah village two hours by car from Gedaref town. This man stated that before the drought of 1984 he had a large herd (Morah) of livestock which includes (124) camels and 100 cattle in addition to a few sheep with three herders. During the drought of the mid-eighties and when it became severe he directed the herders to graze in the southern Gedaref (Bazoura), an area which was not familiar before and he gave part of the livestock to one of his relative in Gedaref town. He said after three weeks he lost all his livestock and the herders came only with their sticks and
wipes. Immediately, after this crisis he sent one of his sons to work in Saudi Arabia and after short time his son sent him (23) thousand Sudanese pounds, so, he bought sheep with this money. Awad El karim mentioned that after three years he had recovered and again the livestock number began to increase but before fully recovering another drought hit the place in 1990 and this eroded every thing. He said now "I have not even a goat for morning tea". His son now is working as a hired herder for the rich pastoralists in Rawshda village (see chapter six). From this story one can identify many points about the role of drought in the current transformation these are:

1. The study area has witnessed two severe droughts within five years these were the drought of 1985 and 1990.
2. Shifting from the large animal types (camel) to small types (sheep) and return lending livestock are accepted coping strategy during drought.
3. Recently, traditional adaptation seems to have lost the capacity to secure people’s livelihoods and to enable them to recover from the effects of drought and famine.
4. Repeated drought within short period of time weakening the resilience of pastoralist and make them more vulnerable and unable to overcome climatic crises as happened in 1984 and 1990.
5. Saving and collecting money from non pastoral activities can be directed and invested in animal after drought.
6. The complete loss of resilience to absorb environmental shocks was due to repeated drought aggravated by human factors such as passive policies from the state towards pastoral sector.
7. Migration of both animal and human is efficient coping strategy during drought.

The study shows that the drought of the mid eighties and the beginning of ninetieth has caused a great lost of both human and animals thus participate in the current socio-economic changes of the rural communities of the Eastern region in general. (Sorbo 1985) stated that for the Eastern region as a whole, the average mortality for different types of stock due to the deterioration of grazing resources, was (23%) for cattle, (12%) for sheep, (7%) for camel and (5%) for goats during 1984 and estimated that 1200 000 people are in need of drought assistance in the region. Therefore, this research includes drought as a factor behind the recent changes and of pastoral economy in Butana area. But
the study concentrates on the external and internal factors that aggravated the situation during drought.

**Figure 6.1: Annual Mean Rainfall in the Study Area (1974-2004)**

![Rainfall Graph](image)

Source: Metrological department-Khartoum

The figure 6.2 explains clearly the role of drought and other external factors that aggravated the situation during such crises. As pastoralists depend mainly on water and pasture in securing their livelihoods. Access to pasture and water resources tends to decrease during a large-scale drought as the result to that pastoralist loses their main assets. When drought becomes acute pastoralist need to sell their livestock in the market. As the result of unfair market mechanisms the price of livestock decreases sharply and price of crop increases dramatically. Thus poor pastoralist need to sell most of their asset to buy basic needs as they have no other alternatives and it becomes difficult for them to recover when drought is over. Decline in livestock price is due to low productivity during dry seasons and to the high price of crops as it's not available in the market. Severe drought affects rich and poor pastoralists differently. A rich pastoralist means a pastoralist who has a large number of livestock in addition to other generation income sources. Those rich people can cope with the market mechanisms as they have different alternatives such as buying fodder, move long distances and diversification, hence when the drought is over it is easy for them to recover. On the other hand, pastoralists who have less number of animals are forced to dropout pastoralism.
6.3 Increased Population:

It is true to say that population has increased rapidly in the area due to both natural growth and migration (chapter two). Gedaref state has witnessed massive migration of seasonal labour and rural-urban migration in addition to the massive influx of refugees. Increase in population whatever the reasons it may put some remarkable pressure on the meager resources of the study area.

The strategy of having many children in the African Sahel is considered as rational household policy because children in such areas could help out on the family farm, making life for their parents easier and help them in their old age. In the study area, the average family number per household is 6.5 persons (7 male and 6 female). This is because pastoral economy (labor intensive) relies basically on members of the extended family to provide labour for grazing and cultivation.

Figure 6.3 shed some light on the increase of population in the study area. It reflects that the total population in Gadaref is increasing in the rate of around 50 000 person every year as in 2006 the total population was estimated 1 729 083 persons.
In this study, the role of population growth and its impact on the environment can’t be ignored, but increased population as such is not the major factor responsible for the recent changes. Therefore socio-economic characteristics should be attached with the increase of population in order to understand the real causes behind current changes. These characteristics for example include distribution of land, access to land, land tenure system, access to political power and role of the state.

Regarding housing characteristics in Gedaref state, the 1993 census showed that (73.5%) of households live in Quttiyas (Huts) while (22.3%) live in houses with one floor. The remaining (3.7%) live in assorted categories of housing. These figures indicate the extent of system of housing in the state and its negative impact on the surrounding environment e.g. Quottiya is made of (trees, grass and straw). In addition to that the average fence of (400) meters requires about (33) Acacia melifera (Kitir) trees. A family also needs about (26) trees per year for firewood. This explains why most of the study area stands bare mainly in the far north of Butana (Al Awad 1990). Due to that land stand bare around settled villages and today there is changing in building materials and type of energy.

The above discussion showed that there are different schools when it comes to relation between population growth and the collapse of pastoral economy. The study concentrates on that increase in population without proper planning and sound intervention from the state it will lead to social and environmental
problems. Figure 6.4 reflects the role of population in the current transformation of pastoral communities. The increased in population certainly leads to increase demand for foods and houses especially in arid lands where there is scarcity of resources. This means more pressure on the environment especially with the recurrence of drought. The outcomes of that are environmental degradation and poverty. As a result, people will move to more fragile area and become landlessness. People try to cope with this by migrating to other areas and this again leads to decreasing population number and their demands begin to decrease and since there would be no risks, then population tends to increase again.

**Figure 6.4: The Role of Population Growth and Environmental Degradation in the Study Area**

Source: Researcher 2006
6.4 The Role of Market Economy:

One of the major factors that have led to the recent changes and participate in the collapse of pastoral economy is the role of market. Many studies in the Eastern Sudan supported this idea. One of these is the study of (Egemi 1994) who carried out a research on the collapse of pastoral economy among the Hadandowa. To him ecological and political marginalization has made the Hadandwa more vulnerable to economic marginalization and this through the operation of the markets and trade relation, particularly animals-durra relation during episodes of drought.

In the past the relation between pastoralists and market was limited depending on their demand of basic needs, surplus of production and processes of restocking. This is because pastoral economy has no or very little financial inputs; it was just a system of labour intensive economy (extended family). Access to pasture and residue for grazing was free of charge and their small farming depends on rainfall and traditional tools in addition to that accessing land was secured for every member and even for outsiders. Thus, selling animals and their products were for satisfying basic needs and during crises only.

Recently, due to the role of market economy pastoralists were forced to enter unfair markets especially during crises such as drought. Many factors have led pastoralists to hold the idea of market economy these are:

1. Mutual and symbiotic relation between farmers and herders has profoundly changed. Thus, farmers open their farms after harvesting for cash. Surpluses of crops are rather sold to merchants or to the traders of the village.

2. Most of the farmers adopted the strategy of having livestock beside cultivation to eliminate any dependence on herders for manure and dairy products and above all as risk management strategy.

3. Pastoralists are increasingly forced to sell their livestock to buy food, building materials, gases or other goods (settled life). This increased their dependence on the market and therefore their vulnerability to market forces and price fluctuations are increasing.

4. The collapse or weakening of moral economy has led to the commercial orientation of production, thus contributing to the changes of past adaptation mechanisms of community and vulnerability replaced the social solidarity.
5. The concept of the extended family has no longer existed; therefore, all processes of herding and farming need cash.

All these above at the end have led to the fragmentation of society and increase of social stratification. The erosion of traditional entitlement mechanisms has increased pastoralists' vulnerability to droughts and famines and pushed growing numbers of poorer herders to settle as farmers or to migrate elsewhere. As pastoralists become more dependent on the market for their daily needs, therefore they have been under the control of unfair market relation. This unfairness is due to the lack of market infrastructure, absence of marketing information, lack of support and protection from the state. All these aggravated the already degraded situation of pastoralists in the study area and made poor pastoralists more vulnerable. Poor people have to sell proportionately more of their herd products on the market to obtain food than the rich. The ongoing market integration tends to make the rich richer and the poor poorer and, inevitably, more vulnerable to drought (Hogg 1997). One of the best examples that explain the role of market economy is the relation between herders and farmers. In the past, pastoralists have adapted themselves to the dry condition by free access to agricultural residues in the schemes. In recent years, however, this access has been blocked by the scheme-owners, who started to demand a price for residues. Thus pastoralists were forced to purchase agricultural residues and other supplemented fodder such as (umbaz). It is worth mentioning that crop residue or artificial forage have considerable contributions to the recent available grazing.

Map 6.1 explains the available markets for people in Butana areas. These include the local market of El Subag, Gedaref, Faw and Tanboul. To highlight the role of unfair market relation, the study selects the cost of transportation for accessing these markets as a measurement. For example, pastoralists need to pay around 500 to 1000 Sudanese Dinners (SD) per head (sheep) for transporting animals to these markets. The variety in the cost of transportation is related to the difference in distances and the seasonality (dry and wet). Thus, transportation costs during the wet season increase due to the bad situation of roads. As the result, pastoralists prefer to sell their animals in the village to local buyers and traders coming to the village with low price than transporting them to the surrounding markets with suitable price. For example, the price of a sheep in the village is around 12000-1400 SD and in Gedaref market is between 20000-25000SD. Transportation facilities plus the taxes and fees constitute the most serious limitation when it comes to the selling of animals,
since animal owners sell their animals in the surrounding markets, which usually lie at a distance of 70 to more than 150 km (see map 6.1). Due to the long distance and type of transportation (Lorries), usually around 2-5 sheep per/lorry get lost on the way to markets and this figure will double itself when a lorry carries more than its capacity. Moreover, there is a lack of proper market information therefore, when pastoralists reached markets they have no option than to sell their animals even the offered price is lesser than they expected.

Map 6.1: Current Market Places in Butana Area

Legend
- Distances to Markets
- Animal Markets

Source: GPS data 2006
6.5 International Marginalization:

Modernization is considered as one of the major external factors that led to the collapse of the pastoral communities in most of the African countries. Sudan has no exception. Sedentarization of nomads and integration of livestock in farming were the policies adopted by the international agencies (Westernization) without seeking to understand the livelihoods strategies which at the time were primarily based upon mobility. This policy of anti-nomads is also supported by other external factors main among these are international community (Donors) and UN agencies. The general hypothesis among most planners is that being mobile meant that pastoralists were not full participants in the international economy. This is justifying why the main objective of development project is aiming to integrate the nomads into the life of the nation, and to enable them to contribute fully to the national and international progress. Therefore, the general policy of the Sudan is to develop irrigation and rainfed cultivation, which they perceived as a necessary step in moving the country forward to become a truly modern nation. Modernization policy (chapter two) applied in most of the African countries, Sudan one of them, is forced by international communities. There were big interventions from the international communities that have led to recent changes of pastoral economy these are organized as follows:

1. The starting point of mechanized farming in Gedaref state by the colonial people in 1940s. The objective was to secure food for British during the Second World War.
2. The clear role of the World Bank in supporting the expansion of mechanized farming in 1968.
3. The role of World Bank in funding Rahad scheme which cut considerable part of the General Grazing Area (GGA).

6.6 National Marginalization:

6.6.1 Lack of Basic Services Infra-Structure:

- Health Facilities:

As noted in chapter four that the contribution of pastoralists in local and national economy is considerable on contrast, pastoralists have received little or nothing from the state especially when it comes to the basic services. It was observed that there is no hospital all over Butana except small clinic at El Subagh centre less equipped and lack of qualified staff. Moreover, it is very difficult to access it especially during rainy season. Although Butana is
surrounded by many urban centres (Gedaref, Kassala, Halfa and Medani) that enjoy and access all facilities of public and private health services Butana enjoy nothing see map 6.2.

**Map 6.2: location of Urban Centres in Butana Area**

![Map of Urban Centres in Butana Area]

**Legend**
- Distance to Towns
- Towns
- State Boundaries

Source: fieldwork 2006 and GPS data

- **Credit Services:**

  Also in term of credit system, during the fieldwork it appears that farmer or say big farmers can access credit from banks or say different banks in condition that they are Sudanese and have lands although more than half of them not repaying the credit and now they are considered as bankrupt (see table 6.1). In the side of pastoralist although they are Sudanese and have land and over all have banks carrying their names (Animal Resource Bank) but no body in the fieldwork mentioned that they get official credits or even can access
financial support from government. The reasons behind that they have no documents to claim their lands as their land is a government non-registered land and therefore would not be approved by the Bank as collateral and (grantee) to return the loan. In addition to the lack of credit institutions, pastoralists even lack of knowledge of procedures to obtain credit.

Table 6.1 Bank Credits to Farmers in Gedaref State by Agricultural Season During the period 2000-2005

<table>
<thead>
<tr>
<th>Agriculture season</th>
<th>Banking credit</th>
<th>Repaying</th>
<th>Losing</th>
<th>% of repaying</th>
<th>% of losing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999-2000</td>
<td>1014499</td>
<td>575804</td>
<td>438695</td>
<td>56.8</td>
<td>43.2</td>
</tr>
<tr>
<td>2000-2001</td>
<td>26639543</td>
<td>1536455</td>
<td>1103088</td>
<td>85.1</td>
<td>14.9</td>
</tr>
<tr>
<td>2001-2002</td>
<td>2447779</td>
<td>1352165</td>
<td>1495614</td>
<td>46.5</td>
<td>52.5</td>
</tr>
<tr>
<td>2002-2003</td>
<td>1944182</td>
<td>1085552</td>
<td>858630</td>
<td>55.8</td>
<td>44.2</td>
</tr>
<tr>
<td>2003-2004</td>
<td>2614754</td>
<td>1784112</td>
<td>830642</td>
<td>66.2</td>
<td>31.8</td>
</tr>
<tr>
<td>2004-2005</td>
<td>18556959</td>
<td>6938593</td>
<td>11618366</td>
<td>36.4</td>
<td>62.6</td>
</tr>
</tbody>
</table>

Source: Agricultural Report, Gedaref State, 2006

- **Education Services:**

  Lack of the basic services such as accessing to schools is one of the main factors behind recent changes. Education is the key factor to measure the policy of marginalization toward pastoral economy. Marginalization policy towards education among rural people and pastoralists in the study area is an old phenomenon. Figure 6.5 shows the level of education among the local communities in the area of the study.

  Figure 6.5 reflects that around (43 %) of the total population are illiterate with very few that hold university degrees (5%). The study sees the main factors behind the predominance of illiteracy are:

  1. Unfair access to education between local and tribal leader's families. The study argues that beside the positive role for the native administration in sound resource management this system offered less care to the education of the rural communities. Tribal leaders with support from the colonial people concentrate only on educating their close relatives so as to grantee the continuity of ruling the tribe and get blind support from their followers. This strategy is found all over the Sudan Abu Sin in Butana is the best example.
2. The system of pastoral mobility inside the Butana faced many obstacles in building schools and offering education services. In addition division of family labour has another constraint.

3. Cultural problems as pastoralists are very sensitive when it comes to education. Thinking that going to school means loosing of good traditions and changing the honour parents' jobs. In a village called El Gelieb an old man having two children one in the school and the other is working as a daily labour. This man does not support the idea of education he said my son earns 10 thousands Sudanese pounds per day besides securing his meals (Hanako Barra- His mouse is out) and the educated one becomes dependent spent all the time costuming him-self. Thus conservative nature is an essential factor of illiteracy among the nomadic societies particularly towards female education.

4. Decreasing of livestock through natural disaster (Drought) also put some remarkable problems in education services. People in Butana depend on mobile school but after the severe drought of mid eighties most of them prefer and establish permanent settlements.

The idea of concentration of education among tribal leaders is supported by many researchers. One of them is (P. Ingleson in Young 2005) who worked in Darfur. He said the colonial administration devised its education policy with a view to strengthen the social grouping whose support it required. Inequality within the region was evident in the limited availability of educational opportunities. Entry to schools was very strictly controlled and largely limited to the sons of tribal chiefs. P. Inglesoon, the British governor of Darfur from 1934 to 1941, said at the time: we have been able to limit education to the sons of chiefs and native administration personnel and can confidently look forward to keeping the ruling classes at the top of the education tree many years to come. Thus, during colonial period special attention was given to the education of the sons of tribal chiefs, notables and dignitaries with the view of preparing them for leaderships in the future.
In addition to the above mentioned causes behind the concentration of the education only in the elite houses. In addition to that, education will open the minds of people to ask about their right and demand for democratizing the system of native administration which now is found in Darfur and Eastern region conflict.

To show the problem of education especially among girls the study uses the El idied El Saminah School as an example. This school was established in 1992 when the village settled due to the repeated drought (their ideas) see table 6.2. This table shows that less number of the pupils (boys) enters the school and this figure decrease sharply when it comes to girls. Another problem is that not all the pupils continue their study till class eight that means there is a high rate of dropouts (*Tasaroob*). There are many causes why pupils prefer not going to school and the high rate of dropouts these are organize as follows:

1. Most of the children in the Butana area took the responsibility of bringing water. It was observed that children spend around three hours in bringing half barrel to their families. Besides helping in herd management.
2. Culturally, they are not enthusiastic for education of girls.
3. Early marriage is wide spread among local communities of Butana.
4. There is no secondary school in the area or close near by thus they are afraid to send their girls to the cities.
5. Migration of the family between the settlements of the rainy and dry season which disrupts school attendance.
6. Problem of payment of the school fees.

**Table 6.2: Distribution of Pupils per class in El Idied El Saminah School**

<table>
<thead>
<tr>
<th>Name of the class</th>
<th>Number of boys</th>
<th>Number of girls</th>
<th>The total</th>
</tr>
</thead>
<tbody>
<tr>
<td>The first class</td>
<td>29</td>
<td>12</td>
<td>41</td>
</tr>
<tr>
<td>The second class</td>
<td>26</td>
<td>11</td>
<td>37</td>
</tr>
<tr>
<td>The third class</td>
<td>24</td>
<td>3</td>
<td>27</td>
</tr>
<tr>
<td>The fourth class</td>
<td>8</td>
<td>6</td>
<td>14</td>
</tr>
<tr>
<td>The fifth class</td>
<td>9</td>
<td>Null</td>
<td>9</td>
</tr>
<tr>
<td>The six class</td>
<td>13</td>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td>The seventh class</td>
<td>8</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>The eights class</td>
<td>3</td>
<td>Null</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>120</strong></td>
<td><strong>35</strong></td>
<td><strong>155</strong></td>
</tr>
</tbody>
</table>

Source: Field work, 2006

From the above discussion it is clear that access to the basic services such as education is one of the major factors behind the recent transformation in Butana area.

**6.6.2 Collection of Animal Taxes:**

Livestock in Gedaref state is considered as one of the economic pillars and it is necessary to be considered in development policies. Moreover, this sector has low input facilities if compared to agriculture which needs financial and technical support from the state. Table 6.3 explains clearly the role of livestock in the GDP of the Gedaref state; it shows that more than (80%) of the GDP comes from this sector. Although Gedaref state was famous as a land of mechanized farming, this sector contributes little to GDP if compared with livestock sector. It seems that the contribution of livestock alone is three times the contribution of other three sectors all together.
Table 6.3: The Contribution of the Traditional Sector to the Growth Domestic Product (GDP) in Gedaref State

<table>
<thead>
<tr>
<th>Sector</th>
<th>1998 %</th>
<th>1999 %</th>
<th>2000 %</th>
<th>2001 %</th>
<th>2002 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigated Agriculture</td>
<td>2.3</td>
<td>3.2</td>
<td>2.9</td>
<td>4.0</td>
<td>2.1</td>
</tr>
<tr>
<td>Rain fed agriculture</td>
<td>31.5</td>
<td>26.3</td>
<td>26.8</td>
<td>11.8</td>
<td>11.5</td>
</tr>
<tr>
<td>Livestock</td>
<td>66.1</td>
<td>70.4</td>
<td>96.2</td>
<td>84.1</td>
<td>86.2</td>
</tr>
<tr>
<td>Forest</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.2</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Gedaref Encyclopedia 2004

In addition to the lion share contribution of livestock sector in GDP of the state, this sector also plays a considerable role in the state revenue (Irradat State). Table 6.4 shows that animal tax is considered as one of the five sectors which is the basic source of the state revenue. Therefore, in Gedaref there is a department named animal tax administration (Idarrat El Gottan). It also reflects that always this sector fulfills the budget (Rabtt) by more than (50%) and it reached (84 %) in the year 2002.

To proof in depth the concentration of the state in livestock rather than pastoral community, the study made some details about the animal tax. It is worth mentioning that there are different kinds in collecting money from pastoralists: these are zakat tax (Islamic taxes), animal tax (government taxes) and fees of market for local use and export.

Table 6.4: The Contribution of State Revenues to the Annual Budget (2000-2002) in Gedaref State in million Dinnar

<table>
<thead>
<tr>
<th>Sector</th>
<th>2000 Budget</th>
<th>Actual</th>
<th>%</th>
<th>2001 Budget</th>
<th>Actual</th>
<th>%</th>
<th>2002 Budget</th>
<th>Actual</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fees(masalih)</td>
<td>22512</td>
<td>1808</td>
<td>80</td>
<td>3339</td>
<td>2348</td>
<td>70</td>
<td>4456</td>
<td>35288</td>
<td>79</td>
</tr>
<tr>
<td>fees localities</td>
<td>75721</td>
<td>4149</td>
<td>55</td>
<td>8057</td>
<td>4338</td>
<td>54</td>
<td>89228</td>
<td>56517</td>
<td>63</td>
</tr>
<tr>
<td>Taxes</td>
<td>11000</td>
<td>51325</td>
<td>47</td>
<td>6615</td>
<td>46523</td>
<td>70</td>
<td>5500</td>
<td>48653</td>
<td>88</td>
</tr>
<tr>
<td>Animal tax</td>
<td>2000</td>
<td>1062</td>
<td>53</td>
<td>3030</td>
<td>20055</td>
<td>66</td>
<td>4000</td>
<td>3354</td>
<td>84</td>
</tr>
<tr>
<td>Fees (market)</td>
<td>12500</td>
<td>15311</td>
<td>122</td>
<td>14392</td>
<td>60457</td>
<td>42</td>
<td>2000</td>
<td>24496</td>
<td>122</td>
</tr>
</tbody>
</table>

Source: Gedaref Encyclopaedia, 2004

Animal tax is defined as the annual governmental tax for using water and pasture (fees of rangeland services) freely. Generally, there are two types of
this tax one for the local animal inside the state and the other is for livestock coming to the state (other states). According to the ministry of livestock, the coming animals from different states (Kassala, Gezira, Blue Nile, and Sinner) are about two million. Pastoralists from other States can pay double tax if they cross the boundary. For example, a herder from Kassala can pay a tax to the government of kassala. And if the same herder moves to Gedaref he will pay to the government of Gedaref (see table 6.5).

Table 6.5: The Rate of Animal Tax in SD in Gedaref State

<table>
<thead>
<tr>
<th>Number</th>
<th>Type of animal</th>
<th>Tax of animals of Gedaref State</th>
<th>Taxes of Animals from other States</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>camel</td>
<td>600</td>
<td>300</td>
</tr>
<tr>
<td>2</td>
<td>cattle</td>
<td>400</td>
<td>200</td>
</tr>
<tr>
<td>3</td>
<td>Sheep and goats</td>
<td>175</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>donkey</td>
<td>30</td>
<td>200</td>
</tr>
<tr>
<td>5</td>
<td>horses</td>
<td>300</td>
<td>300</td>
</tr>
</tbody>
</table>

Source: fieldwork 2006

It was observed that there are eight sectors benefiting from this tax (see table 6.6). The administration of Animal tax which is responsible for collecting and managing this type of taxes gets 25% from the total and then send the rest to the ministry of finance to distribute it see table 6.6.

To see the real marginalization towards pastoral sector the study raised the question what happen if a pastoralist is not in a position to pay animal taxes? The answer will be as follows; in each team there is a number of police their responsibility is to protect the team and collected animals in case of not paying in cash. They will not return your animal unless you pay if not for at least ten days the animal will not be yours. Always they took more animals in order to recharge any services cost during those ten days. So after selling they will take the animal tax and the cost of the ten days then the rest (orally) went to the herders.

Also in case of giving wrong information about livestock number or animal types the punishment will be doubling tax with prison for one month. If you are escaping from paying, the punishment will be triple of tax with at least three months in prison.
Table 6.6: Percentage Distribution of Animal Tax According to the Different Sectors in Gedaref State

<table>
<thead>
<tr>
<th>Number</th>
<th>Sector</th>
<th>Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Localities (mahalliyat)</td>
<td>65</td>
</tr>
<tr>
<td>2</td>
<td>State Headquarter</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>Public corporation for water</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>Livestock' union</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>Jihad share</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>Nomad education</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Students hostiles</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>Department of rangeland and pasture</td>
<td>5</td>
</tr>
</tbody>
</table>

Source: Animal tax administration 2006

Table 6.7 shows the type and number of livestock that accessed by the administration of animal tax in different years. It seems that around two third of livestock in the study area is accessed by the administration of animal tax. It was observed that this department is highly equipped with having new and advanced cars that have ability to work in muddy condition.

Table 6.7: Total Number of Animals Subjected to the Animal Tax in Gedaref State

<table>
<thead>
<tr>
<th>Year</th>
<th>camel</th>
<th>cattle</th>
<th>sheep</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>126011</td>
<td>163381</td>
<td>1234786</td>
<td>1524178</td>
</tr>
<tr>
<td>2003</td>
<td>127430</td>
<td>1269198</td>
<td>729517</td>
<td>1083866</td>
</tr>
<tr>
<td>2004</td>
<td>72977</td>
<td>81102</td>
<td>547610</td>
<td>703693</td>
</tr>
<tr>
<td>2005</td>
<td>98029</td>
<td>75881</td>
<td>883609</td>
<td>1059524</td>
</tr>
<tr>
<td>2006*</td>
<td>69235</td>
<td>89323</td>
<td>511152</td>
<td>671716</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>493682</strong></td>
<td><strong>536606</strong></td>
<td><strong>4006674</strong></td>
<td><strong>5036962</strong></td>
</tr>
</tbody>
</table>

Source: department of Animal tax 2006 * in process

To reflect the delay and decline in offer services to this sector, the study adopted and joins two tables one from the animal tax and another from the ministry of livestock both are governmental offices. Table 6.8 reflects that the
number of livestock accessed by administration of animal tax is more than total livestock accessed by vaccination team which is about (21.1%), (19.8 %) respectively. Marginalization policy as represented in collecting different types of taxes forced pastoralist to change their pastoral economy and diversify sources of income in order to secure their livelihoods.

**Table 6.8: Comparison between the Total Number of Animals Subjected to Animal Tax and those Being Vaccinated in Gedaref State**

<table>
<thead>
<tr>
<th>Type of animal</th>
<th>Number</th>
<th>Vaccinated/animal</th>
<th>% Animal tax</th>
<th>% Vaccinated animal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camel</td>
<td>540,000</td>
<td>NA</td>
<td>21.7</td>
<td></td>
</tr>
<tr>
<td>Cattle</td>
<td>1,120,000</td>
<td>440,431</td>
<td>6.7</td>
<td>39.3</td>
</tr>
<tr>
<td>sheep</td>
<td>2,550,000</td>
<td>556,720</td>
<td>34.7</td>
<td>21.8</td>
</tr>
<tr>
<td>goats</td>
<td>820,000</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5,030,000</strong></td>
<td><strong>21.1</strong></td>
<td><strong>19.8</strong></td>
<td></td>
</tr>
</tbody>
</table>

Source: Ministry of livestock, department of Animal tax 2006

**6.6.3 Decentralization Policy and Lack of Fund for Development:**

As the result of the abolition of native administration, pastoralists access to the political power become weak. One of the problems facing pastoralists is their lack of participation in the structures of governance where policy decisions are made. Participatory approach now is wide spread and accepted in planning and development; except for rangeland management as always planners talked on behalf of pastoralists. Therefore, many researchers state that decentralization policy would put some remarkable positive changes among pastoralists. One of the objectives of decentralization was to improve the delivery of services to the public and further democratize the system of public services management.

Orally, decentralization provides an opportunity for local communities to participate in decisions that have direct impact on their livelihoods. This is may be a window for pastoralists to express their needs and aspirations. But on the reality this process of decentralization put double tasks and pressure on pastoralists such as increasing taxes (inside and outside fees) instead of solving their problems. It seems that most of the state expenditure went to the salaries and the budget allocated to the development getting lesser.

Table 6.9 shows that the main characteristics of government spending is the allocation of the largest share of the state's resources to running the
bureaucracy and the security with the low priority assigned to the development and the services sectors. This reflects the negative impact of federal system as the only things is the increase of salaries and put more pressure on the meager resources. In almost all budgets expenditure is allocated for salaries and the running cost. Around (80% up to 90%) of the total Budget expenditure is allocated for chapters one and two which have no relation with development. In 1998 Chapter one and Chapter two (composed of salaries and wages plus running cost) amounted to (85.7%) while the development budget only received the remaining (9.7%) and it continues to decrease.

Table 6.9: Public Expenditure in Gedaref State (1998-2002)

<table>
<thead>
<tr>
<th>Details</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter I Salaries and Wages</td>
<td>29</td>
<td>22.3</td>
<td>36</td>
<td>40</td>
<td>46.3</td>
</tr>
<tr>
<td>Chapter 2 Running Cost</td>
<td>56.7</td>
<td>61</td>
<td>46.9</td>
<td>50</td>
<td>45</td>
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<tr>
<td>Chapter 2 capital services</td>
<td>4.3</td>
<td>2.8</td>
<td>2.2</td>
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<td>1.8</td>
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<tr>
<td>Chapter 3 states funding</td>
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<td><strong>Chapter 4 Development Expenditure</strong></td>
<td><strong>9.7</strong></td>
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<td><strong>9</strong></td>
<td><strong>6.9</strong></td>
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<tr>
<td>Chapter 4 capital transformation</td>
<td>0.35</td>
<td>-</td>
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</tbody>
</table>

Source: The Ministry of National Economy- Gedaref state

The above discussions have led the study to confirm that livestock received more care from the government than the pastoralists. The relation between state and pastoralists always has linear direction, pastoralists contribute mush to the economy of the state and the state expenditure toward them (socio-economic is very little) comparing to the other type of economy such as agriculture. This marginalization policy now become clear in Sudan as most of the tension areas lie within the territory of pastoralist (Darfur and the Eastern part). Moreover, instead of the state to support or offer services or at least let them struggle alone, they create (participate) conflict and always put them in trouble. One of these obstacles was the abolition of native administration and creation of land Act 1971, thus two contradicting ideas exist when it comes to the land rights. Traditionally, the land of Butana is for local pastoralists; new people such as outsiders claim also their rights based on the Act land for all. New comers believe that they pay a lot to the government especially the animal tax which means for them as taxes for using government pasture land.
6.7 Land Use Policy in Sudan (State Intervention):

For this study the state intervention especially in land use and land tenure is the major factor behind the recent socio-economic transformation in Butana. Regarding land use policy in Sudan, no much attention was given to the traditional sector despite its positive contribution in the local and national economy. Moreover, it is considered as a primitive sector and most of the planners and decision makers think seriously it is high time to sop it or transform it into modern one (their views). The main objective of the different plans in Sudan is improving the economic base and broadening the structure of the country economy mainly through agricultural expansion in order to increase the level of export. Therefore, most of the infrastructure is made in the agricultural areas so as to attract the investment in this sector. In Gedaref state there are many Asphalt roads that link the southern part where the concentrations of mechanized farming exist. In the Northern part where livestock concentrated there is no single Asphalt road, therefore Butana become none accessible during rainy season. To reflect the role of state' intervention in the current changes of pastoral economy some details are made on the role of mechanized farming and the irrigated schemes.

6.7.1 The Role of Mechanized Farming:

According to (Eltayeb, et al 1983) mechanized farming in the area started in the year 1940 on small scale and in 1945 the total area was about 21000 feddan. The stage of turning point was in the year 1968 when Mechanized Farming Corporation (MFC) was established by the government upon the request from the World Bank. The objective behind MFC is demarcation lease as blocks to registered land users (individual, villages group, companies, government institution and co-operative) for specified period (25 years) and purposes. In addition (10%) of land leased should be given for tree planting around the scheme. The mechanized farming as such has played vital role in developing the country in general and Gedaref state in particular. However, there are short comings due to the rapid expansion of unauthorized farming at the expenses of the other land users. Although, (MFC) is not responsible for the expansion of unauthorized scheme, it has indirectly supported it as revealed by the author these are:

1. The discussions have shown that the MFC renews contract for both authorized and unauthorized schemes.
2. Some companies and individuals even were granted up to 100 schemes although the legal size must be one or maximum two.
3. Total area under cultivation is around 8 million feddan while only 3 million are authorized schemes. So the rest is unauthorized.
4. Recently, the total area under cultivation it reaches eight millions feddan 66.2% (5 347115 feddan) is considered as unplanned scheme and 33.8% (2 729 500 feddan) is demarcated.

Although the area under cultivation now reached 8 million feddan, it seems that the traditional sector didn’t benefit from the introduction of mechanized farming. This idea is supported by (Agabawi 1969) who states that benefits of mechanized farming are concentrated in the hands of few lease holders most of whom are merchants having little or no agricultural knowledge. In addition to that, the unauthorized expansion of mechanized cut large part of the good pastures area in Butana. As it has extended beyond the grazing line see (map 5.5). The study observed that there is a shift of grazing line towards far north and no body is held responsible for this shift but some voices under the table blamed and accused the lobby of the big farmers in Gedaref. Therefore, it is true to say that the expansion of unorganized mechanized schemes took over land which was traditionally utilized by nomads and hence decreased the area available for grazing. It also drove the villagers out of their traditional villages turning them in some cases into wage labourers.

Regarding the role of mechanized farming in the development and securing livelihood of rural communities, the study collects some figures showing that such sector has no relation with securing livelihood for local people. The total farmer that own mechanized land is about (9800) farmers most of them depend on (wakeel) caretaker for farming as they have other business thus; their role is just funding and supervising the processes of cultivation. Recently (10 %) is accessed schemes through renting. Oral discussions have shown that the mechanized scheme of 1000 feddan needs only five people as permanent workers and around (35) persons for the process of weeding and harvesting. Moreover, farmer developed some techniques so as to reduce this number aiming to increase the profit. The most important thing is that pastoralists can not access crop residue as in the past. All above mentioned points confirmed that the benefit of mechanized farming for traditional communities is rather limited. Thus, the objective of mechanized farming in rural development needs to be revised.
Although most of the mechanized farming lies in the area that traditionally belongs to pastoralists benefit from this rapid expansion is less to the livestock sector. Recently, the old system of opening the farms freely to the pastoralists after harvesting is completely changed. Normally, farmers use residue for their own animals as most of them adopted the strategy of having animals besides practicing agriculture (Rawshda village). The pastoralists were completely eliminated from the development processes although the schemes were established in their traditional grazing lands.

6.7.2 The Role of Irrigation Schemes:

In addition to rapid expansion of mechanized farming, Gedaref state has also witnessed considerable expansion of irrigated schemes. Rahad and New halfa irrigated schemes were established in the greater Butana area and have remarkable effect on pastoralists (see map 5.5).

6.7.2.1 The New Halfa Agricultural Scheme:

The New Halfa agricultural scheme traces its roots to the 1959 Nile Water Agreement that was sighed by the Governments of Egypt and Sudan. That agreement provided for the construction of the Aswan High Dam in Upper Egypt the waters of which inundated vast areas along the Nile in the far north of Sudan. That was at the expense of the Nubians who had to be resettled and provided with adequate compensation for their lost assets, including farmland. For that purpose, the government constructed the Khashm El Girba Dam on the River Atbara in Kassala State and established the New Halfa Agricultural Scheme and the service town and villages associated with it for resettlement of the displaced Nubians. The resettlement of the Nubians took place in 1964 after completion of the Khashm al Girba Dam, and the project was named New Halfa Agricultural Scheme by demand from the resettled Nubians. Another objective of this project is also to resettle and provide for accommodation of members of the indigenous tribal groups of the area as tenants in the agricultural scheme, and provided them with comparable social services. The total inhabitants of the scheme in 1978 were about 300 000 and 150 000 were from nomads belonging to the following ethnic tribes see table 6.10. Each tenant farmer has allotted 15 feddans of land the cultivation of which involved a three-course crop rotation. The field crops produced in the tenancies include cotton; groundnuts, wheat and sorghum. Concerning the tenants of nomads, no planned villages were provided for the nomads. Instead
the nomads were provided with local building materials, bamboo poles and straw. Although it was originally intended to accommodate all the nomads in 22 villages at the predetermined location, people proceeded to make their settlement in a haphazard way all over the scheme area. As the result 57 new communities emerged, in addition to the 15 villages which were found before the establishment of the scheme and a number of seasonal settlements (Sorbo 1983).

**Table 6.10: Ethnic Composition in New Halfa Scheme**

<table>
<thead>
<tr>
<th>Tribe</th>
<th>No. tenants</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shukriya</td>
<td>6915</td>
<td>67412</td>
</tr>
<tr>
<td>Lahawyin</td>
<td>2358</td>
<td>22990</td>
</tr>
<tr>
<td>Beja</td>
<td>2398</td>
<td>23380</td>
</tr>
<tr>
<td>Ahamda</td>
<td>1061</td>
<td>10344</td>
</tr>
<tr>
<td>Rashida</td>
<td>631</td>
<td>6152</td>
</tr>
<tr>
<td>Kawahla</td>
<td>615</td>
<td>5696</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>13978</strong></td>
<td><strong>148619</strong></td>
</tr>
</tbody>
</table>

Source: Sorbo, 1983

Regarding tenants distribution in Halfa scheme, there were no surveys of potential beneficiaries, and a system of registration of the applicants instead. This means tribal leaders came to be strongly involved in allocating tenancies. As they were each given a quota of tenancies for their followers, they were able to proceed more or less on their own with the final distribution. As the consequences, some tenants belonging to the shukriya elite families managed to obtain large areas of land for themselves and for their close, relatives, friends and clients (sorbo 1985).

Halfa scheme contributed much in the recent socio-economic transformation of the communities in Butana area positively and negatively. This scheme has positive impacts on local communities of Butana these organized as follows:

1. People in the Butana area mentioned that during drought of mid eighties they migrated to Halfa scheme searching for better life with their relative over there. Moreover, offer a chance of pastoralists to compensate degraded grazing land in Butana.
2. Offer pastoralist a chance to practice both agriculture and livestock. Local tribes invest most of the surplus in livestock. The new source of income proved insufficient to satisfy the needs of most tenants. Since livestock production was still perceived to offer security as well as profit, and since it was possible to remain a tenant while pursuing other economic activities, the most rational strategy, for those who could afford it, was to combine work on the scheme with livestock herding and sorghum cultivation (Sorbo 1985).

3. The scheme has led to new livelihood strategy as during rainy season (kharif) people move to Butana area and come back at the end of it. Thus, benefit from better services in Halfa and also graze and cultivate their origins land in Butana.

4. Access to better services such as health, education and water supply.

5. Open a chance for pastoralists to compare between mobility life and sedentary one.

On the other hand the major negative impacts of New Halfa scheme for pastoralists are organized as follows:

1. Cutting half a million feddans of rich pasture land of Butana area which was considered as one of the main area of grazing during dry season.

2. Accessing water of the river Atbara become difficult thus, shortage of water during dry season becomes acute. As a result of that, members of tribes tended to keep more camels, due to longer grazing radius, while people in central Butana enjoyed the use of permanent water and so could keep different types of livestock (Sorbo 1985). Moreover, camel is not allowed to be in the scheme.

3. Not all local tribes have equal access to the tenant, and it seems that tribal leaders and rich family get the lion share on the dark side poor people have less or no access to land in the scheme. (Salem-Murdock 1984) argues that income level of elite shukriya families, particularly those belonging to lineage associated with the traditional rulers, seem generally to have risen considerably with the involvement on the scheme, whereas household without sufficient labour are clearly at a great disadvantage and, in several cases, have even lost control over tenancies that had been allocated to them by the government. Thus a substantial number of local communities have become poorer, providing
cheap labour for the elite and rich in irrigated as well as in livestock sector.

6.7.2.2. The Role of Rahad Irrigation Scheme:

The Rahad Scheme is the most important agricultural scheme for cotton and groundnut production established by the government of Sudan in the Butana area, and more specifically on land that was part of the General Grazing Aera (GGA). The scheme was inaugurated in 1977 and it envisioned the development of 300,000+800,000 feddans of irrigated land over two phases. The Rahad scheme introduced a new land tenure arrangement whereby the Government through the Rahad Corporation - the main authority entrusted with administration of the scheme – allocates tenancies.

The Rahad Irrigation scheme is located partly in Gedaref State and partly in the Gezira State. It is supplied by water and electric power from the Roseires Dam which was built in 1966 and became capable of generating hydro-electric power in 1971. It was financed by a loan from the World Bank. Crop cultivation started in the Rahad Irrigation Project on an experimental scale in the early 1970s, but the first irrigation water for Phase One was received in 1976.

There are negative impacts of Rahad on pastoralist in Butana area; these are:

1. Cutting 300 000 feddans of rich pasture land of Butana Area. The area taken over by the Rahad Scheme was part of the "General Grazing Area" accessed by pastoral groups from both within and outside Butana.

2. Has negative impact on wildlife in Butana. People mentioned that Rahad stop the traditional migration of wildlife from Dinder Park to Butana.

3. Reduced the grazing area during the rainy season thus put more pressure on Butana area.

4. Participate in the degradation of forest as Rahad scheme become an obstacle for pastoralist to access water and pasture in the southern part of the state thus targeting public forest resources as only option left for pastoralists.
The study concludes this section by raising some positive points about practicing rainfed and irrigated agriculture in the Gedaref State these are:

1. Supplemented fodder especially during dry period and compensated degraded natural pasture of Butana.
2. Improve transportation thus help in supplying animal with water and fodder in far areas.
3. Improved transportations have led to better access to the market (suitable price and easy access market information).
4. Open chances for alternative jobs for the drop-out pastoralists and it become one of the basic sources of their livelihoods. Although it is seasonal and limited to small number.
5. Offering mechanical inputs such as tractor for wadi cultivation and access to the credit from the relative having tenant in Halfa.
6. Agro-pastoralists have a chance to practice both mechanized farming and animal keeping thus, they get double benefit. Through selling crops as well as providing fodder to their own animals and if a crop failed animals will compensate (Rawshda Village).

To highlight the role of irrigated schemes on the current transformation for local producers, the study adopted the experience of Miheidat tribe towards drought. (Holter 1994) mentioned that when the drought of 1984 struck, the Miheidat suffered great losses of animals and were forced to leave natural pasture of the Butana. They moved to the agricultural schemes of Rahad, New Halfa and of Ghadmbaliya and further south. These were the sub lineage of the Wad Shola, who had owned tenancies (hawashat) in the new halfa scheme therefore relatively well off, as they had a place to go and the surviving animals could live in crop residues. By the way, Shola now is the head of pastoralist union of Gedaref state. Households who did not own any land had to depend on relatives in the scheme who gave them shelter and support. But the drought of 1990 was the second and unexpected thus Miheidat lost most of their animals and return nil from farming. Again people who have access to irrigated scheme became better than others. When its rain fell again Miheidat have return from the scheme to the area of origins. More than 50% did not. They had stayed over there relying on agriculture or paid labour rather than on animal husbandry.
6.8 Change Land Tenure System:

As mentioned in the previous chapter access to land and other resources in Butana was through the customary land tenure. Thus Nazirs and their representatives (sheikh, Omda) were responsible for allocating and distributing land for their affiliates. The year 1970s was considered as the turning point in land tenure system in the Sudan and the study area in particular. During the phase of May revolution when Nimeiri came to power, the "Native Administration" was abolished. The philosophy behind, is that native administration is having the characteristic and symptoms of traditional hierarchies and tribal thinking (primitive). And this will stand against May ideology which was communist at the beginning of the revolution. Therefore, they had replaced that existing land tenure system by the system Land Administration Act (1971) and the Unregistered Land Act. As the result of this all lands in Butana area was transferred into being state property. Moreover, they have been considered Butana area, since then, as "unoccupied land" and are thus, as "open grazing land," available and accessed by all people without any restriction of utilization. The tribal leader lost his role in controlling and managing land use and all authorities were shifted to the herd owners. Therefore, the common law which prevailed was who comes first has a lion share in grazing land otherwise you loose your chance.

The consequences of the Act 1971 are organized as follows:

1. Formally, the system of the tribal leader has no longer existed or exists without power to enforce the rules in the area.
2. No attention was given to the native administration which used to play a considerable role in managing land use.
3. The native administration was not replaced by any other form; in addition the state claimed that land is for all. Therefore, no body took the responsibility of controlling the natural resources.
4. Lack of pastoralist representative body in the political power in order to reflect the problems and interest affairs for politicians.
5. Butana becomes an open grazing land.

The abolition of the native administration reflects the marginalization policy towards pastoralist and supports the recent trend of privatization. Due to the bad image that mastering most of planners and policy makers, pastoralism is labelled as inefficient system of land use, lack of modernization, lack market orientation, irrational behaviour to accumulate stock beyond the carrying
capacity and thus, it's high time to replace it by other sector that will improve our economy (agriculture). Therefore, the main contribution and the intervention of the state in land tenure is privatization of the common property and titling the land for new investment.

Land reform is the main policy that shapes most of the African countries, Sudan is not an exception. Registering land is considered to be a useful provision to secure rights and occupancy for local producers mainly pastoralists and at the same time it has some disadvantages. The advantages of this policy are that through titling it might be easier to prove ownership and hence guarantee security against encroachment. Also pastoralists may be able to use their lands as collateral in getting fund or support from funding institutions. On the other hand, if titling extends to the individualisation it may also have some disadvantages; these are:

1. Open access will replace the common property and thus lead to degradation and conflict (The Tragedy of the Commons).
2. Easy for poor to sell their lands under the pressure from the rich and thus missing one of their main assets.
3. Land will loose its social value after being concentrated in the hands of rich people. Rich care about the profit of land not for conserving and protecting.

6.9 Poor Contact and Lack of Information:

Lack of proper and up-to-date knowledge among planners towards pastoralist and about the later toward the state has contributed to the recent changes of rural communities. There is a wide gap between policy makers and pastoralists and due to that both are talking different languages. State interventions in pastoral economy reflect the lack of understanding of the nature of pastoralist livelihood. This has led the state to be less capable of matching the need of the local communities. Lack of knowledge is due to the fact that there is no proper system for offering accurate and up to date information. Till the writing of this research no body knows exactly the total number of pastoralists even the pastoralist union it self. Again there is lack of area been under degradation caused by concentration of livestock. Thus all interventions made to this sector are subjected to the perception of the planners and what were written in the books such as the theory of "tragedy of the commons" and "cattle complex".
Lack of information together with the top down approach policy all have led to decrease in number of pastoralists. According to the 1983 population census people classified as nomads constituted about (10.7%) of the total population of the country, it declines to (2%) in 1993.

This section concludes that there are many causes behind the collapse of pastoral economy in the study area. It shows that drought as such is not the only factor responsible for this changes but it aggravated the already degraded situation. Thus the collapse of pastoral economy is an outcome of nature, demographic, lack of proper information and irrational state intervention. As the result of theories mentioned in chapter one (tragedy of the commons, cattle complex) planners and decision makers adopted anti-nomads policy. Thus, most of the intervention from the sate in the study area was focused on the construction of water resources, range conservation, expansion of marketing infrastructure and veterinary services. No attention was given to the basic services such education, health and water for the pastoralists. This bad image has mastered most if not all the planners in Africa. Thus, the whole experience of pastoral development in Africa has been perceived as a major failure by development agencies and donors alike and many have labeled the dry lands as a 'no hope area' (Scoones, 1994), reducing or ceasing the provision of support. One of our endeavors is to redress this situation by introducing a rangeland information system as it will be tackled in the following section.
6.10 Rangeland Information System:
This section deals with the designing of rangeland information system. The main objective is to provide planners and local people with up to date, accurate and on time information for sustainable development. Data in this section is mainly a written type in addition to the researcher background in this field besides the support from the fieldwork.

6.11 Preface:
With the reference to concept of problem tree (research problem) this study gives special attention to the lack of proper information and considered it as the basic key of all problems in the study area. The research has shown that there is no information about land use, number of livestock, carrying capacity of rangeland, marketing and etc, as the result to the absence of proper information planners used to apply the experiences of others. More over, they have been mastered by old written views such as the Tragedy of the Commons and Cattle Complex. Thus, the study confirms that lack of proper and up-to date information are the most serious problems for both planners and pastoralists. This section focuses mainly on rangeland problems aiming to design an information system that can be useful in evaluating and assessing these problems. The overall objective is to support planners, NGOs, decision makers and local communities with concise and timely information on some aspects of rangeland.

Geo-spatial data is highly needed in managing rangeland. Assessment of rangeland situation needs different variables and various processing techniques. The analysis tool of geographic information system (GIS) provides a capability for the evaluation of spatial correlation as well as process oriented modeling (Grunblatt 1991). In rangeland assessment different spatial relationships are needed such as soil, vegetation, distribution of water points, number of livestock and rangeland carrying capacity. Due to the lack of geo-spatial data, the assessment of rangeland is ineffective and time consuming. Manual data handling method has proven to be slow and ineffective in managing rangeland data and it leads to improper actions taken. Due to the lack of efficient information, the government introduces more water points, veterinaries and crops cultivation in marginal areas. As a result of these measures, the number of livestock goes up exceeding the required carrying capacity of the grazing area, conflict between land users and socio-economic transformation.
Therefore, pastoral economy faces serious problems that seem to be the main threat of livestock productivity, social and physical environment. The use of a geographic information system overcomes this kind of deficiency as it helps in processing and integrating data and thus establish baseline database. Due to the state policy, information technology hasn’t been given it is deserves attention. Therefore, there is lack of digital data and even the existing analogue data is most difficult to find. Having digital information will speed up the evaluation and assessment of rangeland degradation and with keep data up to date for future use.

The use of rangeland database in GIS environment will enhance the possibilities of satisfying user’s need through the capabilities of data handling and building proper decision. Therefore, one of the major aim of this study is to contribute in designing an information system that can facilitate in rangeland assessment.

6.12 Problem of the Existing System:

There is no clear information system related to rangeland management and there is no obvious policy of promoting information technology in Sudan in general and the study area in particular. Article 16 of the convention to combat desertification underlines the need to ensure collection, analysis and exchange of information addressing the needs of local communities and those of decision-makers, with a view of resolving specific problems. Sudan is a signatory to this convention. This shortcoming has lead to many government departments to process and analyze the rangeland data manually. Due to the lack of an information system, there is a lack of databases, data sharing and data harmonization, delay in data processing, less capacity to build complex models, which leads to poor presentation of results that contributes to inefficient and ineffective decision making (refer to Figure 6.6).
6.13 Changing Clients Need:

Since a large part of the Sudan population relies on the rangelands for the daily economy and living, information of its potential is of utmost importance. The information is required by both the government at the state level and a number of Non Governmental Organizations (NGOs) such as the World Food Program, Food and Agriculture Organization FAO, CARE who are involved in securing livelihoods for pastoral communities. Most of these institutions need accurate and up-to-date information on conditions on the ground such as, crop production, range conditions and status of droughts. But also state institutions in the localities also require the same information to provide services and plan development programs for their people. So there is need to increase data harmonization and integration to serve these diverse clients information needs. Therefore, there is need to have tiered structured of institutions to coordinate information collection, exchange and analysis of information that would serve the expanding clients needs. It was observed during the fieldwork there is a lack of coordination between different institutions working in the pastoral sector such as rangeland department, rural water cooperation, forest, ministry of livestock and etc.
6.14 Main Objectives of Rangeland Information System:

The development of a rangeland information system is a grand task and therefore this study will focus only on some aspects of rangeland management. The main objectives of this information system are to:

1. Design an information system that can help in assessing rangeland management as a key factor for sustainable development.
2. Determine organizations, agencies and institutions concerned in the management of rangelands.
3. Design a database that can help in assessing rangelands at local and national level.
4. Determine the most essential information and processes needed for better and suitable rangelands management.

6.15 Research Approach:

Research approach of this study includes the following:

1. Identification of the problem based on the existing data and the researcher’s experience in the field of rangeland management.
2. Selection of system design methodology.
3. Selection of database design.
4. Data integration and implementation of some products.

6.15.1 System Methodology:

The study adopts a structural methodology in designing the rangeland information system. This methodology is based on the life cycle approach, which has four clear and well-defined phases and activities (Parasi, 2002). Review and changes take place as the system goes through the phases; going back to the previous phase is also possible if there is a problem. The structural methodology covers four phases, which are:

1. Problem definition: focuses on why, where and what is information problem. The research solves this problem through using techniques of problem tree see fig 6.5.
2. System analysis: emphasis on the analysis of the existing system and why there is need for new one and what is information needed.
3. System design: the aim of this phase is to select an engineering design to implement the system.
4. System implementation and evaluation: testing of the new system by showing some final products.
The second phase of the research methodology is the data modelling. Data modelling is the structure of database that is used by the system. There are different methods in structuring the data but the study adopts the entity relation diagram (ERD). Entity relation diagram models the real world, users needed and system requirements.

6.15.2 System Analysis and Design:

The focus of this section is firstly to analyze what information is needed by institutions dealing with rangeland management. And secondly determine the main indicators, data, criteria and processes required for assessing the range condition in the study area.

Generally, there is no information system dedicated to rangeland condition in Sudan. The analysis of the problem tree diagram indicates that funding and lack of an information infrastructure are the major causes behind the lack of information in the study area (Fig 6.6). Due to the lack of information, the government faces some difficulties in developing sound policy concerning rangeland. For example, in the rangelands water is the scarcest resource and improper siting can always lead to further land degradation. In order to solve the problem of water scarcity in the area, the government has occasionally introduced more water points siting based on improper site assessment. Table 6.11 shows the information needs of the system.
Table 6.11: The List of potential Clients, Information Need and Information Purpose.

<table>
<thead>
<tr>
<th>Potential client</th>
<th>Input data</th>
<th>Information need</th>
<th>Purpose of Information</th>
<th>Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department of Livestock</td>
<td>Livestock data</td>
<td>Mapping Suitable grazing area Water information</td>
<td>Improve livestock sector</td>
<td>Digital analogue</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Department of Water Resources</td>
<td>Surface water Ground water Existing water point</td>
<td>Mapping Suitable grazing area Water information</td>
<td>Waters management</td>
<td>Digital analogue Table</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Department of Agriculture</td>
<td>Crop data Agricultural area</td>
<td>Mapping Suitable grazing area</td>
<td>Reduce conflit</td>
<td>Digital analogue</td>
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<td></td>
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<tr>
<td>Private sector</td>
<td></td>
<td>Mapping Suitable grazing area Water information</td>
<td>Investment</td>
<td>Digital analogue Report</td>
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<tr>
<td>Department of Planning</td>
<td>Socio-economic data</td>
<td>Mapping Suitable grazing area Water information</td>
<td>Poverty alleviation</td>
<td>Digital analogue Report</td>
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<tr>
<td>Ministry of Forest</td>
<td>Forest data</td>
<td>Mapping Suitable grazing area Water information</td>
<td>Water conservation</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Pastoralist</td>
<td>Local knowledge</td>
<td>Mapping Suitable grazing area Water information</td>
<td>Improve livestock</td>
<td>Analogue Report</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metrological Department</td>
<td>Rainfall data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NGOs</td>
<td>Fund data</td>
<td>Mapping Suitable grazing area Water information</td>
<td>Monitoring degradation</td>
<td>Digital analogue Report</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Academic institution</td>
<td></td>
<td>Mapping Suitable grazing area Water information</td>
<td></td>
<td>Digital analogue Report</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Survey Department</td>
<td>Images Basic map</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Researcher 2006
6.16. System Main Processes:
Figure 6.7 shows the main processes and activities of the new information system. These processes include Data Acquisition, Data Verification & Interpretation, Geo-Information Production and Information Dissemination.

Figure 6.7: System Main Important Processes for Rangeland Information

SoSource: Researcher 2006 based on Parasi 2002
6.16.1 System Modular Architecture:
The system’s modular architecture includes the main and sub-processes, information flow and database of the system (Figure 6.8). The modular architecture of the system consists of four major processes each one has its own mandate and role.

Figure 6.8: System Modular Architecture
6.16.2 Main Functions of the Sub-System:

6.16.2.1 Modular 1 Data Acquisition:

The main activity of this section is to collect rangeland primary and secondary data that includes images, topographic and thematic data. The main sources of data collection include all institutions mentioned in Table 6.11 and from fieldwork (Figure 6.9). A fieldwork is highly needed for ground check (truth) before sending the collected data to verification and interpretation node.

Figure 6.9: Modular 1 Data Acquisition

Source: Researcher 2006
6.16.2.2 Modular 2 Data Verification and Interpretation:

The role of data verification and interpretation section is to make sure that data collected are fit for use in term of accuracy and completeness. This modular consists of two sub processes, data verification and process of digitization. The data verification will be responsible for the quality control of the data to check data in term of accuracy, scale, timeliness and completeness. After verification, the verified maps are digitized then sent to the GIS application node (Figure 6.10).

**Figure 6.10 The Activities Verification Section**

Source: Researcher 2006

6.16.2.3 Modular 3 Information productions:

This section is responsible for the final products, which are produced based on users and their intended project objectives. The GIS functionalities such as overlaying, reclassification and mapping are of highly used in developing suitability maps for rangeland development. Various scenarios are built to fulfill the aspiration of the various users. These tasks are highlighted in Figure 6.11.
6.16.4.4 Information Dissemination Section:

This section is responsible for the distribution of the final product to the clients. After the clients have submit their request, they analyze the requested form to know what exactly the client’s need. The dissemination process will access the final product. In case of the information requested is available the clients will receive information through dissemination process if not, a requested form will be send to the information production process for new product. Knowledge on database management, data documentation, metadata, reception and reproducing techniques is required. The section is responsible for providing metadata for the final product (Fig 6.11).
6.17 Infrastructure and Requirements to Support System Architecture:

In order to have a more efficient information system that can help in producing accurate and up to date geo-information product several factors should be considered. These factors include:

1. Funding: as mentioned in chapter one funding is the biggest problem behind lack of information system in the study area.
2. Availability of fund may help in buying recent and up to date technology and train the staff.
3. Skill of manpower: well-trained people are highly needed to help in getting more efficient final products. The system needs qualified person that can help in computer programming, system analysis, photo interpretation etc.
4. Software and hardware: use modern and efficient software, which help a lot in reducing time and assessing high quality products. Hardware may help in storage large amount of data and thus avoid duplication and redundancy.
5. Access to satellite images especially that dealing with land use and land cover such as landsat is of high valuable to the rangeland information system.
6.18 Data Integration:
This section explains clearly how (spatial and non spatial) data are linked and integrated into Geo-information database. The first task is to build a conceptual data framework based on system analysis requirements. After the conceptual model the physical construction takes place, which will use the Entity-relationship approach. Finally a physical data structure will be constructed and data entered into final GIS software that will be implemented in Arc View or ArcGis and Access (relational database).

6.18.1 Conceptual Design:
This phase depends on the understanding of the user requirements. Define the major problems that are going to be solved through designing the database. It shows all the external entities that interact with the system and the data flows between these entities and the system. The next step is the collection of entities (tables) and how it is conceptually appears in the real world. In this step the analyst gathers the information needed about the system from interviews with the system users and by examining the written documents. The main aim is to develop and initial data flow diagram that includes all physical component. The last step of this phase is to design conceptual schema including data type, relationship and constrains. The conceptual schema is based on the enterprise rules that governs the relationship between entities are as follows:

1. Gedaref State has many localities
2. The localities have many administration units
3. Two units can’t overlap
4. Each unit has it is own soil, topography, geology, land use, land cover livestock etc

Based on these rules we can aggregate the data to move from unit to locality and locality to country. The conceptual schemas for the study includes 12 entities are highlighted in detail in figure 6.13.
6.18.2 Logical Design:

The role of this phase is to convert the conceptual design into actual implementation of the real database. We need to answer questions such as how can data be stored in the computer and in what ways will the database management system going to operate. Logical design is more closely to the mirrors of the subject world and it shows what only occurs (Parasi 2002). By doing so, the designer gain clear perception of what the system is going to achieve. The logical design is explained fully in Figure 6.14.

Source: researcher 2006 Based on Parasi 2002
6.18.3 Physical Design:

In this phase the designer makes sure that the database follows the integrity rules. The integrity rules are very essential to ensure data consistency, fast retrieval and data manipulation. Key uniqueness, key integrity and referential integrity are the database integrity rules (Ellis, 2002). Physical modeling is dependent on the software (DBMS) that you are going to use in storing and manipulating database. It shows clearly how things are going to happen or occurs. Thus, physical design is very close to the usage world as it shows the ways of data entry and system operation. Table 6.12 shows all entities and its attributes that are needed by the system. Moreover, it shows the primary key that help in linking all different entities in the locality. In this system, locality ID was chosen as a primary key and this because there is no two localities have same ID. Access was chosen as the software for storing the non-spatial data (Table 6.12).
Table 6.12: Physical Modeling of Information System

<table>
<thead>
<tr>
<th>ENTITIES</th>
<th>ATTRIBUTES</th>
<th>ENTITIES</th>
<th>ATTRIBUTES</th>
<th>ENTITIES</th>
<th>ATTRIBUTES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PROVINCE</strong></td>
<td>P ID</td>
<td><strong>PASTORLISTS</strong></td>
<td>PST ID</td>
<td><strong>RAINFALL</strong></td>
<td>Rain id</td>
</tr>
<tr>
<td>NAME</td>
<td></td>
<td>NAME</td>
<td></td>
<td>MEAN-rain</td>
<td></td>
</tr>
<tr>
<td>AREA-COVER</td>
<td></td>
<td>FAMILY-size</td>
<td></td>
<td>AREA-COVER</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CATEGORIES</td>
<td></td>
<td>RAIN-Month</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>EDUCATION</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>POPULATION</strong></td>
<td>NUMBER</td>
<td><strong>GEOLGY</strong></td>
<td>GI ID</td>
<td><strong>LIVESTOCK</strong></td>
<td>Unit</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TYPE</td>
<td>AREA-COVER</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>AREA-COVER</td>
<td></td>
<td>TYPE</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>DENSITY</td>
<td></td>
<td>AREA-COVER</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>MALE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>FEMALE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SURFACE WATER</strong></td>
<td>SW ID</td>
<td><strong>VEGETATION</strong></td>
<td>VT ID</td>
<td><strong>LAND USE</strong></td>
<td>LS ID</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TYPE</td>
<td>AREA-COVER</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>AREA-COVER</td>
<td></td>
<td>TYPE</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PURPOSE</td>
<td></td>
<td>AREA-COVER</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>SIZE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>LOCATION</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>WATER POINTS</strong></td>
<td>CAPACITY</td>
<td><strong>ROAD</strong></td>
<td>RO ID</td>
<td><strong>TOPOGRAPHY</strong></td>
<td>RANGE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DEPTH</td>
<td>NAME</td>
<td>AREA-COVER</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PURPOSE</td>
<td>ORDER</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>QUALITY</td>
<td>DEPTH</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>TYPE (Gov/Privy)</td>
<td>DEPTH</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>LOCATION</td>
<td>PURPOSE</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>LATITUDE</td>
<td>QUALITY</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>LENGTH</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: researcher 2006
6.19 Cost-Benefit Analysis:
6.19.1 Budget:

Cost benefit analysis focuses on how much budget is needed for the investment and how much benefits will the system produce. It includes both direct and indirect cost of the system. Direct cost covers those items that can be measured in actual money like the cost of computer, software, training, building rent, salaries, transportation etc. Indirect cost includes items that are very difficult to measure in term of money, For instance better decision, time reduced, and client satisfaction. Table 6.13 explains the possible items to be considered in new system implementation cost analysis for the first year. This study suggests that 5 well trained and skill persons are highly needed in order to start the information system in condition that they are very efficient in GIS field. For one locality such as Butana five computers of advanced characteristics (speed, hard disk, and processor) are enough. Below is the estimated budget for one year which is the beginning of establishing the system. This means that the second year the cost will reduce as no need to buy hardware and software. General estimation of the rangeland information system is about hundred million Sudanese pounds which is about one million Sudanese pounds (new currency of 2007)

Table 6.13 Estimated Cost for Tangible Aspect In (000 SD)

<table>
<thead>
<tr>
<th>Item</th>
<th>Description of an item</th>
<th>Cost SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Contractual aspects (rooms renting)</td>
<td>1 000</td>
</tr>
<tr>
<td>2</td>
<td>Hardware Evaluation, selection, acquisition and installation of software,</td>
<td>70 000</td>
</tr>
<tr>
<td>3</td>
<td>Training and human resources skills development.</td>
<td>3 000</td>
</tr>
<tr>
<td>4</td>
<td>Maintenance, salary, transportation</td>
<td>5 000</td>
</tr>
<tr>
<td>5</td>
<td>Data purchase, data capture and data conversion</td>
<td>10 000</td>
</tr>
<tr>
<td>6</td>
<td>Interfacing to other ‘data servers’ and operational systems</td>
<td>3 000</td>
</tr>
<tr>
<td>7</td>
<td>Requirements/needs analysis (printer, scanner)</td>
<td>2 000</td>
</tr>
<tr>
<td>8</td>
<td>Consultancy support</td>
<td>5 000</td>
</tr>
<tr>
<td>9</td>
<td>Total</td>
<td>100 000</td>
</tr>
</tbody>
</table>

Source: researcher 2006
6.19.2 Benefit:

The most essential part of designing an information system is to justify and measure who will benefit from the system. The study determines two groups that can benefit from the new system. First are the potential clients that benefit directly either as provider or user of the system. Second is the group who cannot use the existing system because of some constraint, but could become a user of the new system by sharing data between various organizations.

Benefit from the system can be categorized into tangible and intangible. The probabilities of achieving intangible benefits are subjectively assessed. The most common examples of intangible benefits expected from the new rangeland information system are:

- Improve decision-making for proper location (grazing-water points)
- Improved analytical procedures
- The provision of better information
- More consistent access to data
- Improved services to clients
- The ability to integrate data
- Improve the ability to share data between different organizations
- More effective communication
- Data sharing internally and externally

Tangible benefits from the system can be calculated through the development of livestock sector and money saved in mitigating degradation. Table 6.14 highlights the benefit from the new system. It shows that livestock will increase at rate of 1% per year. Assessing the benefit of the system in Table 6.13 it shows that the total cost of the system is about 100 million and the benefit of the first year is more than six Milliard Sudanese Dinnar. This means that the system will recover; it is estimated cost within a year with more than six milliard surpluses. In addition to other benefit of the system such as saving money spent annually to mitigate degradation, reduced conflicts and poverty alleviation.
Table 6.14: Estimated Benefit

<table>
<thead>
<tr>
<th>Existing number of Livestock</th>
<th>Type</th>
<th>1% Increasing (000)</th>
<th>Price € Per/head</th>
<th>Total in (000 000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,120,000</td>
<td>Cattle</td>
<td>11 200</td>
<td>200</td>
<td>2 240</td>
</tr>
<tr>
<td>2,550,000</td>
<td>Sheep</td>
<td>25 500</td>
<td>100</td>
<td>2 250</td>
</tr>
<tr>
<td>820,000</td>
<td>Goat</td>
<td>820</td>
<td>50</td>
<td>41</td>
</tr>
<tr>
<td>540,000</td>
<td>Camel</td>
<td>5 400</td>
<td>500</td>
<td>2 250</td>
</tr>
<tr>
<td><strong>5,030,000</strong></td>
<td></td>
<td><strong>42 920</strong></td>
<td></td>
<td><strong>6 781</strong></td>
</tr>
</tbody>
</table>

Source: researcher 2006

6.20 Conclusions:

This section focuses on the causes behind the collapse of pastoral economy and on designing an information system to improve rangeland condition in the study area and thus over the whole country. This chapter concludes that there are many causes behind the collapse of pastoral economy in the study area. It shows that drought as such is not the only factor responsible for this changes but it aggravated the degraded situation. Thus the collapse of pastoral economy is an outcome of nature, demographic, lack of proper information and irrational state intervention. The study also reveals that there is no clear information concerning rangeland in Sudan in general and the study area in particular. Designing of information could help in controlling degradation, improve livestock and alleviating poverty. So there is a need to increase data harmonization and integration to serve these diverse clients information needs. In addition this rangeland information system will fill the essential gap in coordination of different institutions and at the same time reduce the cost of data collection, exchange and analysis of information that would serve the expanding clients and information needs.
Chapter Seven: Conclusions

7.1 Summary:

This study investigates the adaptive strategies adopted by pastoral communities to cope with arid and semi-arid lands in Butana area and the recent socio-economic transformations that have taken place. The main objective is to investigate the indicators and consequences of such changes and to uncover the real causes behind that. The study adopted both political and cultural ecology approaches to achieve the main objectives of this research.

The study formulated six hypothesis and five objectives aiming to address the research problem. The study was based on the primary data collected from the field through questionnaire, observation, group discussions and official reports. The study uses statistical package for social science (SPSS) and Geographical Information System (GIS) in analyzing such data.

The study consists of seven chapters. Chapter one is an introductory dealing with general background, statement of research problem, and justification of selection topic and area, methodology and literature review. Chapter two shows that man–nature theories are simplified explanations of how the interaction works in the reality and enhance understanding. Chapter three focuses on the physical and human aspects in the study area. The main objective is to show how the study area is affected by physical aspects (Geology, climate, soil, and vegetation cover) and to what extent these factors determine the types of human activities (pastoral adaptation). The overall objective is to proof that the study area lies in the ecological marginal area thus, force people to develop their own adaptive mechanisms to cope with such marginal area. Chapter four explains the pastoral adaptations in the African Sahel and the recent changes that have taken places in such zone. Also it covers some points about the land tenure in Sudan. Chapter five consists of two sections: section one deals with the pastoral adaptation mechanisms showing how traditional producers cope with limitation of nature in the study area in particular. Section two explains the recent transformation and the current crisis in African Sahel in general and in the study area in particular. Chapter six uncovers the real causes behind the collapse of pastoral adaptation and environmental changes in the study area. In addition to the design of rangeland information system covering several parts such as the urgent need of information and the technical part of the system. Chapter seven gives a general discussion, conclusion and recommendations.
7.2 Main Findings:

The study has proved that Butana area was considered as a vast and an important grazing area not for the local community, but for the non residence tribes (outsiders) of the neighboring states. In the study area, resources such as land and water are scarce by nature. There is a lack of rains in term of quantity and duration beside that existing rock made the availability of under ground water more difficult. Local producers are aware of the ecological marginality of Butana area. Thus, they had developed their own mechanisms to adapt with such scarcity. These adaptation mechanisms include the best use of biodiversity (grasses, herbs, trees and shrubs) in marginal ecological zone, accessing different areas in various seasons (wet and dry) and having different types of livestock (cattle, camels, goats and sheep). Mobility over space and time among pastoralists is considered as a rational strategy for securing livelihood in such harsh nature beside the creation of mutual relationship between different land users. In addition to mobile livestock, people in Butana adopted some adaptive strategies in practicing agriculture aiming at getting maximum benefit from shortage of rainfall and increasing soil moisture. These include early weeding, shifting cultivation, and low scale water harvesting techniques. All these above adaptive mechanisms are supported by a kind of good social network and moral economy. Therefore, the first hypothesis of this study which says pastoral communities in the study area are traditionally adaptive to the arid and semi-arid lands through wide range of adapting and coping mechanisms is valid.

The study confirms that, livestock raised under pastoral systems are very cost effective. Moreover, pastoral system makes optimal use of the scarce resources with minimal environmental costs, and present important reservoir of knowledge and experiences of good environmental management. Access to land and resources through common property resource tenure regimes help much in natural resource protection, elimination of poverty, reduced tensions and create peaceful relation between different groups.

Recently, the adaptive strategies have undergone severe changes and transformations. The study confirmed that pastoral economy has undergone major changes. These changes includes: the profound changes of pastoral mobility in time and space, acute conflict between different land users, abolition of local institutions and change in diversification. Instead of having all types of animals people in Butana are restricted only on small ruminants.
Thus, the second hypothesis which says recently traditional adaptation has been dramatically changed and affected is valid.

The study reveals that the recent transformations are due to some political and social factors rather than physical factors only. Concerning the causes of the collapse of pastoral economy, the study does not reject the role of drought in changes but pointed out that other factors must be linked to drought to see the real factors that aggravated the situation after and during drought. The study explains that the drought of the years 1984 and 1990 has led to serious transformation in the area. Market economy and the intervention of state in supporting agriculture at the expense of other traditional land users are the most essential factors to be blamed for the recent changes. It is observed that supporting rapid expansion of agriculture by the state was based on the assumption that economically there is no use of pastoral economy (primitive activity). Thus, top-down approach policy was implemented without even considering and understanding the privacy (mobility, traditional resource management) of pastoral system. This negative intervention has led the study to say that most of planners and decision makers if not all do not come from the animal keeping societies whose ways of life are not familiar to them. Therefore, in Sudan as well as in other Sahelain countries local land use planning and resource management become more and more dependent upon non-locals (outsiders). These complex factors reflect the validity of hypothesis three which says changes in traditional adaptation are due to physical and human factors.

The year 1971 was considered as the turning point in shifting the pastoral economy from livelihood security into livelihood vulnerability thus poverty was the main and expected output. In this year common property of land was transformed into open land. Therefore, all land users can access land without any restrictions and permissions from the tribal leaders. The ideology of May regime (1969-1985) played a vital role in the recent transformation that led to the erosion of social network and moral economy among local producers. As the result of this regime, two contradicting laws that govern access to land existed in the area. These are the official law, which says land for all and the traditional law adopted by local producers who still believe in the system of Dars. As a consequence of this contradiction, high competition over resources and conflict between different land users become acute. Thus, a group who has a power becomes the winner in competition with those who lack it. This justifies that why Rashida group has become the winner in Butana and the loser
are the local people. The above mentioned points are a good indicators of the validity of hypothesis four which says changes in land tenure since 1971 are the starting point for recent changes in human adaptation.

As the result of land act 1971 "land for all" unauthorized expansion of mechanized farming and irrigated scheme were introduced in the area. This expansion has led to close the traditional routes and cut considerable part of the grazing land. In addition to that, some permanent water sources became inaccessible. Pastoralists are very careful environmental managers who have evolved a range of strategies to enable them to adapt to, rather than change or damage, the environment in which they live.

The study reveals that pastoralists are politically marginalized in the area and due to that they have created a solid social and economic system to protect themselves and securing their livelihoods. This system provides easy access to land for every member to meet their needs and provides them with some social and materials support to recover after crises. Recently, this system was witnessed severe changes and transformations. Several factors are accused to be behind the collapse of tribal leader system. Changing land tenure from uses in common to free access is the most essential factor and must be blamed for the recent changes in this system. This change in land tenure has done by the state (land reform) under the slogan "securing land elimination of poverty". As consequences the state opens a chance for privatization the land use in commons in the area. Privatization of land is not suitable in such marginal area where there is no clear line between social and economic activities. For example, using land in such area depends on the needs, family labour, and collective work (Nafeer). Thus, introducing privatization will increase the poverty especially among poor household (old, women, children,) and will widen the gap between rich and poor. Because who ever has money and political power can access to large land by way or another and thus, at the end will create social illness and blood shed conflict. Privatization of the commons land has been based on a number of assumptions. Among these are the theory of the tragedy of the commons, lack of information about pastoralist livelihood and the role of international policy (World Bank).

The study showed that there are some negative points concerning the system of the tribal leaders in Butana. Among these are the education and accessing of irrigated lands. This research revealed that tribal leaders since the colonial era have been taking care about education of their close relatives and distributed irrigated land for them. As a result of these bias distributions, elite and tribal
leaders families had survived better than other poor groups, because they were the ones who had access to irrigated lands. Written documents showed that when the New Halfa scheme was opened up, the land first was distributed among different groups of Arab nomads according to the political hierarchy (Sheikh khat, Omda and local Sheikh) and preferably to their relatives and followers, and only after that non followers and strangers. Most of the land was obtained by the Shukriya elite themselves and then the lineage associated with traditional leaders. It is worth mentioning that not all people who have no access to land because of the corruption of tribal leaders but in addition to that local people were not aware (lack of education) about the value of irrigated land and again their livelihood was secured by livestock raising.

The study showed some indictors of the recent transformation such as the decline of household owning live stock, drop out of pastoralist number and rapid expansion of agriculture in such harsh area. In addition, pastoralists were pushed into more marginal areas. Therefore, signs of degradation were found in different places in Butana area. As an indictor of recent transformation, mechanized rainfed agriculture and irrigation schemes in the study area play vital role in supplying animals with fodder especially during dry seasons thus, reducing the impact of crises during the drought time. Although there is massive migration from Butana towards these schemes, people still reserved their rights over there. For example, agro-pastoralists in Halfa especially during the rainy season, take advantage of the pasture in the Butana. For them, Butana still is a part of their common property and people have the right to use it even after they left the region. Access to residue in irrigated and mechanized scheme is more risky, time consuming and very expensive. Thus, people use to cultivate Dura in most part of Butana even where there is low amount of rainfall aiming at using it as fodder or sell it in high price. This is because the symbiotic relationship between farmers and pastoralists has under gone severe changes. Therefore, free access to residue was replaced by paying cash. These major indicators proved the validity of hypothesis five which says environmental and socio-economic conditions in the area have recently changed.

The study uncovers some indicators of the marginalization policy that adopted directly from the state towards livestock sector regardless of its economic contribution. These indictors include lack of access to the basic services such as education and health. This research observed that there is concrete tendency towards mechanized agriculture in Butana as a new source for livelihoods.
Transforming Butana into mechanized farming will lead to severe impact not on Butana itself, but all over the state. The study area has become as protection belts that reducing degradation not to move to the far south of Gedaref state where massive mechanized farming exists.

Lack of proper and up to date information is also responsible for the recent changes. Given poor information led to negative policies. There is a strong argument for the government to take the decision to invest in collecting sound information on pastoralism as soon as possible in addition to the creation of proper land use map. Thus, the six hypothesis which says *there is a lack of accurate and up to date information concerning pastoral economy* is valid.

The study concludes that local communities has profoundly transformed from adaptation to vulnerability and from securing livelihood to food insecurity. In the past, people have equal access to lands and have power to exclude others and above all there are solid institutions that protected them and control their rights. Recently, people no longer claim their commons right as were taken by state. Again, the state is forced by international communities to adopt economic policy that stands against pastoral economy. The study reveals that the number of animals per household is decreasing while the total is almost static. This means that livestock in the area is transformed from traditional owners to the rich pastoralists and merchants.

### 7.3 The political and cultural ecology approach and the problems of the study area:

Regarding the problems that facing African Sahel in general and Butana in particular, the political ecology approach proved to be more efficient in addressing such types of problems. In the past, most of the findings of studies about pastoral economy showed that natural factors (Drought) were the main causes behind the poverty and disappearance of pastoral sector. This approach not rejecting what believed in the past but it concentrates on that natural factors will not be held responsible for the current drama of the African sahel. Thus, this approach opens our minds in searching of other essential factors that have led to the recent socio-economic and environmental transformations in the study area. This approach accused directly the intervention of both local governments and international donors of aggravating the situation of pastoral sector in dry lands. Moreover, it explains the negative consequences of the top
–down approach which is adopted by many African countries towards development in rural areas. The approach touches a very important thing by saying that local producers own a reservoir of traditional knowledge. Before this approach, planners assume that knowledge is the scarcest commodity among local communities. However, due to the application of this approach a new concept (participatory management) appeared recently. Application of this approach needs holistic knowledge about physical, social and political factors at local, regional and international level. In addition to that data needed by political ecology is more qualitative rather than quantitative. Thus, discussion with local communities is highly recommended in order to address their problems. For all the above mentioned, the study recommended this approach to be applied in any study dealing with man-nature relationships.

Political ecology approach lacks to address the role of traditional adaptation of the local communities and cultural values in securing their livelihood. Thus the study uses cultural ecology approach to fill the gap. The cultural ecology approach is very efficient in addressing the adaptive processes and showing the role of local institutions among local communities.

The study ends up by focusing on some practical solutions. The figure of "problem tree" reflects clearly the causes of main problems and their consequences. Figure 7.1 shows the "solution tree" of the research problem. It explains that proper information with rational state intervention will lead to flourishing of pastoral economy.

7.4 Recommendations:

1. State should recognize that pastoral economy is the best activity to secure livelihood in marginal areas and suitable for sound environmental management. Mobility in livestock over space and time is of high value for both human and nature in arid lands.

2. Promote efficient utilization of rangelands and this through empower pastoralist institutions, improve access and quality of veterinary services and well established good infrastructure (Roods, Electricity, etc).

3. Activate all laws concerning rangeland. These include the law of Dars system which says 5km or (8km) around each village is considered as private or exclusive grazing right for indigenous people, the law of grazing line not exceeding latitude (14.15) and reinforcement of the General Grazing Area of 1904 to organize the grazing of non residence
tribes (outsiders). In condition that laws must be powerful for all: elite group and ordinary people.

4. Exact time for coming to Butana and moving out for non residence tribes (outsiders) must be determined clearly. The study suggests that the first of August is suitable time and this because it offers a chance for the plant and grasses to grow after early showers.

5. Solving the problems of water shortage either by construction of Hafirs "scientifically" or extended pipeline or canal from River Atbra. Other option may be through promotion of small and large scale rainwater harvesting techniques.

6. Integrating Crop-livestock is very useful in such areas at it helps in diversifying feed for animals and also animals provides free natural fertilizer to the soil (manure). And most important if one fails other will compensate.

7. Promote programmes that increase and diversify income generating sources for all especially the weakest group (women, old people and orphans) through building rural people’s assets. In addition, the building capacity of rural communities is of high need.

8. Recognition of participatory approach in managing the resources and this may be through creation of village assembly that one of its responsibilities is to securing land and organizing land use for all: local, non residence tribes (outsiders) and state. Using document for land is highly needed and again the assembly will create a permission card for land users showing the area for use, time limit, accessibility of services, forbidden things and above all accountability.

9. Improvement in pastoral resources should be considered within the framework of comprehensive area plan that would have to include different land use system in Butana. Thus requires the adoption of a wide regional perspective such as sustainable framework approach.

10. The government will recognize and respect the right of pastoral communities to their traditional grazing lands. Moreover, the state is responsible for finding the way that can integrate legal and customary frameworks governing land ownership and use rights to eliminate potential conflicts. Without this, emerging pastoral organizations at the local level will find it very difficult to operate, especially when such local level organization come into conflict with the state.
11. Land reform and land demarcation is not the best solution of land tenure and it could be difficult to apply in such areas. The study recommend that securing land use and right for long times under existing system may be useful than imposing land reform. In addition to that and due to uncertain and episodic nature of environmental variability, centralized and bureaucratic state institutions are generally poorly equipped for dealing with local level management issues.

12. Conflict should be addressed explicitly, not ignored. Visible and expressed conflicts can be tackled through an early initiation of "round-table" discussion.

13. Lobbying for pastoral interest at national and international levels is an important role for pastoral organizations. Pastoral groups are politically marginalized in most African countries and their access to the political decision making process is limited. Thus, shifting from the local level to political change at the national level is probably the only effective route to long term policy change.

14. Changing policy makers' perceptions about pastoral economy is an important point to improve their understanding about the dynamics and economic rational, particularly the direct economic contribution it makes to national economies.

15. Addressing the problems of taxes through the co-ordination among the various states. The study suggests annual meeting for all surrounding states to Butana to discuss the issue of tax, times and range regulations. Moreover, the states can pay fees to the government of Gedaref instead of their pastoralists.

16. Building the capacity of the localities and the communities to manage natural resources and economic activities in a manner that is environmentally sustainable and economically viable. Common training themes will include: budgeting and fund management; range and water management; grain storage and livestock marketing and gender analysis.

17. Rangeland Information system should be implemented as soon as possible as it helps in offering accurate and up to date information for all stakeholders. One of the major products of this system is proper land use map for the area. Thus, government will prepare a comprehensive land use map to indicate areas suitable for cropping, grazing and for private sector investment.
Figure 7.1: Solution Tree

- Sustainable Development
  - Re growth of natural
  - Decline population
  - Fair
  - Comprehensive social peace

- Healthy Environment

- Better access to
  - High income
  - Increased animals

- Involve of local

- Flourishing of Pastoral Economy
  - Equal and fair access
  - Better basic services

- Involve of local

- Small size and rotation
  - Suitable area for

- Activate grazing
  - Suitable area for

- Proper land use map

- Rational state policy

- Proper rangeland information system

Source: Researcher, 2006
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Appendix 1

Questionnaire: pastoral adaptations and socio-economic transformation in the Sudan - Butana - Gedaref

Q1. General Information:

<table>
<thead>
<tr>
<th>Family member</th>
<th>Relationship</th>
<th>Tribe</th>
<th>Level of education</th>
<th>Social status</th>
<th>Place of Birth</th>
<th>Place of origins</th>
<th>Major job</th>
<th>Minor job</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td>5</td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

Q2: water resources:

1. What are the available types of water resources?
   1. Wells ( ) 2. Boreholes ( ) 3. Hafirs ( ) 4. Khors ( )

2. From the question above what is the nearest source?
   1. ( ) 2. ( ) 3. ( ) 4. ( )

3. Determine the approximate distance from the nearest sources?
   1. Less than one km ( ) 2. One km ( )
   3. Two km. ( ) 4. More than 2 km. ( )

4. What are the means of transporting water?
   1. Pipeline ( ) 2. Donkeys ( ) 3. Cars ( )
   4. Government ( ) 5. Others ( )

5. Organize the type and consumption according to their importance?
   1. Drinking human ( ) 2. Drinking animals ( )
   3. Washing ( ) 4. Cooking ( ) 5. Other ( )

6. Who is responsible for fetching water?
   1. Children ( ) 2. Your self ( )
   3. Women ( ) 4. Government ( ) 5. Others ( )

7. Is there any shortage in water?
   1. Yes ( ) 2. No ( )

8. If yes when?
   1. Before 5 years ( ) 2. 6-15 years ( )
   3. 15-20 years ( ) 4. More than 20 years ( )

9. What are the reasons behind shortage of water?
   1. High consumption ( ) 2. Increase in population ( )
   3. Dry of wells ( ) 4. Fluctuation in rainfall ( ) 5. Others ( )
10. Suggest some solutions of shortage of water?
   1.
   2.

11. What are the techniques that you had used to cope with this scarcity?
   1.
   2.

Q3. Agriculture:

1. Do you practice agriculture?
   1. Yes ( ) 2. No ( )

2. If yes when?
   1. Before 5 years () 2. 5-10 years( ) 3. 10-15 years( ) 4. 15-20 years ( ) 5. More 20 years ( )

3. What is the type of agriculture you practiced?

4. Through what ways you tenuring this land?
   1. Boughting () 2. Renting ( ) 3. Inhertince () 4. Other ( )

5. Determine the plot size you have?
   1. Jaddah ( ) 2. Feddan ( ) 3. Mukhamas ( ) 4. Others ( )

6. Determine the type of crops you cultivated?
   1. Dura ( ) 2. Millet ( ) 3. Sesame ( ) 4. Others ( )

7. What are the purposes of these crops?
   1. Local consumption ( ) 2. Marketing ( ) 3. Both ( ) 4. Others ( )

8. What are the main problems facing agriculture?
   1. Shortage of rain ( ) 2. Marketing ( ) 3. Conflict between land users ( )
   4. Expansion of mechanized farming ( ) 5. Others ( )

9. How do you cope with the shortage of rainfall?
   1. Early growing ( ) 2. Water harvesting ( ) 3. Use family labor ( ) 4. Others ( )

10. Compare between agriculture now and in 1970s?

<table>
<thead>
<tr>
<th></th>
<th>1970s</th>
<th>Now</th>
<th>Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size of the plots</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area under cultivation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of agriculture</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Types of crops</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Objectives of agriculture</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production/feddan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Means of farming</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Means of marketing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>problems</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
11. Is the return from agriculture is enough?
   1. Yes ( )  2. No ( )

12. In case no how you compensate the gap?
   1. Selling wood ( )  4. Daily worker ( )  2. Migrate to towns. ( )
   5. Depends on sons ( )  3. Sell part of lands ( )  6. Others ( )

Q4. Livestock

1. What types of animals you have?

2. Who rare your livestock?
   1. Yourself ( )  2. Sons( )  3. Relatives ( )  4. Shepherd ( )
   5. Others ( )

3. Determine the suitable place for grazing?
   1. In winter ( )  2. Summer ( )  3. Autumn (kharif) ( )  5. Others ( )

4. What are the main reasons behind nazla?
   1. 2. 5. What are the main problems that faced pastoralism?
   1. Shortage of water ( )  2. Marketing ( )  3. Scarcity of pasture ( )
   4. Close traditional routes ( )  5. Conflicts between different land users ( ) 6. Others ( )

6. How do you solve the problems mentioned in the above question?
   1. Increase animal number ( )  2. High mobility ( )  3. Animal diversity ( )
   4. Search another job ( )  5. Marketing ( )  6. Others ( )

7. Compare between livestock number now and before 1970?
   1. Increase ( )  2. Decrease ( )

8. If decrease what are the main reasons?
   1. Droughts ( )  2. Marketing ( )  3. Diseases ( )  4. rubbing ( )  5. Others ( )

9. Please try to fill this table below:

<table>
<thead>
<tr>
<th>Animal</th>
<th>Behavior /grazing</th>
<th>Water needed/day</th>
<th>distance for grazing</th>
<th>Resistant to drought</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camel</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cattle</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sheep</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goats</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10. Compare between grasses and tree now and before 1970?

<table>
<thead>
<tr>
<th>Dominant in past</th>
<th>Dominant now</th>
<th>Disappeared/ past</th>
<th>Disappeared/ now</th>
<th>Distance/he villages</th>
</tr>
</thead>
</table>
11. Compare between livestock now and in 1970s?

<table>
<thead>
<tr>
<th>Types</th>
<th>1970s</th>
<th>Now</th>
<th>Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numbers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sources of water</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Herd management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time for pasture searching</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Objectives</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diseases</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medicines</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Palatable grasses problems</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

12. What does it drought mean for and how you cope with?
   1. 
   2. 

13. Reasons for appearance of new grasses that not available in the past?
   1. 
   2. 

14. What the reasons behind disappearance of grasses?
   1. 
   2. 

Q5. Energy and building materials

1. Building materials

<table>
<thead>
<tr>
<th>Building materials</th>
<th>Where (access)</th>
<th>Markets</th>
<th>Costs</th>
<th>Problems</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Now</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Past</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Firewood

<table>
<thead>
<tr>
<th>Types (access)</th>
<th>Where (access)</th>
<th>How can access</th>
<th>Prefer trees</th>
<th>Consumption per day</th>
<th>Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Now</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Past</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. What are the changes in building materials?
   1. 
   2. 

4. In your opinion what are the reasons behind such changes
   1.
2. Q6. Income:

1. **Income:**

<table>
<thead>
<tr>
<th>Economic activity</th>
<th>Income /month</th>
<th>Priority of expenditure</th>
<th>Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Now</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Past</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Have you practiced any activities beside agriculture and herding?
   1. Yes ( )
   2. No ( )

3. If yes fill the table below?

<table>
<thead>
<tr>
<th>Types</th>
<th>Nature of work Seasonally/permanent</th>
<th>Income /month</th>
<th>Priority of expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>You</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Member/ family</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Have you received and support from relatives?
   1. Yes ( )
   2. No ( )

5. If yes describe it?
   1. Presents ( )
   2. Gifts ( )
   3. Compensation ( )
   4. Others ( )

6. **Furniture:**

<table>
<thead>
<tr>
<th>Furniture</th>
<th>Enough</th>
<th>Needs</th>
<th>Mass media</th>
<th>Enough</th>
<th>Needs</th>
</tr>
</thead>
</table>

7. Reasons for changing the sources of income?
   1.
   2.

8. Are you poor?
   1. Yes ( )
   2. No ( )

9. What does poverty mean in your opinion?
   1.
   2.

**Q.7 None Governmental organizations:**

<table>
<thead>
<tr>
<th>Name of NGOs</th>
<th>Date</th>
<th>Activities</th>
<th>Evaluation</th>
</tr>
</thead>
</table>


Appendix 2

Rainfall

<table>
<thead>
<tr>
<th>Year</th>
<th>Mean Rainfall</th>
<th>Year</th>
<th>Mean Rainfall</th>
</tr>
</thead>
<tbody>
<tr>
<td>1974</td>
<td>712</td>
<td>1990</td>
<td>372</td>
</tr>
<tr>
<td>1975</td>
<td>607</td>
<td>1991</td>
<td>395</td>
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<tr>
<td>1976</td>
<td>642</td>
<td>1992</td>
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<td>1977</td>
<td>609</td>
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<tr>
<td>1980</td>
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<td>1981</td>
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<td>1983</td>
<td>482</td>
<td>1999</td>
<td>844</td>
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<td>1984</td>
<td>322</td>
<td>2000</td>
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<td>1985</td>
<td>745</td>
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<td>1989</td>
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