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Assessing Impact of Rangeland Degradation on Pastoral Communities Livelihood Systems in Al-Salam Locality-South Darfur State – Sudan

تقييم أثر تدهور المراعي على سبل كسب العيش للمجتمعات الرعوية بمحلية السلام - ولاية جنوب دارفور – السودان

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DEDICATION

I dedicate this work

to my mother

to my father

to my brothers and my sisters

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I am indebted to family for giving me the financial support to conduct this research.

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ABSTRACT

The study was conducted in the Al-Salam locality in South Darfur State. The aim of this study was to assess impacts of Rangeland degradation on pastoral communities livelihoods system in South Darfur state, Besides assess the impacts of grazing land degradation on Food Security and income generation of pastoralist in the study area. The methods of data collection depended on: General survey and visits to the study area, besides the general characteristics of pastoral communities, This was based on structured questionnaires covering different parameters, and Direct interviews were carried out with key informants to provide in going or past information obtained from Range and pasture administration office.

Four villages namely (Abu agora, Safia, Domyia , and Towga) were randomly selected from the total number of villages which were about (20) villages, representing a locality .total of 60 respondent were selected and interviewed . Data was analyzed using statistical Package for Social Sciences (SPSS).

The study concluded that majorities the respondents they were settlement and practice grazing inform of sedentary in addition to cultivating of some agricultural crops such as millet, beans, maize . ,and 90% depend mainly on wells as sources of water for human and animal in the study area. The study showed that there was sever decrease in rangeland in the study area as result of the agricultural expansion associated with used of modern agricultural machines which was reflected in the occurrence of conflict over the use of grazing resources by the pastoral communities in the study area, Also the study revealed that the increase of conflict and competition between sedentary pastoral communities and other land users due to the un clarity of

land ownership and non registration of rangeland in addition to the absence of clear mapping and demarcation of nomadic routes. This study recommended that:

Greet attention should be adopted by government and non- governmental organizations for providing necessary needs service to pastoralist in their areas by supporting livelihoods, diversifying sources of income beside establishment of health center and schools. Also, distribution of water point in suitable place in grazing area in order to prevent conflicts, in addition to increase the number of other water sources such as AL-Dwanki to provide water for humans and livestock specially in remote areas .

Effectiveness of polices and laws of landowner and registration of Rangeland, Beside great attention for mapping of animals rout in order to assists in implementation of Rangeland pasture activities and management it in sustainable manner.

support the role of local administration in managing the process of grazing, as well as contributing in resolving conflicts between pastoralists and other users through local administration.

مستخلص البحث

أجريت هذه الدراسة بمحلية السلام بولاية جنوب دارفور. هدفت الدراسة إلى تقييم آثار تدهور المراعي على نظم سبل كسب المعيشة للمجتمعات الرعوية بالمنطقة، إلى جانب معرفة التأثيرات المباشرة والغير مباشرة للمنظومة الرعوية على الأمن الغذائي ومصادر الدخل للرعاة في منطقة الدراسة .

اعتمدت طريقة جمع البيانات على المسح الاجتماعي و الاقتصادي للمجتمعات الرعوية بمنطقة الدراسة. وتم تصميم استبيان لجمع المعلومات بالإضافة إلي الأسئلة البحثية المباشرة التي وجهت لإدارة المراعي بالولاية والمحلية .

تم اختيار عدد أربع قرى بصورة عشوائية لتغطي محلية السلام من مجموع 20 قرية بالمحلية تمثل مجتمع الدراسة والقرى هي (ابو عجورة، صافية، دومایة، طوقة). ومن ثم غطى الاستبيان عدد 60 فرد من مجموع عدد سكان تلك القرى. تم تحليل البيانات باستخدام برنامج الحزمة الإحصائية للعلوم الاجتماعية (SPSS) توصلت الدراسة إلى إن غالبية العظمى من الرعاة المبحوثين يمارسون نظام الرعي المستقر بالإضافة إلى زراعة بعض المحاصيل هي:(الذرة، الدخن، الفول السوداني و السمسم) وحوالي 90% من الرعاة يعتمدون بصورة رئيسية على الآبار كمصادر مياه لشرب الإنسان والحيوان بمنطقة الدراسة.

أوضحت الدراسة وجود نقصان في مساحة المراعي بمنطقة الدراسة نتيجة للتوسع الزراعي المصاحب لاستخدام الآلات الزراعية الحديثة مما انعكس سلبا في حدوث النزاع والصراع على استخدام مورد المراعي من قبل المجتمعات الرعوية بمنطقة الدراسة .

وكشفت الدراسة أن تزايد الصراع والتنافس بين المجتمعات الرعوية ومستخدمي الأراضي الآخرين يرجع إلى عدم وضوح ملكية الأراضي وعدم تسجيل المراعي بالإضافة إلى غياب ترسيم وتخريط لتحديد مسارات الرحل بشكل واضح. أوصت الدراسة بما يلي:

ضرورة الاهتمام بتقديم الخدمات الضرورية (صحة ، تعليم ومياه) للرعاة في مناطق استقرارهم من قبل الجهات الحكومية والمنظمات الطوعية بجانب تنويع سبل كسب العيش و مصادر الدخل إلى جانب إنشاء المراكز الصحية والتعليمية.كما أوصت الدراسة بالعمل على توزيع نقاط المياه بمناطق الرعي بصورة سليمة تمكن الرعاة من استخدامها بسهولة تفاديا لحدوث النزاعات مع المستخدمين الآخرين ،كما أوصت الدراسة بالاهتمام بإنشاء عدد من مصادر المياه الأخرى كالدوانكي والصهاريج لتوفير مياه الشرب للإنسان والحيوان خاصة في المناطق البعيدة من مجاري المياه والخيران. العمل على تفعيل السياسات والقوانين الخاصة بملكية الأراضي وتسجيل أراضي المراعي بجانب الاهتمام بترسيم وتخريط المسارات مما يساعد في تنفيذ أنشطة المراعي وإدارتها بصورة مستدامة. تفعيل دور الإدارة الأهلية في إدارة عملية الرعي والمساهمة في حل النزاعات بين المجتمعات الرعوية والمستخدمين الآخرين.

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LIST OF ABBREVIATION

FAO Food and Agricultural Organization of the United Notations.

WFP World Food Program.

IDP Internally displaced Person.

ITCZ inter-Tropical-Convergence zone.

NGO Non-governmental organization.

INGO International Non-governmental organization.

UNEP United Nation Environmental Program

SPSS Statistical Package for Social System

NS No significant

CHAPTERI

INTRODUCTION

1.1. Introduction:

Rangeland biomes encompassing much of the area where pastoral livestock production is a major landuse, cover 51% of the earth's land area but support 78% of the global grazing area (Asner*et al*., 2004). Livestock provide food and income to the majority of the 1.2 billion people living on less than $1 per day (FAO, 2008), and livestock demand is rising to unprecedented levels (Delgado *et al*., 1999; de Haan*et al*., 2001; FAO, 2008). In addition to securing livelihoods, rangelands in developing countries provide multiple goods and services of great economic, social, cultural and biological valueslocally, nationally and globally (Mortimore, 2009).Pastoralism has been viewed as a mode of life in many parts of the world. Pastoralists depend on livestock as the major source of food and money but also contribute to national development of the host countries. They usually occupy dry lands. Practiced across many various regions, nomads move from place to place in search of water and pastures for their animals.Nevertheless, rangelands have been facing contradictory pressures, i.e., increased demand for natural resources and animal products to cope with rising human populations. Conservative estimates indicate 10–20% of rangelands worldwide have been severely degraded with an additional 12 million ha of rangeland degraded each year (Millennium Ecosystem Assessment, 2005; Reynolds *et al*., 2007).Pastoralists utilizing degraded rangelands generally suffer from poverty and food insecurity (Donald and Jay, 2012). Thus, rangeland degradation and desertification have raised concerns globally.In Sudan over a thousand years, grazing has been one of

the major land use activities and continues to remain an important activity. Often grazing has been poorly managed and has led to a large- scale soil loss. Currently, many rangelands show signs of either degradation or overgrazing; both conditions lead to reduced vegetation cover and water absorption in the soil. This, in turn, leads to accelerated rangeland environmental degradation (FAO, 2005).

1.2. Problem statement:

In South Darfur state during the last years, the livelihoods of pastoral and agro pastoral communities in Alsalam Locality have been affecting by the degradation of natural resources particularly grazing lands and water sourcesas a result of many factors, including, environmental degradation, rainfall variability, agricultural expansion, over grazing and land use change .These factors intensify resource scarcity and competition over pasture and water sources in the area. Moreover, the pastoralists' nomadic and semi nomadic lifestyle makes it difficult to have access to basic social service sand fodder for their livestock. Due to these, the pastoral communities are forced to look towards diverse sources of additional income generating activities. These situations negatively affected the pastoral communities' on livestock production system, culture and tradition in addition to their effect on future generations. Moreover, lacks of accurate information on the potential impact of rangeland degradation on the livelihood of pastoral and agro-pastoral are not available.

1.3. Objectives

1.3.1. General Objective

To assess impacts of Rangeland degradation on pastoral communities livelihoods system in South Darfur state.

1.3.2. Specific Objectives

. To identify the direct and indirect causes of rangeland degradation the study area.

. To assess the impacts of grazing land degradation on Food Security and income generation of pastoralist.

.To assess the pastoralist perceptions towards impacts on change pattern uses of grazing.

-To identify the other sources of livelihood activities that practices by pastoralist in the study area.

To assess the impacts of rangeland degradation on livestock production system.

1.4. Research Questions:

Some questions are formulated according to the objectives of study, which are:

1. What are direct and indirect impacts of rangeland degradation on pastoral community livelihoods?
2. Does the rangeland degradation have negative impacts on food security and income generation of pastoral community?
3. What are the other sources of livelihood activities that practices by pastoralist in the study area.
4. Does the livestock production system affected by the rangeland degradation?

CHAPTER II

REVIEW OF LITERATURE

2-1 Rangeland condition in the world

The assessment of rangeland conditions and trends is a controversial subject, with much disagreement occurring among researchers and managers about adequate techniques and data interpretation (Friedel, 1991).

Appropriate data gathering and interpretation methodologies must be developed in order to obtain site assessments to meet survey and monitoring objectives.

Many indices of rangeland condition, or the 'state of health' of the vegetation (Tainton, in Stokes, 1994), have been developed over the past 50 years, where plants are categorized according to their responses to management, weightings area assigned to each category and an index is calculated from the abundances of plants in each category (Stokes, 1994). This score is generally compared to a standard, or 'ideal', vegetation according to management objectives. Examples of this approach are the ecological index method (Vorster, in Stokes, 1994), the benchmark method (Foran *et al*, in Stokes, 1994), the weighted palatability method (Barnes *et al*, in Stokes, 1994), the key species method (Hardy and Hurt, in Stokes, 1994), and the weighted key species method(Heard *et al*, in Stokes, 1994).

The score that is computed will fall in the range of 0-25% if the range is in "Poor" Condition, 26-50% if the range is in "Fair" Condition, 51-75% if the range is in "Good" Condition, and 76-100% if the range is in "Excellent" Condition. By taking the range condition score that is determined, the researcher then can use Table 4 in the Nebraska Cooperative Extension Circular EC 86-113-C to determine an "Adjustment Factor for Initial

Stocking Rate." ." This adjustment factor is then multiplied with the correct number found in Table 3 of the same Extension Circular to determine an initial stocking rate value for livestock. This stocking rate is expressed in units called AUM/acre (Animal Unit Months per acre). AUMs are based on the amount of forage that a 1000-pound animal will graze in one month's time, which is roughly 780 pounds of air-dry forage. This information is further detailed in the "Nebraska Handbook of Range Management" (EC 92-124-E by Reece and Stubbendieck). By connecting the research completed involving quantifying rangeland health to the research completed involving livestock grazing and distribution, we now have a system in place to more properly manage stocking rates of grazing livestock. In addition, we have a system that determines the amount of forage that should not be grazed to provide adequate support for wildlife biodiversity. This use, as well as others, is detailed below.

2.2 Pastoral in the global region:

This thesis analyses pastoralist's risks to their livelihoods under scenarios of changes in

resource tenure. For general readers, my definition of pastoralism follows Toulmin (1983).

She defines pastoralism as a method of production whereby humans being rely on livestock production and livestock make use of natural resources for their survival.

According to Scones (1996) pastoralists in Africa get their livelihood from ecologically highly variable environments. The environmental that pastoralists occupy are arid and semi-arid land that

lack forage and water for their livestock. These areas are not very suitable for many livelihood

options but pastoralism has managed to adopt well (Kirkbride & Grahn 2008). However, due to environmental variability of arid and semi-arid environment drives pastoralists to keep large herds so that they can secure their livelihood particularly in dry years. Consequently, large herd size requires vast amount of land for grazing, and practicing mobility.

2.3 Pastoralist community in Sudan:

Most pastoral land in the Sudan are associated with particular tribal homeland (dar), defined by customary rights, Within the dar grazing is communal.

Conflicts associated with competition for pasture and water were suppressed since the colonial time with the maintenance for policies that restrict different tribal groups to their respective dar.

This policy was severely undermined by the enactment of the 1970 Unregistered land Act, the 1971 local Government Act and the 1981 Regional Government Act [Shazali, 1988; Babiker and Abdel Gadir,1999].

2.4 Environmental degradation and conflict in Darfur:

South Darfur lies in a region that suffers from the significant impact of environmental degradation .Over grazing, deforestation and over cropping have caused the poor soil in the area to deteriorate further, and consequently, yield has deteriorated . However, due to land use/land cover change, most rural inhabitants have become to cop with environmental hazards. This has led to competition and over exploitation of natural resources. Subsequently, conflicts and war have merged and most rural inhabitation have abandoned their homelands and become internally displaced or refugees. The conflict in Darfur has greatly accelerated the processes of environmental degradation that have been undermining subsistence livelihoods in the area over recent decades. On

the other hand the negative environmental consequence of the conflict more generally, and of the establishment of massive IDP camps specifically, are well recognized (Tearfund, 2007).On the other hand, the devastating impact of Darfur swollen urban population on forest resources has been documented by UNEP (2008), with brick-making identified as the major cause of deforestation around Darfur's main towns .(UNEP).

2-5 Rangeland Degradation:

Rangeland degradation is a decrease in plant species diversity, plant height, vegetation cover and plant productivity. Recently, degradation has also come to mean deterioration in ecosystem services and functions. In general, rangeland degradation is a reduction in the rank or status of natural vegetation. **(**Oba and Kotile, 2001**).**

2-6 Major Causes of Rangeland Degradation:

Rangeland degradation, a worldwide problem, loss of perennial grass cover and increase in annuals, unpalatable forbs and bush cover are the leading cause and also conversion of rangeland to cropland, wood harvesting and over-grazing by livestock are the major causes **(**Musa *et al.,* 2016**).**

2.6.1 Climate Change:

Climate change is seen as a key ecological driver that influences the dynamics of sub-Saharan rangelands (Hoffman and Vogel, 2008). As understand from different projected data that rangelands will be more negatively affected by climate change, with implications such as changes in water resources, rangeland productivity, land use systems and rangeland-based livelihoods. An problem that affects many sectors, including biodiversity (flora and fauna), agriculture, human health and water. Climate

change may also increase the spread of invasive species (McCulley, *etal*, 2004).

2.6.2 Over-grazing:

Overgrazing of rangelands is a problem worldwide. According to the World Resource Institute **(**WRI, 1992**),** overgrazing is the most pervasive cause of soil degradation. In arid and semi-arid regions in Africa and Australia, overgrazing causes 49 and 80 percent for soil degradation respectively. In overgrazed land, the animals clip the vegetation to the bare ground, causing starvation and death of the root system **(**Purdon and Andreson, 1980**).**

2.6.3 Bush Encroachment:

Bush encroachment refers to the spread of plant species into an area where previously it did not occur. Invasion on the other hand, refers to the introduction and spread of an exotic plant species into an area where previously did not occur. In the process of bush encroached, land vegetation was shifting from herbage to bush, the coverage of herbage decreased and the area of bare land increased the spatial and temporal variability of soil water and nutrients were increased and the process has an important impact to the structure and function of the community ecosystem, which reduced herbage production, declined carrying capacity of native pasture, threaten sustainable progress of livestock production **(**Zhang *et al* ,.2001**).**

2.6.4Drought:

The frequent drought in many parts of the Africa's lowlands is a prominent factor which has contributed to range degradation. When there is drought and overgrazing together, the effect on the productivity of the rangeland is double barreled (Herlocker, 1993). Prolonged drought, including a shortage and erratic rainfall can cause serious range degradation (Abate and Angassa, 2016). As a result, mobility is the most important pastoralist adaptation to

spatial and temporal variations in rainfall, and in drought years, many communities make use of fall-back grazing areas unused in 'normal' dry seasons because of distance, land tenure constraints, animal disease problems or conflict (Blench and Florian 1999).

2.6.5 Human and Livestock Population Pressure:

An increase in the size of the population and overstocking are in turn causing imbalances, for example. The effects of overpopulation highly influenced on food availability and increased poverty have contributed to the sedentarization of pastoralists (Alemayehu, 2005). This makes most of the community concentrated one centered area on permanent water supplies (Herlocker, 1993 and Alemayehu, 2005) becomes overuse of rangeland resources and subsequently resulted in rangeland degradation and reduced biodiversity.

2.6.6 Traditional Rangeland Management Practice:

The recognition given by policy makers, leaders, researchers and development workers for indigenous knowledge and elders is still low (Abule and Alemayehu, 2015). Traditionally the communities used herd diversification, mobility and free ranging of communal land in order to protect rangelands from degradation (Oba and Kotile, 2001).

2.7 Rangeland Ecosystems Degradation:

The major indicators of rangeland degradation are shifting in species composition, loss of range biodiversity, reduction in biomass production, less plant cover, low small ruminant productivity, and soil erosion. The major indicators of rangeland degradation are shifting in species composition, loss of range biodiversity, reduction in biomass production, less plant cover, low small ruminant productivity, and soil erosion. Major changes in rangeland surface morphology and soil characteristics have a

drastic effect on the primary productivity of the rangeland ecosystem, and in turn on livestock production (Payton *et al*., 1992). There are a number of factors responsible for degradation; among others, are climate, grazing (Arnalds and Barkarson, 2003), soil quality, and landform and its influence on rangeland ecosystem hydrology (Garcia-Aguirre *et al.*, 2007).Identification of putative a biotic and biotic barriers to the natural regeneration of more desirable vegetation can lead to the implementation of appropriate restoration treatments (Whisenant, 1999).

2.7.1 Impacts of Rangeland Degradation:

Rangeland degradation has a great impact in the pastoral communities and in the country level that resulted in substantial declines in rangeland condition, water potential, soil status, and animal performance, livestock holding at the household level, while communities in general have lost their livestock asset and become destitute. And this Coues food insecurity for the local community and become a burden for the government due to the need for alternative livelihood income and diversification (Teshome and Ayana, 2016).In the long run it results poverty and tribal conflicts over grazing land and water resources (Solomon *et al*., 2007).

2.7.2 Economic Importance of Rangeland

The rangeland provides one of the most important resources of the world's arid and semi-arid areas. 3.5 billion hectares of the earth’s land is now pasture or rangeland. This area is 26% of the total and it over 70% when we refer to agricultural land (Pardini. etal, 2003). The total digestible nutrients produced by the world's rangelands could be measured in grain crop equivalents, the results would be outstanding (Norris, 1972). These are the region's rangelands which provide ninety or more percent of the food consumed by millions of head of cattle, sheep, goats, and wildlife (WRI and

IIED, 1990). Semi-arid and arid rangeland systems are found in many parts of the world. They are ecologically very sensitive systems, yet they are of great local economic importance (Oba and Lusigi, 1987). The Situation in the Near East and North Africa Region most of the land area in the region (62%) is classified as rangelands (FAO, 1991), and half of these rangelands are desert and semi-desert, with a limited contribution to controlled or reliable livestock production. The rangeland-dominating arid and semi-arid areas provided primary products (grasses, legumes and shrubs) which were converted into animal protein. Use of the resources for other purposes, such as fuel and building material, intensified with the increase in human population and with sedenterization. The Near East, rangelands provide more than 90% of the nutrients consumed by 302 million head of domestic livestock; cattle, sheep, goats, buffalo, camels, horses, mules and asses (Norris, 1972). Sudan is the first among Arab countries according to the number of livestock contributing, with 12% from the total production, and 50% of agricultural production (Daragetal, 1995).

2.7.3 Ecological Importance of Rangeland

Rangeland plays a significant role in ecological stability on a global scale and their importance nowadays also comprises landscape diversity over large territories. Rangelands are increasingly recognized as important for their environmental and recreational amenities. Because they are managed much less intensively than many other types of agricultural lands, rangelands are seen to represent closer approximations to natural ecosystems. Rangelands are managed for a variety of outputs; in recent years, the contribution of natural rangeland systems to biological diversity has become increasingly recognized. Rangelands provide two major values, those associated with use (use values) and those realized in the absence of direct

use (existence and option or nonuse values). The major commercial use (use values) of rangelands is livestock grazing to produce food, fiber, and draft animals. Other, less significant, commercial uses such as wild game and bird hunting also are associated with rangeland habitats. In addition, rangelands are viewed as important contributors to watersheds: because rangelands usually have lower rates of soil erosion than cropland, they enhance water quality. Further, the natural system that exists on well-managed rangelands makes them increasingly recognized as places for non-consumptive wildlife associated recreation. Rangelands also produce intangible products (or nonuse values) that are the result of use. These products include natural beauty, open space, and the mere existence as a natural ecosystem (NRC, 1994). Others emphasize biological diversity and the associated potential array of products and services as a distinct intangible product (West, 1993).

2.7.4 Social Importance of Rangeland

There are an estimated 190 million pastoralists in the world. Mobile pastoralism is an adaptive response to an inhospitable arid environment. Nomadic pastoralism postdates either agriculture or domestication of animals. It is a highly specialized form of land use which arose in the steppe regions of the Old World and has continued there until the present (NGO, 2002). Pastoral nomadism, the major land use of the region, is adapted to variable forage supplies and water distribution. The ability of nomadic people to survive in these marginal lands is attributed to their opportunistic mobility and diversified livestock husbandry (Oba and Lusigi, 1987). Africa contains a substantial portion of the world's arid and semi-arid rangeland, extending over three million square kilometers. These arid zones support an estimated 16-22 million pastoral population (Widstrand, 1975) and nearly 500 million head of livestock (FAO, 1975). There is much argument in favor

of optimism with regard to the future of the rangelands in the arid/semi arid areas (Sidahmed, 2001).The nomad in Sudan is about 11% of the total Sudan population (2.5 million people), while the pastoralists constituted about 21% of the total Sudan population (Daragetal, 1995).

2.8 Pattern of Rangeland Utilization

2.8.1 General

Utilization is the proportion of a year's forage production that is consumed or destroyed by grazing animals (UCCE). Many arid and semi-arid rangelands have a large livestock population. The objectives of rangeland based livestock production vary with the pastoral system employed, such as nomadic, semi nomadic and sedentary systems. Pastoralists are people who depend for their living primarily on livestock. They inhabit those parts of the world where the potential for crop cultivation is limited due to lack of rainfall, steep terrain or extreme temperatures. In order to optimally exploit the meager and seasonally variable resources of their environment and to provide food and water for their animals, many pastoralists are nomadic or semi-nomadic. An important characteristic of pastoralists is their close relationship with their animals.

2.8.2Type of Users for Rangeland Utilization

- Nomads

Pastoral nomadism, the major land use of the region, is adapted to variable forage supplies and water distribution. The ability of nomadic people to survive in these marginal lands is attributed to their opportunistic mobility and diversified livestock husbandry (Oba and Lusigi, 1987). Exclusive pastoralists are livestock producers who grow no crops and simply depend on the sale or exchange of animals and their products to obtain foodstuffs. Such producers are most likely to be ‘nomads. Their movements are

opportunistic and follow pasture resources in a pattern that varies from year to year. This type of nomadism reflects almost directly the availability of forage resources; the more patchy these are, the more likely an individual herder is to move in an irregular pattern (Blench, 2001).

- Semi Nomads

Semi nomadic system implies that stock owners have permanent place or semi permanent place or residence, usually near to land on which his family may cultivate crops, but travel with the herds for long period away from their settlement (Humphreys, 1991).

- Sedentary

Settled pastoralists are those cultivate sufficient areas to feed their families from their own crop production. The key to interaction between the sedentary and mobile communities. Sharing the same ethno linguistic identity with the pastoralists they often act as brokers in establishing cattle-tracks, negotiating the 'camping' of herds on farms, which potentially exchanges crop residues for valuable manure, and arranging for the rearing of work animals which adds value to overall agricultural production (Blench, 2001).

2.8.3 Traditional Strategy for Rangeland Utilization

The rangeland-dominating arid and semi-arid areas provided primary products (grasses, legumes and shrubs) which were converted into animal protein. It is widely recognized by ecologists that pastoralism represents a sustainable method of utilizing certain types of ecosystems, such as deserts, steppes and certain mountain areas. In fact, continued utilization of the world's arid lands very much depends on viable pastoral systems (LIFE, 2001). Pastoral groups use a wide range of techniques in managing their natural resources, and that these systems are neither random nor irrational,

but quite deliberate and adapted to the vagaries of their environment (Oba and Lusigi, 1987). The pastoral strategy is to use a broad array of species (cattle, camels, sheep and goats) which utilize different parts of the forage and have varying resistances to drought. In such a multi-product setting, where a pastoralist operates different livestock production systems, a decision must be made as to the stocking rates for each type of system (Lusigi and Buursink, 1994**)**. African pastoralist who accepted and adapted to environmental diversity by having a herd of mixed species. Cattle and sheep rely in large part on grass (but also some forbs and browse especially in the dry season), while camels and goats rely mainly on browse (Le Houerou, 1980). Nomads often occupy specific tribal territories. Lands within a tribal territory are often partitioned into ‘wet season and ‘dry season ranges. In order to cope with the varying rainfall and forage distribution, both nomads and their animals must possess a high degree of mobility. Two aspects of mobility should be recognized. Resource exploitation mobility is undertaken in response to unpredictable forage and water availability. Escape mobility involves long distance migration to escape drought conditions. In either case, the primary objective is usually to maximize livestock survival. Resource exploitation mobility allows nomadic herds to utilize widely dispersed forage resources at times when they are most nutritious. Such a system results in annual migratory cycles determined by seasonal changes. The distance moved, routes followed, and the degree of flexibility built into the system vary from year to year, place to place, or herd to herd, and even from community to community In the Sahel, cattle traditionally graze two categories of rangelands. Following the rains, cattle nomads move toward ephemeral ranges where surface waters are exhausted and annual plants decline in nutritive quality. At these times, nomads

migrate back to dry season ranges, thus completing the cycle of transhumance. In the Sudan, similar grazing patterns are followed. During the rainy season, camels, sheep and goats move toward the fringes of the Sahara desert, while cattle nomads follow, occupying those zones left by camel nomads. Late in the rainy season, however, camels, cattle, sheep and goats migrate back to the short grass savanna zone. Cattle nomads move south to fly-infested range by the early dry season, while camels, sheep and goats remain in the Savanna zone. Nomads attempt to minimize such losses for utilizing mobility to rapidly convert growing vegetation to animal products. The number of movements undertaken during any year depends on environmental conditions, the state of available resources, and the livestock species being managed (Oba and Lusigi, 1987).

2.9 Importance of Mobility on Rangeland

The growing understanding of the relationship between mobility and ecological health that has contributed the most to the mobility paradigm. Ecological studies undertaken in the arid lands show that climate appears to be a more significant factor in determining vegetation structure, function, and dynamics than either grazing or internal ecological processes. This does not mean, however, that grazing does not affect vegetation dynamics; only that its impact is very much determined by climatic variability (Niamir, 1991). Pastoralists in arid and semi-arid Africa have developed a set of principles and strategies that have enabled them to meet their physical and social needs in a harsh and variable environment. Mobility is an effective tool for range improvement, as it provides the herder flexibility to modify herds, and access to alternative pasture areas, while waiting for spontaneous regeneration of degraded pastures. Mobility may be used in managing forage resources. Due to variable rainfall and often limited water supplies, each

range area is used only for a short period, such that forage plants remain in good condition. It may be speculated that such intermittent use of the land will result in improved forage and increased carrying capacity relative to those areas where yearly production of standing crop biomass remains unexploited and/or those other ranges grazed year long. Such a grazing strategy increases plant vigor and growth. The new shoots being more nutritious are much more readily grazed. In contrast to resource exploitation mobility, escape mobility is undertaken to evade drought. Distances moved are dependent on availability of limiting resources both within and outside the tribal territory, and on the social and political 'climate shared with the neighboring groups or nations. It is interesting to observe that during such hard times, security risks become secondary to community survival (Oba and Lusigi 1987). Herders from the same social unit are usually free to use any part of their territory, but in practice confine themselves to the range they know best, and prefer to stay with the same group of people, especially relatives. This usually ensures a continuity and consistency in range use by the same managers (Niamir, 1991). Which utilize different parts of the forage and have varying resistances to drought. In such a multi-product setting, where a pastoralist operates different livestock production systems, a decision must be made as to the stocking rates for each type of system (Lusigi and Buursink, 1994**)**, includes moving to minimize the effects and impacts of droughts, and being able to use underused pastures distant from settlements, or those that are only seasonally available. However, productivity per animal is lower, primarily because of the lack of external supplementation and low veterinary input. Another benefit of mobility is its deliberate use for contributing to pasture sustainability and improvement. The mobility of neighboring pastoral herds is a form of spatial and temporal

choreography determined by the nutritional needs of the livestock portfolio, informal rules that determine precedence, degree of concentration and length of grazing (that is, effective grazing pressure), and "safe" distance or dispersion between herds (disease or social relationships). An opportunistic stocking strategy requires that mobility patterns adapt to both herd sizes and variability in primary productivity. High primary productivity in good years provides an incentive to herders to reduce mobility, but they have to balance that with the needs of a larger herd. A smaller herd could be kept closer to home, but in bad years may need to be taken further afield to reach pockets of good feed (Niamir, 1991). One important mechanism that allows opportunistic use is the "tracking" of ecological variability, both spatially and temporally. Herders and scouts track the ecosystem by constant monitoring and adjust the behavior of their animals accordingly (Oba and Lusigi, 1987).

2.9.1 Socioeconomic dimensions of Rangeland

The semi-arid tropics cover an area of about 20 million km^2 (Kampen and Burford, 1980) estimated that 700 million people live in this zone (Vandenblat, 1990). Political, social and economic issues are as important as the technical problems in semi-arid areas. The potential agricultural areas constituted an important source of revenue and livelihood for many people. In addition, most of the efforts concentrated on crop production rather than livestock keeping, which is the mainstay of many people in semi-arid areas (Schechambo and Kisanga, 1999). Livestock production is one of few options available to millions of impoverished people who live in arid and semi-arid areas of sub-Saharan Africa (Winnie. etal, 1998). Extensive livestock-production is one of the most appropriate types of land use in the arid areas of Africa because of its adaptability to the highly variable

environmental conditions. Animals can be regularly moved from one location to another to follow seasonal climatic patterns or within a particular location to track local variability in the quality and quantity of forage (Sandford 1982; Behnke and Scoones 1992). Pastoralists usually live in arid, semi-arid where crop production is difficult and the availability and distribution of forage varies seasonally with precipitation. Pastoralists cope with this variability by migrating with their herds. Mobility helps pastoral production systems maintain optimum rates of productivity by allowing the pastures time to recover after grazing. In these systems, livestock production is absolutely critical to the economy because there are few or no economically viable alternatives for income generation. Pastoralism may be the only lifestyle suitable for such a harsh climate (Winnie. etal, 1998). In adapting to a harsh and variable physical environment, the African pastoralist has developed principles and strategies for managing natural resources. Recently the pastoralist has had to face new external pressures, such as crop expansion into high quality rangelands (Niamir, 1999). African pastoralist who accepted and adapted to environmental diversity by having a herd of mixed species. The term “pastoralist” is defined as a mode of production where livestock make up 50 percent or more (Sandford, 1982).

CHAPTER III

STUDY AREA

3-1 Location:

South Darfur state is located in the far southwest of Sudan. It is one of five states that compose the region of Darfur in western Sudan. Prior to the creation of the two new states in Darfur region in January 2012. It lies between latitudes 10^o to 13^oN and longitudes 27^o to 28^o E, with an area about 137.857 Square Kilometers, see the map (A).

Nyala city is located in latitude $12^o - 30^o$N and longitude$24^o - 53^o$ E, the total population of Nyala, was estimated from the 2008 population census as 2.96 million persons. At present there are about 66.000 internally displaced persons living in IDP camps surrounding Nyala. About 38 camps in Nyala and the largest of these camps Kalma camp, south-east Nyala, with an estimated population of nearly to 100.000 inhabitants. More than 60% of the total population is rural people, settled in small villages scattered all over the area. Main occupation is agriculture and grazing where more than 28% of the total population constitutes nomads.

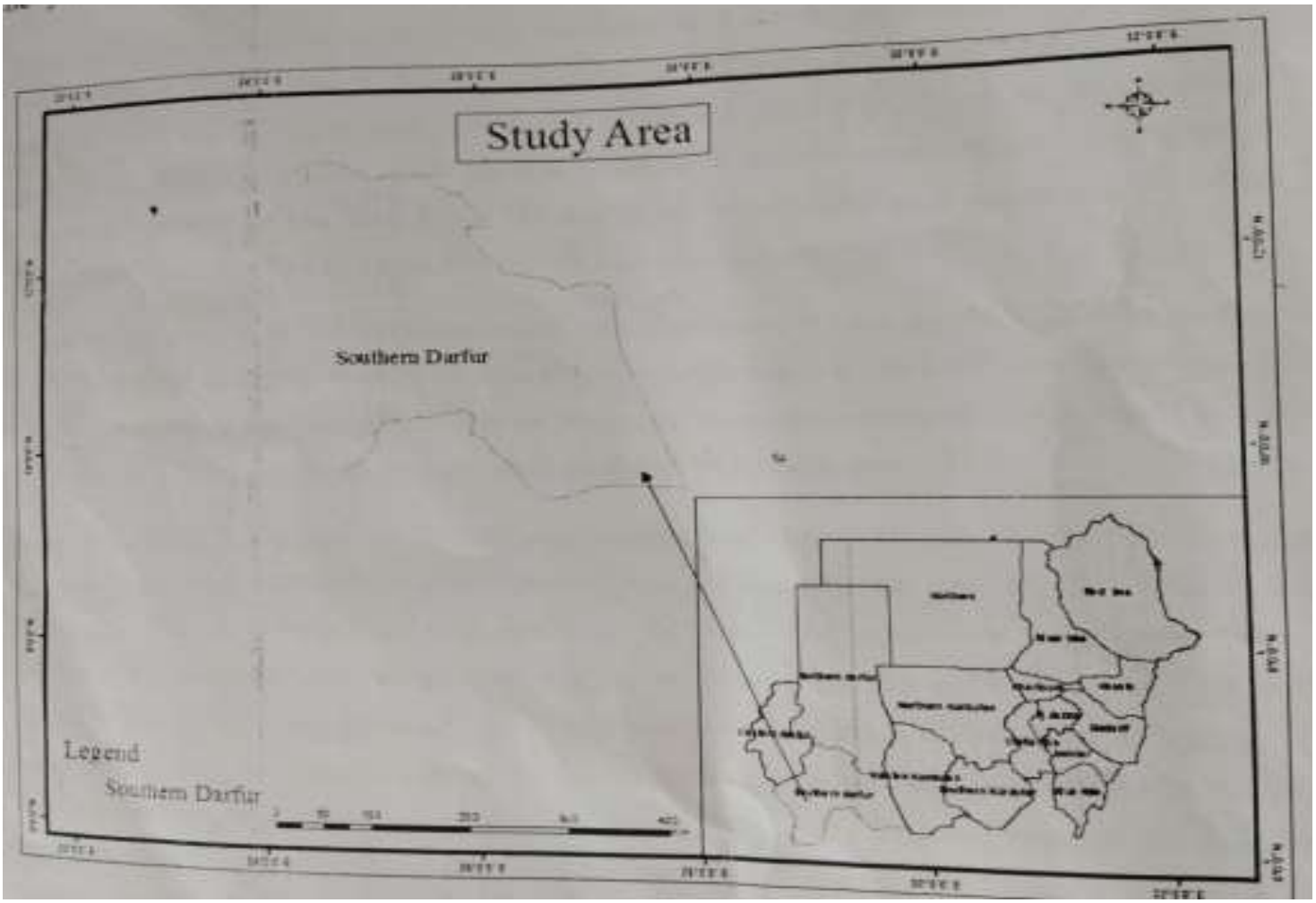


Figure (A) location of the study area

3-2 population:

The total population of south Darfur is 4.31 million (in2010) that expected to reach 4.90 million by the year 2015 (using 206% official growth rate). Of the total state population, 56% of people are rural, 22% are urban and 22% are nomadic. Most of the population is agro-pastoralists (SHHS, 2006).

The state is also characterized by large number of livestock, primarily cattle, sheep, gouts, camels, and horses. The total number of livestock is estimated at 15 million and expected to reach 17.28 million by 2015. Armed conflict caused significant population displacement and hence 1,016,692 internally displaced persons (IDPs) are living in camps and / or with other rural / urban hosting communities. This situation has resulted in the serious deterioration of basic services.

Also, the increase in population has increased the need for natural resources the main source of people livelihood in the area and resulted on pressure on the resources use misuse and over use. On the other hand, the environmental conditions deteriorated due to drought and desertification patting even more pressure on natural resources.

3-3Climate:

Darfur region has a very dynamic climate, but recently episodes of drought became more visible. The dominant climatic feature in southern Darfur is the rainfall pattern associated with the northward movement of the inter-Tropical Convergence Zone (ITCZ) in May to June. Moist tropical air from equatorial regions is brought into contact with the hot north winds from the Saharan desert.

The converging air masses lead to the formation of convective storms, which prevail over the area until the ITCZ retreats southwards in September to October.

Rainfall in the study area is highly variably and follows a general north-south gradient from 400-500 mm in the north falling in July and September, to 800 mm in the extreme south with a rainy season extending from May to October. As rainfall decreases, its amount and distribution become more erratic and unreliable (EL-TOM, 1975).

Evaporation follows a gradient opposite to rainfall with about 250 mm/annum in the north to 150 mm in the south. Temperatures are moderate to high throughout the year with greater daily and seasonal variation at more northern latitudes.

3-4 Topography and soils:

Darfur topography is mainly sandy *Goes* which occupies more than 65% of the northern of Darfur and about 10 to 15% of Southern Darfur. The region is characterized by gently undulating to nearly level uplands; however, it is interspersed with various hills and mountains. The mountains and hilly parts cover areas of middle Darfur and feature the massive of Jebel *Marra* and other hills such as Meidoub hills.

Clay and Gardud soils occupy the western and south western parts and some areas in the north. *Jebel Marra* forms the watershed divide where seasonal streams and *Wadis* flow east, west and south of the Jebel. Such as Wadi Barei and Wadi Azoom where flow to the west and south west. Wadi Alku, Wadi Taweela, Wadi Kuttum and Wadi Al kaj flow to the east. Wadi Kass and Wadi Bulbul flow to the south and south east.

Although all these Wadi are seasonal, some of them retain surface and subsurface waters where shallow wells are dug to grow some vegetables and

horticultural crops. Deeper water aquifers are Baggra, Sag Annam and Umbuyada where good drink water for both human and animals is always available.

The two main soils in Darfur are the sandy and the dark clay soils. The sandy soils are mainly stabilized sand dunes known locally as qoz lands. These are generally flat to undulating with various depths. The soil are very permeable, excessively drained and have low water holding capacity and this kind of soil suitable for gorps like Dukhun, groundnuts, watermelon and sorghum. The clay soils are part of the central plains of the Sudan. These are vertisols with high clay content. Other than these two soils the *pediplain* soils known locally as gardud prevail in many parts particularly in Southern Darfur and the Naga'a soils which mainly exist in Southern Darfur.

3-5 Vegetation:

Southern Darfur comprised of the low rainfall woodland savannah and the associated areas such as the Hill catena and *Baggra* repeating pattern (Harrison and Jacksons, 1958). This categorizing is closely associated with plant species which favor specific climate zones and soils. Previously Darfur region was classified as the wealthiest in forest resources among other region in Sudan with exception of the south. Land cover in South Darfur estimated by 3,157,458 ha equivalent to 22.3% as trees with shrubs (Sudan Land Cover Atlas, 2011).

The overuse and misuse activities such as heavy grazing and over cutting of tree in addition to drought and over population of both human and animals have reduced the densities of plant species.

CHAPTER IV

RESEARCH METHODOLOGY

4.1 General

The study was conducted in the Al-Salam locality in South Darfur State, where impact of range resources degradation and patterns of users on livelihoods of pastoralist communities were assessed in the study area.

4.2 Primary data:

The primary data were including the following:

4.2.1. Personal field observations:

General survey and visits to the study area were adopted to assess the visual indicators or aspects such as rangeland resources, vegetation cover, pattern of range uses, types of livestock owned by pastoralist, besides the general characteristics of pastoral communities in the study area.

4.2.2. Households Interviews:

This is were based on structured questionnaires covering different parameters

I: Sample Selection:

Four villages namely (Abu agora, Safia,Domyia , and Towga) were randomly selected from the total number of villages which are about (20) villages, representing a locality on the basis of similarities in socio-economic activities and livelihoods levels(Herding animal, Practice of agriculture ,charcoal production, and collection of forest products).

II: Sample Size:

Random Sample was applied as a sample technique to determine a sample size. The sample size was selected according to the total number of all households in these villages. The sampling unit in the household survey was

the household head. 5% was taken from the total numbers of households in these villages for interviews.

4.2.3. Key informants:

Direct interviews were carried out with key informants to provide ingoing or past information obtained from range or pasture administration office on impact of rangeland degradation on pastoral style life, changes in pattern of uses and rangeland utilization links with sustain livelihoods and increase the income generation of pastoralist communities using pre- prepared checklist.

4.3 Secondary data:

The information's about the pattern of rangeland users, herding, types of structure, factors caused rangelands degradation and changes in livelihoods of pastoralist communities were collected from different documents which were included the scientific papers, researches, reports, text books….. etc.

4.4. Data analysis:

Quantitative data was analyzed using statistical Package for Social Sciences (SPSS). The main statistical analyses applied were frequency and descriptive statistics. Chi- square test for independence would use to determine associations between categorical variable.

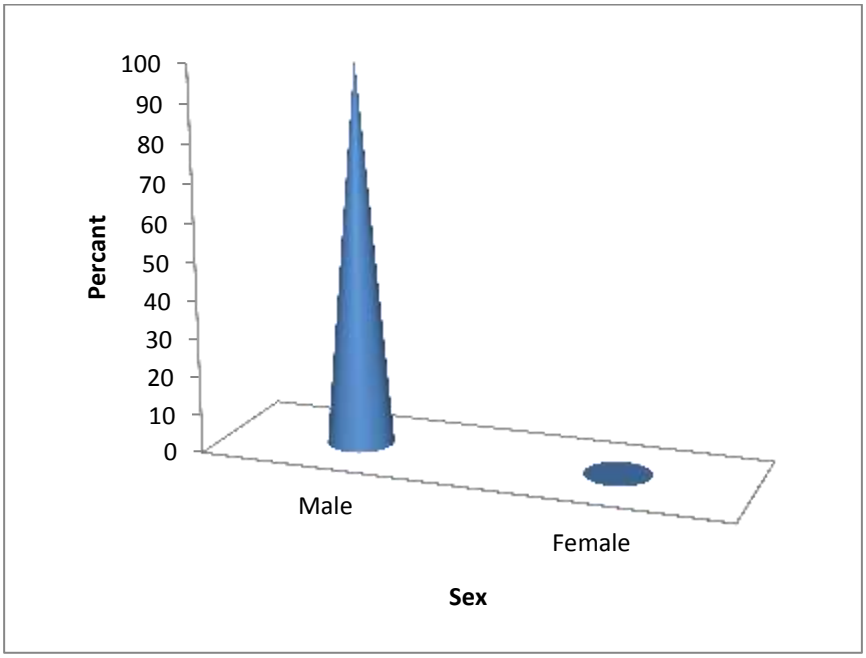
CHAPTERV

RESULT AND DISCUSSION

5-1 Social economic characteristic of pastoralists in study area:

The result in the figure (1) shows that all the three were very high significant differences at (p<.000), among the respondent. About 100% of the respondents were men in the study area, this refers to the practice of the natural of grazing that depends mainly on men through mobile with their animal for long distances, besides the presences that most of the rangeland owner were found in difficult areas that have been affected by civil war and conflicts in the study area, while we that found women have different roles through practice of agricultural activities and animal care beside locking for their children.

Figure(1)Sex composition of respondent



Df = 1, sig = ***, chi- square

*= significant **= high significant ***= very high significant

According to the result in above table (1) shows that there were very high significant differences at p<.000, among the pastoralist ages groups. About more than 50% of the pastoralist their ages range between 30-40year old, while about 25% of them their ages over 51 year and about 21.7% of the respondents their ages range between 41-50year, the presents of large categories of the respondent that their ages range between 30-40years these indicates that pastoralist community structure depend, on youth group for look after grazing with animal in difficult and remote area.

The elderly categories among pastoral community play after role in solving the problems and conflict that occurs between the pastoral community and other users in water points and animals' routes.

Table (1) Distribution of age groups of Respondents:

Age groups	Frequency	Percent
30-40 years	32	53.3
41-50 years	13	21.7
More than the 50 years	15	25
Total	60	100

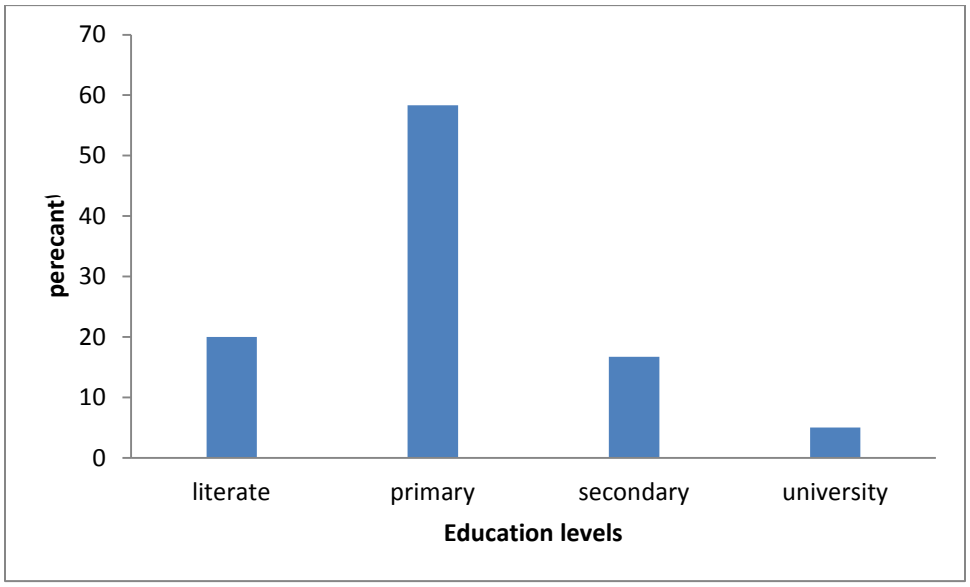
Df =2, sig= **, chi-square = 6.565

*= significant **= high significant ***= very high significant

The result in figure (2) Shows that there was significant difference at ($p<0.00$) between respondent's education level. About 58.3% while 16.7% of them educated at the secondary level only about 5% of them war from graduated university and about 20% of pastoralist were illiterate.

Community area attention for education among pastoralist different levels (primary and secondary school) and with a few graduates university, these indicate the stability of the pastoral in the study area and increase their awareness about the importance of education in improving their life as well as the desire of pastoralist to education their children , in spite of that we found the illiteracy rate was highly especially in the neighboring villages of the study area due to the lock of interest among most of them, in addition to that after number of schools especially in remote area.

Figure(2)Education level



Df = 3, sig = *, chi-square = 10.927

Ns = not significant ($p<0.00$), *= significant, **= high significant,**= very high significant.

The table (2) shows that there was high significant difference at ($p<0.045$) among the respondent marital status. highly percentage more 93.3% among the pastoralist married, while a few of them about 6.7% were single.

The highly percentage of married among pastoralist these reflects the influence of customs and tradition in rural communities that prefer marriage at early ages, it also mean that stability of respondent, Which association with the practice of grazing animals.

As a way of life in addition to that depend on their children in managing the grazing process and taking care of animal.

Table (2) marital status of pastoralists in study area:

Martial states	Frequency	percent
Married	56	93.3
Single	4	6.7
Divorced	0	0
Widower	0	0
Total	60	100

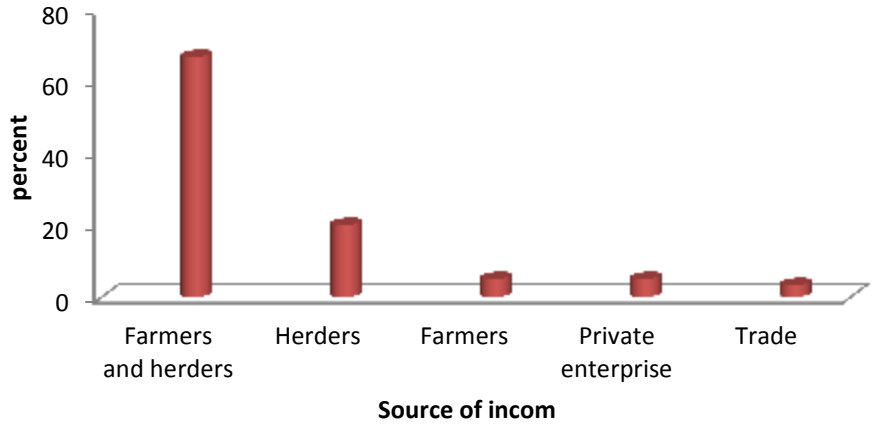
Df = 3, sig = *** chi-square = 2.053

Ns = not significant (0.05), *= significant, **= high significant, ***=very high significant.

According to the results in figure (3) describes the occupation of the respondent in the study area showed that there were very high significant differences at p<.000, between pastoralist resources income. about 66.7% of the respondents depend mainly on the practice of agricultural and herding animals' income, while 20% of them depend on grazing animals, a few about 5% depend on agricultural and private work.

The highly percentage of the respondents depend on grazing and agriculture as sources of income with some time these indicates that pastoral community area, Ware settler and herding animals in addition to agriculture in order provide fodder during the summer season. It also reflects their stability due to the high percentage prefer to send their children to schools

Figure(3) sources of income for respondents in the study area



Df = 4, sig = ***, chi-square = 21.197

*= significant **=high significant ***= very high significant

5-2 Main activities practiced by pastoral associated with land use:

As the result in table (3) which shows that there were high significant differences at (p<.0045) among respondent. The majority of the respondent agreed that the main reasons for the decrease area of rangeland, these due to increase agricultural expansion by 66.6% of the herders mentioned that settlement of nomads affected the area of the rangeland resource, while only about 10% of them confirmed that insecurity situation in study area, have agreed major import on the pastoralist system in addition to some other reasons such as land ownership, fluctuation of rainfall and population expansion the majorities of the respondent expansion of agricultural practice resulted in decrease the area of rangeland due to the change in the lifestyle of most other pastoralist through practice of agricultural activities for crops sorghum, millet, wheat at used for feeding animals during summer season and to increase their income.

Table (3) Main Reasons of decreased area of the Rangeland:

Reasons	Frequency	percent
Agricultural expiation	40	66.7
stability pastoral	10	16.6
Insecurity	6	10
Land owner	4	6.6
Total	60	100

Df =3, sig= **, chi-square = 2.053

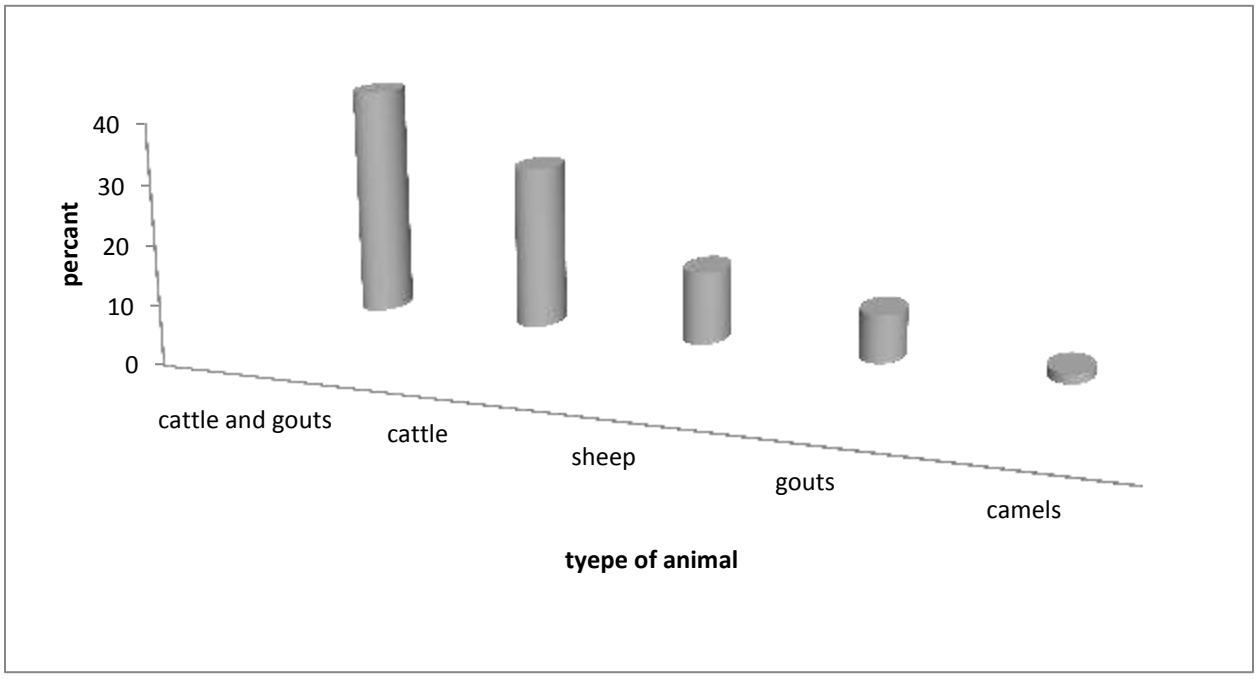
Ns= not significant (p<0.05), *= significant, **= high significant, ***= very high significant

According to the result figure (4) there were very high significant differences at (p<.000) about 40% of the pastoralist herd mixed types of animal surceases goats and cattle, while 22.3%, of them owned cattle only about 21.7% of the pastoralist owned, sheep and few of them owned camels, while only 8.3% of them raise goats.

The majorities of pastoralist owned mixed types of animal and goats mainly related to the (Baggara system) that cattle owned and breeding beside these the natural and geographical characteristics in state suitable for growth of different varieties of grazing plant and trees.

In addition to fact these types of animals have economical return, which contributes to meet the basic and essential needs of pastoralist community.

Figure(4)Types of animals owned by Respondents



Df = 4 sig = ***, chi- square = 11.226

Ns = not significant (p<0.05), *= significant, **= high significant, *** very high significant

The result table(4) shows that there were very high significant differences at (p<.000), among the pastoralist. About 66.7% of the pastoralist were practice grazing through sedentary pattern about 18.3% of them were practice as semi sedentary grazing system, while those who dependent nomadic system constituted about 15%.

This result owned that were great change in pastoral livelihoods system, which made pastoral community more stable and depend on other activities such as agriculture and trade, in the nomadic and mobile grazing system, as well as the increase of conflicts, and insecurity in the study area led to lots of great number of livestock.

Table (4) Grazing pattern that practices by pastoralist in the study area

Grazing patterns	Frequency	percent
Sedentary	40	66.7
Semi sedentary	11	18.3
Nomads	9	15
Total	60	100

Df = 2 sig = ***, chi- square = 13.771

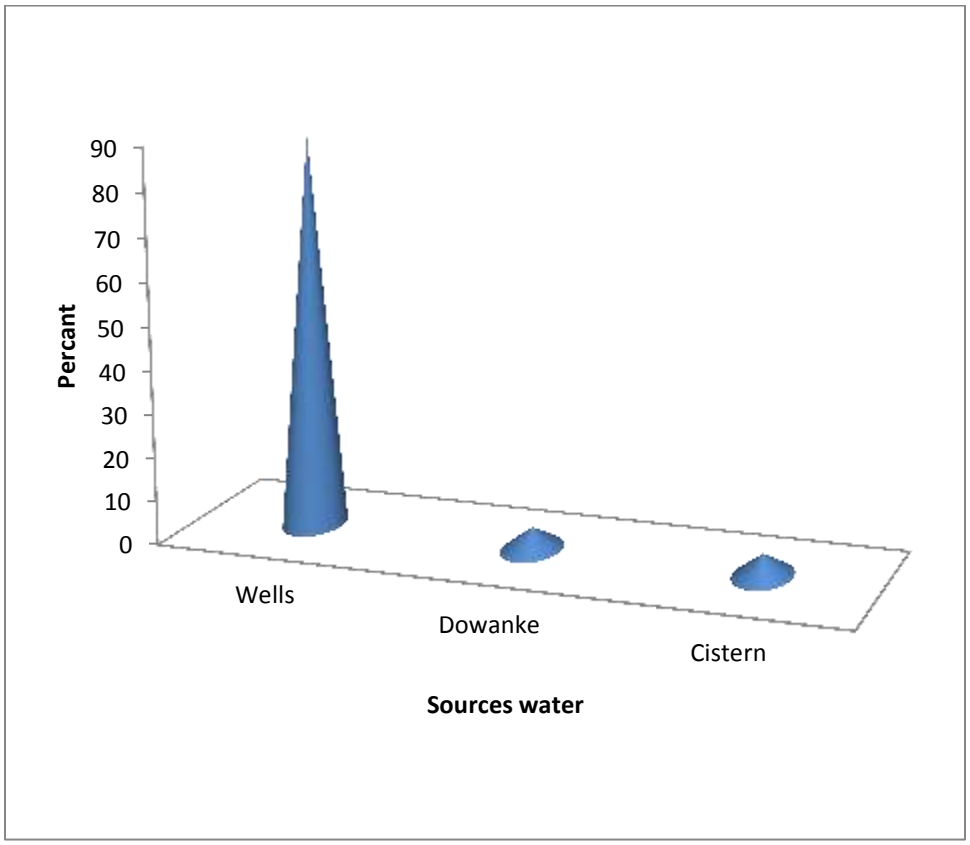
Ns = not significant (p<0.05), *= significant, **= high significant, *** very high significant

The result in figure (5) shows that there was high significant difference among the respondents at (p<.0015). About 90% depend mainly on wells as sources of water for human and animal in the study area.

While few of them have depend on other sources such as donkey and trunks with 5% for each one.

The majority of the pastoralist depend mainly on wells save water these due to the characterizes geographical study area, in addition to that the rainfall season contribute these wells during these points.

Figure(5)Sources of water in the study area



Df = 2 sig = ***, chi- square = 2.505

Ns = not significant (p<0.05), *= significant, **= high significant, *** very high significant

Result in table (5) shows that there was very high significant difference at (p<.000), among the respondent. The found that about 50% of the pastoralist said, that the agricultural expansion was main reasons for blocked the animals' route in the study area, while about 25% of them agreed that the land ownership and the homes of the are routs, and only about 66.7% of them attributed that to insecurity situation which directly affected in blocking and the reduction the area of animal rout, which cosset overgrazing in the study area.

Table (5) Main reasons for blocking of animal routs in the study area:

Reasons	Frequency	Percent
Expansion Agricultural	30	50
Land Towner	15	25
Insecurity	15	25
Total	60	100

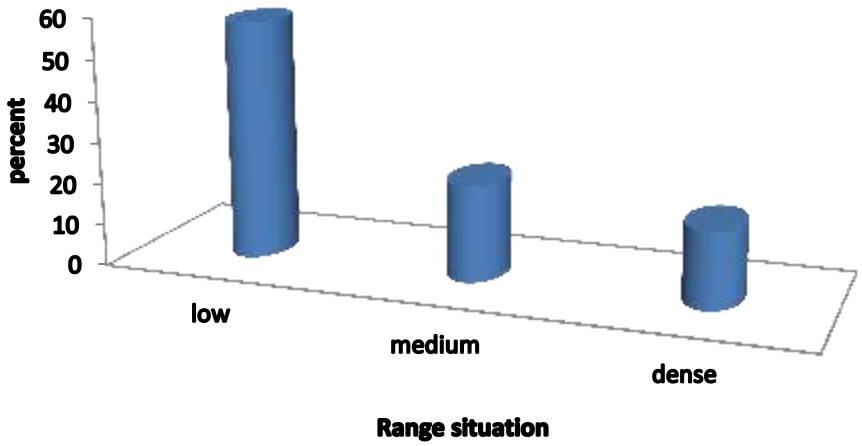
Df =2, sig= **, chi-square = 8.784

*= significant **= high significant ***= very high significant

5-3 The current situation of rangeland in the study area:

According to the result in figure (6) shows that there were very high significant differences at (p<.000), among the pastoral. About 58.3% of the pastoralist confirmed that the current condition of the rangeland was low there about 23.3% of the pastoralist said that current status of the rangeland was medium and only 18.3% agreed that the owned condition of rangeland was douse climatic condition that led to change in the composition an types of range plants and the increase in the number of livestock which led to deterioration of rangeland resources through overgrazing the density of rangeland conditions these due to the availability of water during the range season, which assist there plant in the study area.

Figure(6) Rangeland situation in the area



Df =2, sig= **, chi-square = 12.826

*= significant **= high significant ***= very high significant

The result in table (6) shows that there were very high significant differences at (p<.000), among the respondent. That there were many reasons that led to the deterioration of the rangeland in the sundering, where 65% of the herders

confirmed that agricultural expansion was one of the main reasons for the deterioration of rangeland fueled 13.3% of the respondents believed that climate change, led to the change in composition and quality of range plants through the appearance of unpalatable plants such as: *senna tora* (kooale) and: *Calotropis Procera* (oshaer), and the disappearance of some palatable plants such as *Blepharis Cilaris* (bgiiell) and *Echinoochloa Colonum* (al deefraa), while 11.7% of them explained that wars and the death of animals as result of the spread of diseases in the rain season such as Hyalomma (goraad) cusses the diseases B.Cuballi and Theileria Anulata.

While 10% of them agreed that overgrazing contributed to the deterioration of Rangeland and increase in the number of animals led to com best on rangeland and compete over sources.

The presence majorities of pastoralists believed that agricultural expansion was main threats that led to the deterioration of range as result of the increased demand for lands and meeting needs of rural communities from agricultural crops, in addition to the sedentary of many pastoral community study areas in the indicator of this that led to the exploitation of rangelands.

Table (6) Reasons of Rangeland degradation in the study area:

Reasons	Frequency	Percent
Expansion of agricultural	39	65
Climate change	8	13.3
Deices	7	11.7
Overgrazing	6	10
Expansion of industrial	0	0
Total	60	100

Df = 4 sig = ***, chi- square = 16.212

Ns = not significant ($p<0.05$), *= significant, **= high significant, *** very high significant.

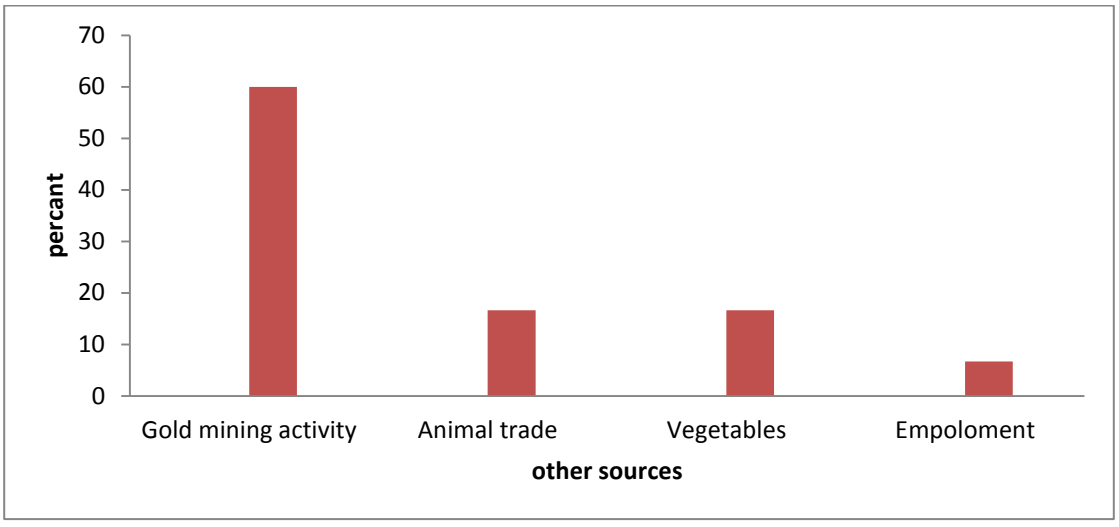
5-4The Effects of rangeland degradation on pastoralist life and animal husbandry:

According to in figure (7) shows that there were very high significant differences at (p<.000) among the respondent. It is clear that the deterioration of the range has been health change in livelihoods system and the practice of grazing by pastoralists about 60% of them were depending on sources of livelihood and increased income through working gold mining activities, while some of them work in trade of livestock and vegetable cultivation similar percent for each one 16.6%.

The study also found that 6.7% of the pastoralist in the study area have been work, as governmental employment, especially those graduate university from the other rat heading Sudanese certificates.

The high percentage of the respondent said that working gold mining activities one of the alternatives there to sources that have practice recently by pastoralist lead that many of leave the practice of grazing animals to the working mining areas, while the others depend one trade of livestock in local markets and some of them grow vegetable in summer season.

Figure(7)Alternative sources of income and livelihoods of pastoralist community study area



Df =3, sig= **, chi-square = 6.066

*= significant **= high significant ***= very high significant

The result in table (7) shows that there were very high significant differences at (p<.000) among the respondent. That their different sources and types of fodder that use by pastoralist to feed the animal, in the study area, where the study found that 50% of the herders depend mainly on the agricultural residues after the end of the harvest period, and the scarcity of fodder, while about 38.3% of theme confirmed that they depend on forests to feed animals. About 6.7% of pastoralist feeding their animals from concentrated fodder which they get from market, while only 5% of them depend on green fodder irrigated and these were as small group who breeding animals for marketing and dairy production.

Table (7) Type of Fodder used by pastoralist for feeding livestock:

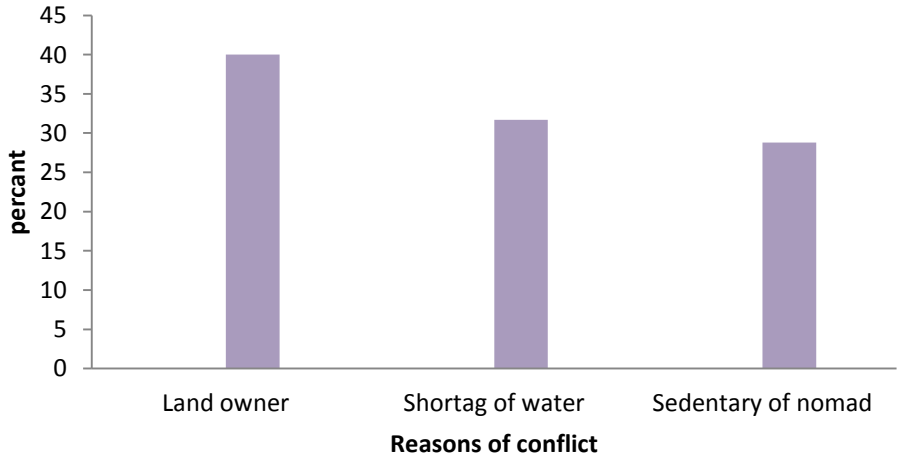
Types	**Frequency**	**Percent**
Crops Residues	30	50
Natural forest	23	38.3
Constraint forage	4	6.7
Green forage	3	5
Total	60	100

Df =3, sig= **, chi-square = 7.182

*= significant **= high significant ***= very high significant

The result in figure (8) shows that there were very high significant differences at (p<.000) among the respondent. About the utilization of range resources in recent yare, where the study found that 40% of the pastoralists indicated that the direct and main causes of conflict were the land ownership and the un registration of rangeland, beside these the absence of demarcation and mopping of the animals routs these due to the of coordination between the institutional related to land use, while 31.7% affirmed that the scarcity and shortages water use drinking humans of animals specially in the summer season that lead to the conflict especially the water point that exploited used by different users, pastoralist Also the study found that 28.8% of the pastoralists explained that the sedentary of the Nomadic pastoralists in explanation of range resources water and fodder indention of the expansion agricultural in area of range lands.

Figure(8)The main reasons of conflicts among pastoralist community in the study area



Df = 2 sig = ***, chi- square = 9.595

Ns = not significant (p<0.05), *= significant, **= high significant, *** very high significant

The result in table (8) shows that there were very high significant differences at (p<.000), among the pastoralist. About 40% of the respondents agreed that the tolls of conflict that occurs between the pastoralist hem selves and farmers these during the practice of grazing process while about 38.3% of the pastoralist reported that animals' routes were one of the majority areas where conflicts were broking.

These due to expansion of agricultural and block rout by farmers during the range season, also study found about 21.7% of the respondents confirmed that the areas of water point led to the conflict because of large numbers of animals, lead to the frequency of conflicts between different pastoral groups in addition to the lock of appropriate distribution of water points.

Table (8) the most conflict areas:

Area of conflict	Frequency	Percent
Grazing area	24	40
Animal routs	23	38.3
Water point	13	21.7
Total	60	100

Df = 2 sig = ***, chi- square = 11.847

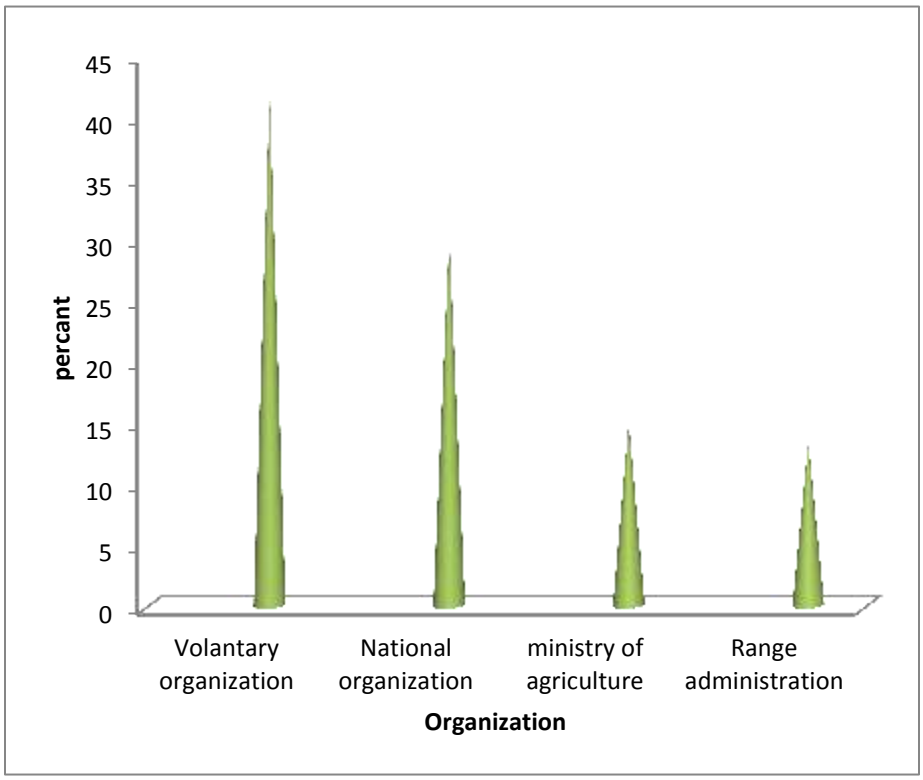
Ns = not significant (p<0.05), *= significant, **= high significant, *** very high significant

5-5The role of organization and government in providing the services to pastoralists:

The result in figure (9) shows that there were very high significant differences at (p<.000), among the respondent. The many bodies such as governmental institution and organizations that provided different services to pastoralist which including health services, education and extension program in addition of financing of small projects.

About 41.7% of the pastoralist mentioned that the voluntary organization have major role conducing and providing humanitarian services such as the World food program (WFP) and international food Agricultural develop (IFAD), Through providing social services such as establishing health care and support of awareness and building capacity of pastoralist Risk management and disaster, while we then showed 30% of the respondents confirmed the existence of nation organization such as the Sudanese Red Crescent society which works in community development on first aid, while about 14% of them mentioned the presence of government institutions such as Ministries of Agriculture and Livestock that distribution of improved seeds of financing farmer and legalization lands, in addition to the role of mobile veterinary unit that provides extension services to the pastoralist in the markets and training them on how to deal with broken of deices.

Figure(9) Types of organization and institutions that providing in the study area



Df =3, sig= **, chi-square = 7.960

*= significant **= high significant ***= very high significant

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

6-1Conclusions:

The study concluded that majorities the respondents the ware settlement and practice grazing inform of sedentary in addition to cultivating of some agricultural crops such as millet, beans, maize, to meet their basic need and provide animals with fodder in the summer season, these diversification in sources income to adaption with variable the conditions in study area.

The main source of water that used for human and animal in addition to other sources such as AL- Dwanki and water trunk.

The study showed that there was sever decrease in rangeland in the study area as result of the agricultural expansion associated with used of modern agricultural machines which was reflected in the occurrence of conflict over the use of grazing resources by the pastoral communities in the study area.

The study revealed that the increase of conflict and competition between sedentary pastoral communities and other land users due to the lack of clarity of land ownership and non-registration of rangeland in addition to the absence of clear mopping and demarcating of nomadic routes.

The study proved the international and voluntary organizations have a vital role provides services to pastoral communities, such as establishment of health and support for education process in addition to raising awareness and center capacities of pastoralist in the field of risk management and disaster.

Weakness of the role rangeland and pastoral administration at stat level in implementing of range implement activities these due to shortage in budgets for implementation of these activities.

6-2 Recommendation:

From the conclusions reached we recommend the following:

Greet attention should be adopted by government and non- governmental organizations for providing necessary needs service to pastoralist in their areas by supporting livelihoods, diversifying sources of income beside establishment of health center and schools.

Distribution of water point in suitable place in grazing in order to prevent conflicts, in addition the number of other water sources such as AL-Dwanki to provide drinking water for humans and livestock.

Activating the policies and Law to assess in organize of land utilization between different parties related to natural resources, especially the legislation and Lows on the protection of rangeland area through demarcating and mopping of routes and the registration of rangeland to reduce the occurrence of conflict between nomadic pastoralist and sedentary.

Community supports the local administration to play a great role in managing the process of grazing, as well as contributing to resolving conflicts between pastoralists and other users through traditional.

Involving of pastoralist in implementation the development project and improvement of rangeland by broadcast seeds, opening fire lines, as well as adoption of programs that lead to raise their awareness through conducting workshops.

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Appendices

Appendix (1)

Sudan University of Science and Technology

College of Graduate Studies

Questionnaire to collect information interview form pastoral communities in AL- Salam locality- South Darfur- state

Research for M.sc Degree in Range science

Under the Title: **Assessing Impact of Rangeland Degradation on Pastoral Communities Livelihood Systems in Al-Salam Locality-South Darfur State – Sudan**

(A) Social economic characteristic of pastoralists in the study area:

1\ Village…….

2\ Name……

3\ Sex:

Male ☐ Female ☐

4\ Age:

30-40 ears ☐ 41-50 years ☐ More than 50 years ☐

5\ Education level:

Literate ☐ Primary ☐ Secondary ☐ University ☐

6\ Marital status:

Married ☐ Single ☐ Divorced ☐ Widower ☐

7\ Occupation:

Harder ☐ Farmer ☐ Private Enterprise ☐

Trade ☐ Farmer and harder ☐

(B) Main activities practiced by pastoral associated with land use:

1\ What is it main Reasons of decreased area of Rangeland?

Agricultural expiation ☐ Stability pastor ☐

Insecurity Land owner ☐ ☐

2\ What is the type of animals owned by Respondents?

Cattle ☐ Sheep ☐ Gouts ☐ Camels ☐ Cattle and gouts ☐

3\ Grazing area pattern that practices by pastoralist in the study area:

Sedentary ☐ Semi sedentary ☐ Nomads ☐

4\ Sources of water in the study area?

Wells ☐ Cistern ☐ Dowanke ☐

5\ Main reasons for blocking of animal routs in the study area

Expansion ☐ Land Towner ☐ Insecurity ☐

(C) The current condition of rangeland in the study area:

1\ Rangeland condition in the area?

Low ☐ Medium ☐ Dense ☐

2\ Reasons of Rangeland degradation in the study area?

Expansion of agricultural ☐ Climate change ☐

Overgrazing ☐ Expansion of industrial ☐

(D) The Effects of rangeland degradation on pastoralist life and animal husbandry:

1\ Alternative sources of income and livelihoods of pastoralist community study area?

Gold mining ☐ Animal trade ☐

Vegetables ☐ Employment ☐

2\ Types of fodder used by pastoralist for feeding livestock?

Crops Residues ☐ Natural forest ☐

Constrain forage ☐ Green forage ☐

3\ The main reasons of conflicts among pastoralist community in the area?

Land owner ☐ Shortage of water ☐ Sedentary of nomad ☐

4\ The most conflict area?

Grazing area ☐ Animal routs ☐ Water point ☐

(E)The role of Organization and government in providing the service of pastoralists:

1\ Types of Organization and institutions that providing in the study area?

Range administration ☐ Ministry of Organization ☐

Voluntary Organization ☐ National Organization ☐

One-Sample Test

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Ge	6.565	59	.000	.717	.50	.94
Education Level	10.927	59	.000	1.067	.87	1.26
Marrtial Status	2.053	59	.045	.067	.00	.13
Accupation	21.197	59	.000	3.383	3.06	3.70
reason of rangeland decreased	2.053	59	.045	.067	.00	.13
type of croups	3.403	59	.001	.267	.11	.42
type of animals	11.226	59	.000	2.300	1.89	2.71
grazing systems	13.771	59	.000	1.033	.88	1.18
sources of water	2.505	59	.015	.250	.05	.45
rangeland condition	5.917	59	.000	.600	.40	.80

the crrunts rangeland sitouation	12.826	59	.000	1.233	1.04	1.43
the reason of rangeland degradation	16.212	59	.000	1.750	1.53	1.97
the impacts of rangeland degradation	9.127	59	.000	1.050	.82	1.28
the vegetation cover in the area	12.361	59	.000	1.883	1.58	2.19
challages in grazing practis	8.784	59	.000	.567	.44	.70
the new resources of levelholds	6.066	59	.000	.733	.49	.98
the animals descease	2.791	59	.007	.117	.03	.20
type or sources of forage	7.182	59	.000	1.317	.95	1.68
the confilcts in the area	1.000	59	.321	.033	-.03	.10
the reason of conflicts on rangeland resources	9.595	59	.000	.967	.77	1.17
the most confilcts areas	11.847	59	.000	1.167	.97	1.36

are there was organzation servecs	4.867	59	.000	.317	.19	.45
the names of organzation in yes	7.960	59	.000	1.333	1.00	1.67
the activities of rangeland administration	10.256	59	.000	1.550	1.25	1.85

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Sex	60	.00	.000[a]	.000
age	60	.72	.846	.109
Education Level	60	1.07	.756	.098
Marital Status	60	.07	.252	.032
Occupation	60	3.38	1.236	.160

reason of rangeland decreased	60	.07	.252	.032
type of croups	60	.27	.607	.078
type of animals	60	2.30	1.587	.205
grazing systems	60	1.03	.581	.075
sources of water	60	.25	.773	.100
reason of decline of animal’s roots	60	.00	.000[a]	.000
rangeland condition	60	.60	.785	.101
the currents rangeland sitouation	60	1.23	.745	.096
the reason of rangeland degradation	60	1.75	.836	.108
the impacts of rangeland degradation	60	1.05	.891	.115

the vegetation cover in the area	60	1.88	1.180	.152
challages in grazing practis	60	.57	.500	.065
the impacts of degradation on lvelihold	60	.00	.000[a]	.000
the new resources of levelholds	60	.73	.936	.121
the animals descease	60	.12	.324	.042
type or sources of forage	60	1.32	1.420	.183
the confilcts in the area	60	.03	.258	.033

the reason of conflicts on rangeland resources	60	.97	.780	.101
the most confilcts areas	60	1.17	.763	.098
are there was organzation servecs	60	.32	.504	.065
the names of organzation in yes	60	1.33	1.298	.168
the activities of rangeland administration	60	1.55	1.171	.151
conflicts management tools	60	.00	.000[a]	.000

a. t cannot be computed because the standard deviation is 0.