

Dedication

Peace and Prayers to Great Grophet

Mohammed

I dedicate this research

To my mother

To spirit of my father

To all my family and friends

ACKNOWLEDGEMENT

I am deeply indebted to my supervisor professor Babo Fadlalla Mohamed for his invaluable help and guidance throughout this work and for the useful discussions concerned with the interpretation of the results. I also wish to extend my gratitude to Sudan University of Science and Technology represented by the College of Forestry and Range Sciences which has given me the opportunity to study for the degree of Master of Science. Thanks are also due Dr. Maarouf Ibrahim, the forage breeder at Shambat Agricultural Research Station for assistance with the statistical analysis and to El Obied Research Station represented in Mr. Abdelrahman Khatir and other supporting personnel. Appreciation also goes to Mr. Abd Elraheem Ali at Eyal Ali village, to Omda of Gireigikh Council Mr. Salih Hakim and to IFAD represented by Mr. Ahmed Hanafi. Lastly thanks to my brother Mr. Mohamed Ezzat and Mr. Nader Saad for their help during data collection and to all of my colleagues.

CONTENTS

Dedication	I
ACKNOWLEDGEMENT.....	II
List of contents	III
List of tables	VII
List of Fig	VIII
List Abbreviations and Acronyms	IX
ABSTRACT (ENGLISH).....	X
ABSTRACT (ARABIC).....	XII

CHAPTER ONE

INTRODUCTION

1.1 General.....	1
1.2 Study area.....	2
1.2.1 Location	2
1.2.2 Topography and drainage.....	2
1.2.3 Water Resources.....	3
1.2.3.1 Rainfall.....	3
1.2.3.2 Surface Water.....	3
1.2.3.3 Ground Water.....	3
1.2.4 Climate.....	4
1.2.5 Soil	4

1.2.6	Vegetation	5
1.2.7	Population and Economic activities.....	6
1.2.8	Land Use.....	7
1.3	Problem statement.....	9
1.4	Objective.....	9
1.5	Hypothesis.....	10

CHAPTER TWO

LITERATURE REVIEW

2.1	Traditional Range Management.....	12
2.1.1	Government intervention.....	13
2. 1. 2	Drought and migration.....	14
2.1.3.	Conflicts.....	14
2.2	Mobility vs. Sedentarization.....	15
2.3	Ranching systems	15
2.4	History of ranching.....	16
2.4.1	Ranching in North America.....	16
2.4.2	Ranching in South America.....	18
2.4.3	Ranching in Sudan.....	18
2.5	Types of ranching in Africa.....	20
2.5.1	Moving the larger stock owners to commercial farms.....	20
2.5.2	Sub-division of purchased farms into family unit.....	20
2.5.3	Group ranching.....	21
2.5.4	Cooperative ranching.....	21
2.5.5	Commercial ranching	22
2.5.6	Government ranching	22
2.6	Ranch design.....	23
2.6.1	Area survey.....	23

2.6.2	Water and paddocking	24
2.6.3	Housing, yards and dipping facilities.....	24
2.6.4	Mineral licks.....	24
2.6.5	Fire-breaks and roads.....	25
2.6.6	Shelter-belts.....	25
2.6.7	Labour requirements.....	25
2.7	Basic requirements and considerations.....	26
2.7.1	Land tenure.....	26
2.7.2	Management.....	27
2.7.3	Ranch Operations.....	28

CHAPTER THREE

MATERIALS AND METHODS

3.1	Vegetation Measurements.....	29
3.1.1	Sampling design.....	29
3.1.2	Vegetation attributes measurements.....	30
3.1.2.1	Botanical composition of grassland.....	30
3.1.2.2	Biomass estimate.....	30
3.1.2.3	Density and frequency of range plants.....	31
3.1.2.4	Vegetation cover.....	31
3.1.2.5	Trees density.....	31
3.1.2.6	Available Browse of trees and shrubs.....	32
3.1.3	GIS/Remote sensing	32
3.1.3.1	GIS-software and GPS devices.....	32
3.1.3.2	Remote sensing data.....	32
3.1.3.3	Image geo-referencing, processing and interpretation.....	33
3.1.3.4	Final map.....	33
3.2	The socio-economic aspect.....	34

CHAPTER FOUR
RESULTS AND DISSUCSION

4.1	Vegetation measurements.....	36
4.2	Socioeconomic study.....	45
	CONCULSIONS AND RECOMMENDATIONS.....	59
	References.....	60
	Appendices.....	65
	Appendix1. Questionnaire	65
	Appendix2. Dry matter DM (g/m ²) production in protected and unprotected sites, October 2007	70
	Appendix3. Percent vegetation cover in protected and unprotected sites, October 2007	71
	Appendix4. Density of herbaceous species (plant/m ²) in protected and unprotected sites, October 2007	72
	Appendix5. Ranching projects of implemented by Range and Pasture Administration	73

List of tables

Table 1: Estimate of livestock population in North Kordofan State	6
Table 2. Dry matter (kg /ha), cover (%) and density (plant/m ²) in protected and unprotected sites, October, 2007.....	36
Table 3. Species composition in protected and unprotected sites, October, 2007.....	38
Table 4. Relative Frequency (RF %) of herbaceous plant species in protected and unprotected sites, October, 2007.....	40
Table 5. Density (Tree/ha) in protected and unprotected sites, October, 2007.....	42
Table 6. The main source of income in the communities.....	46
Table 7. Water sources.....	47
Table 8. Main problems with the potable water service.....	47
Table 9. Education level.....	48
Table 10. Destination of migrants.....	48
Table 11. The main crops.....	49
Table 12. Community access to market.....	50
Table 13. Markets for sale of livestock and other products.....	51
Table 14. Ownership of natural resources.....	52
Table 15. Demarcation of communal land.....	52
Table 16. Incidence of conflicts.....	53

Table 17. Current environmental condition of the communities.....	53
Table 18. Incidence of environmental problems.....	54
Table 19. Problems faced by communities during grazing.....	55
Table 20. Causes of project failure in protected communities.....	56
Table 21. Services provided and lessons learned from the project.....	57
Table 22. Time of opening the enclosure for grazing.....	58

List of Fig

Fig. 1: Sampling design	29
Fig. 2: Ground cover (%) in protected and unprotected sites, October 2007.....	41
Fig. 3: Density by species (tree/ha) in protected and unprotected sites, October, 2007	43
Fig 4: Available browse production (kg/ha) in protected and unprotected sites, October 2007	44

Abbreviations and Acronyms

Masl	Meter above Sea level.
DM	Dry Matter.
UNDP	United Nation of Development Program.
IIED	International Institute for Environment and Development.
IES	Institute of Environmental Studies.
CAPRI	Collective Action and Property Rights.
FAO	Food and Agriculture Program.
HCENR	Higher Council for Environment and Natural Resources.
CBRRP	Community Based Rangeland Rehabilitation Project for Carbon Sequestration and Biodiversity.
GEF	Global Environment Fund.
PCQ	Point-Centered Quarter.
GPS	Global Positional System.
GIS	Geographical Information System.
Ha	Hectare.
Kg	Kilo gram.

ABSTRACT

This work was conducted at Gireigikh Rural Council, Bara Province in North Kordofan State. The objectives of the study were to investigate the effect of protection, through enclosure, on productivity and quality of range. The parameters measured and used as indicators in the evaluation of range were biomass production, botanical composition, density of herbaceous and browse plants, cover, frequency and available browse production. The measurements were done at two sites Eyal Ali which has an enclosure and Mereikha which has no protected site and was open to grazing and other human activities.

A socioeconomic survey was also conducted with the objective to shed light on the prevailing production systems and ways of living which hopefully will provide an explanation for some of differences in the results that may be found between communities that had access to the project and thereby have enclosures and those that were not part of the project and have only open access land.. A questionnaire was developed and was implemented through group discussions with ten selected communities five with an enclosure and five without.

The results obtained from this study showed that biomass production of rangeland from the herbaceous layer in the enclosure was 635 kg DM /ha compared with 439kg DM /ha for the open access site. Plant cover was 75.6 and 29.4% in the protected and open access sites respectively. The available browse production was 1,538 and 209 kg/ha in each of the sites respectively. The density of herbaceous plants was 642 plant/ in the protected site and 216 plant / m² in the unprotected site. The densities of trees and shrubs in the two sites were in the range of 129 and 34 trees / ha respectively. The diversity of species composition was limited in the protected site compared with the unprotected site (Four vs. seven species respectively). This may be explained by the fact that while no reseeding was practiced in the enclosure, new seeds were always introduced in the open access area through animals and various human activities.

From the socioeconomic survey it was found that the project intervention was manifested mainly in the provision of services such as education, water, health and the enclosures that maintained their animals in dry season (summer). Lands of the communities under the common system (unprotected) were suffering from overgrazing, desertification, encroachment of sand dunes and shortage of forages and water during dry season.

The area of the enclosure of 18 ha was intended for piloting. It does not give a good demonstration for the communities as an alternative that provides sufficient feed for their livestock. Future attempts should consider areas large enough to provide feed that sustains a larger portion of the community's livestock.

It can be concluded that the enclosure system contributed positively to improving the rangeland resources while the open access resulted in severe deterioration of rangeland resources. Enclosures are a better tool for sustainable management of rangeland resources compared with open access systems.

ملخص الدراسة

اجريت هذه الدراسة بمنطقة جريخ - محلية بارا - ولاية شمال كردفان . هدفت الدراسة الي معرفة تأثير الحماية (المحميات) علي انتاجية وجودة المرعي. والابعاد التي تم قياسها (انتاجية المراعي من المادة الجافة، التركيب النوعي، كثافة الغطاء العشبي والشجري، نسبة التغطية النباتية، التردد والعلف الشجري المتاح) والتي استخدمت كمؤشرات لتقييم المرعي. هذه القياسات تم اجراءها بقرية عيال علي كمنطقة محمية و قرية مريخة كمنطقة رعي مفتوح.

المسح الاجتماعي الاقتصادي كان من ضمن اهداف الدراسة وذلك لتسليط الضوء علي نظام الانتاج المشاع ومستوي حياة هذه المجتمعات. وتم عمل استبيان عن طريق استخدام المناقشة الجماعية وتم اختيار عشر مجتمعات (خمس بها محميات وخمس ليست بها محميات). و قد رصدت اختلافات في النتائج بين المجتمعات تحت نظام المحميات والمجتمعات تحت نظام الرعي المفتوح.

خلصت الدراسة الي ان انتاجية المراعي من المادة الجافة بلغت 635 كجم/ هكتار داخل المحمية مقارنة بخارجها حيث بلغت 439 كجم/ هكتار. كما بلغت نسبة التغطية النباتية حوالي 75.6 و 29.4 % داخل وخارج المحمية علي التوالي. كذلك بلغت انتاجية العلف الشجري المتاح 1538 و 209 كجم/ هكتار على التوالي في كل منطقة. كما وجد ان كثافة الغطاء العشبي بلغت 642 نبات/ م² في المنطقة المحمية و 216 نبات/ م² في

المنطقة غير المحمية . وبلغت كثافة الاشجار والشجيرات في المنطقتين 129 و 34 شجرة/ هكتار علي التوالي. كما وجد ان التباين في التركيب النوعي للنباتات محدود في المنطقة المحمية مقارنة بغير المحمية, وربما يعزي ذلك لعدم وجود اي نشاط كثر البذور داخل المحمية بينما خارجها يعزي تنوع التركيبة النباتية الى ادخال بذور الى المنطقة عبر رعي الحيوانات المستمر ونشاطات الانسان.

من خلال المسح الاجتماعي وجد ان المحمية ادت الي تنمية تلك المجتمعات المحلية عن طريق تقديم الخدمات الاساسية (التعليم، المياه والصحة) كما وجد ان المحمية تعمل علي حفظ حيواناتهم اثناء الموسم الجاف (فترة الصيف) بينما نجد ان اراضي المجتمعات تحت نظام الرعي المفتوح تعاني من رعي جائر، تصحر، زحف كثبان رملية وذقص في الغذاء والماء اثناء الموسم الجاف.

وجد ان مساحة المحمية (18 هكتار) غير كافية لحفظ جميع حيوانات القرية لذلك عند الحاجة الي انشاء مزرعة رعيوية لابد من زيادة مساحة المحمية لكي تتناسب والحمولة الرعيوية للمرعي.

خلصت الدراسة الي ان نظام المحميات يساهم في تحسين موارد المراعي بينما نظام الرعي المفتوح يؤدي الي تدهور الموارد الرعيوية. ووجد ان نظام المحميات هو افضل اداة لاستدامة ادارته الموارد الرعيوية مقارنة بنظام الرعي المفتوح.

