

بسم الله الرحمن الرحيم
Sudan University of Science and Technology
College of Graduate Studies

**Assessment of Nilotic goat's Management System in Upper Nile
State: A case Study-Malakal Town**

تقويم نظم إدارة الماعز النيل في ولاية أعالي النيل
دراسة حالة- مدينة ملكال

By:

Samoul Hassan Mohammed Hassan

**A Thesis Submitted in Fulfillment of the Requirement for the
Degree of M. Sc. in Animal Production**

Supervisor: Dr. Muzzamil Atta Ali Abdalla

Co-supervisor: Prof. Mohamed Tageldin Ibrahim Omer

April 2011

بسم الله الرحمن الرحيم
Sudan University of Science and Technology
College of Graduate Studies

**Assessment of Nilotic goat's Management System in Upper Nile
State: A case Study-Malakal Town**

تقويم نظم إدارة الماعز النيلي في ولاية أعالي النيل
دراسة حالة- مدينة ملكال

By

Samoul Hassan Mohammed Hassan
B.Sc. (Animal production), College of Animal Production,
Upper Nile University, (2001)

**A Thesis Submitted in Fulfillment of the Requirement for the
Degree of M. Sc. in Animal Production**

Supervisor: Dr. Muzzamil Atta Ali Abdalla
**College of Natural Resource and Environmental
Studies, Department of animal production – Juba University**

Co-supervisor: Prof. Mohamed Tageldin Ibrahim Omer
College of Animal Production,
Sudan University of Science and Technology

April 2011

Dedication

My parents, to them I shall always be grateful.

To my family members

Acknowledgement

Firstly and lastly thanks to Allah who gave me persistence, support and patience to complete this work.

It is my proud privilege and immense pleasure to thank my supervisor Dr. Muzzamil Atta Ali Abdalla and Professor. Mohamed Tageldin Ibrahim Omer for their luminous guidance, inspiration, efforts in planning and execution of my theoretical and research work during the entire period of my study.

It is my honour to thank the former Director of Vet hospital Lieutenant-colonel Dr. Ajai Kumar valuable assistance and cooperation by all the staff India vet of UNMIS. My appreciation also goes to the Lieutenant-colonel Dr. Shucber Shighe for availing me all the necessary facilities for the successful completion of my studies.

Dr. Raja Mustapha Mohamed Ahmed providing me the necessary reference pertaining to my work is greatly acknowledged.

I express my profound gratitude to my advisory, Dr. Kamal El-Dein Abdel Wahab, Peter Ayul Othow, Wani Antiuo Sioso and El-Sadge Arbab Haggre for their valuable guidance and suggestion during my study.

This work would not have been completed without the help of my family members during the entire study period.

Samoul Hassan Mohammed Hassan

Acronyms

AOAD: Arab Organization for Agricultural Development.

ARP: Annual Reproductive Performance.

EDF: European Development Fund.

FAO: Food and Agricultural Organization.

ILAC: International Livestock Centre for Africa.

INDBATT: Indian Battalion.

MDM: Meteorological Department Malakal.

MARF: Ministry of Animal Resources and Fisheries.

MFEP: Ministry of Finance and Economic Planning.

NADC: National Animal Disease Center.

NGO_s: Non-Government Organizations.

NOPA: The project for Nomadic Pastoralists in Africa.

RMANR: Regional Ministry of Agriculture and Natural Resources, Southern Region Planning Department.

SDG: Sudanese pound.

UNMIS: United Nation Mission in Sudan.

WAD: West African Dwarf.

WSARP: Western Sudan Agric. Research Project Range / Livestock Research Activities.

List of contents

	Page
Dedication.....	iii
Acknowledgement.....	iv
Acronyms	v
List of contents.....	vi
List of tables.....	ix
List of figures.....	xi
List of charts.....	xii
List of annexes... ..	xiii
English abstract.....	xiv
Arabic abstract.....	xvi
1. Chapter One: Introduction.....	1
2. Chapter Two: Literature review.....	3
2.1. Geographical characteristics.....	3
2.2. Soil and topographical characteristics.....	3
2.3. Climate.....	3
2.4. Water sources.....	4
2.4.1. River and streams.....	4
2.4.2. Rainfall.....	4
2.5. Vegetation cover.....	4
2.6. Population in Malakal area.....	5
2.7. Resources use and rural economy.....	6
2.7.1. Crop production.....	6
2.7.2. Forest resources.....	7
2.7.3. Fisheries resources.....	7
2.7.4. Wildlife resources.....	7
2.7.5. Food collection.....	9
2.7.6. Livestock keeping.....	9
2.8. Livestock management system.....	10
2.8.1. Herd practices.....	10
2.8.2. Ownership pattern.....	12
2.8.3. Husbandry practices.....	13
2.8.4. Feeding management practices.....	30
2.8.5. Housing management practices.....	31
2.8.6. Animal health.....	32
2.8.7. Goat flock structure.....	32
2.9. Goat description.....	35
2.10. Productive performance.....	38
2.10.1. Flock growth rate.....	40
2.10.2. Mortality rate.....	42
2.11. Reproductive performance.....	42
2.11.1. Age at puberty.....	42
2.11.2. Age at first kidding.....	43
2.11.3. Kidding rate (Litter size).....	45
2.11.4. Gestation period.....	47

2.11.5.	Kidding interval.....	48
2.12.	Socio-economic of livestock.....	50
2.12.1.	Livestock as a source of food.....	50
2.12.2.	Livestock as a source of income.....	50
2.12.3.	Livestock as a source of agriculture inputs.....	51
2.12.4.	Livestock as a source of energy.....	51
2.12.5.	Socio-cultural aspects of goats.....	52
2.12.6.	Marketing of livestock.....	52
2.13.	Acquisition of Nilotic goats.....	54
2.14.	Rate of goat off-take.....	55
2.15.	Disposal of Nilotic goats.....	56
2.16.	Constraints	58
3.	Chapter Three: Materials and Methods.....	60
3.1.	The study area.....	60
3.2.	Testing of the questionnaire.....	63
3.3.	Field survey.....	63
3.4.	Distribution of random samples.....	63
3.5.	Field measurements.....	66
3.6.	Statistical analysis.....	67
4.	Chapter Four: Results.....	68
4.1.	Demographic data.....	68
4.2.	Herd structure.....	71
4.3.	Nilotic goat flock structure.....	76
4.4.	Nilotic goat productive traits.....	78
4.4.1.	Body measurements.....	78
4.4.2.	Body weight.....	78
4.4.3.	Utilization of Nilotic goat.....	80
4.5.	Nilotic goat reproductive traits.....	83
4.6.	Nilotic goat housing system.....	86
4.7.	Socio-economic of Nilotic goat.....	89
4.7.1.	Nilotic goat as source of skin.....	89
4.7.2.	Nilotic goat socio-cultural values.....	92
4.7.3.	Marketing of Nilotic goats.....	95
4.7.3.1.	Price of live Nilotic goats.....	95
4.7.3.2.	Price of goat's edible parts.....	97
4.8.	Acquisition of Nilotic goats.....	97
4.9.	Rate of Nilotic goats off-take.....	97
5.	Chapter Five: Discussion.....	98
5.1.	The respondent.....	98
5.2.	Husbandry practices.....	99
5.3.	Ownership pattern.....	101
5.4.	Nilotic goats housing systems.....	102
5.5.	Nilotic goats health.....	103
5.6.	Herd structure.....	104
5.7.	Nilotic goat flock structure.....	106
5.8.	Nilotic goat description.....	106

5.9.	Productive traits of Nilotic goat	110
5.9.1	Birth weight.....	110
5.9.2.	Weaning weight.....	111
5.9.3.	Mature weight.....	112
5.9.4.	Utilization of Nilotic goat.....	113
5.9.5.	Mortality rate.....	114
5.10.	Reproductive traits of Nilotic goats	115
5.10.1.	Reproductive traits of Nilotic doe	116
5.10.1.1		116
.	Age at first pregnancy.....	
5.10.1.2		117
.	Gestation period.....	
5.10.1.3		118
.	Type of births.....	
5.10.2.	Male to female ratios.....	119
5.11.	Socio-economics of Nilotic goats.....	119
5.11.1.	Nilotic goats as a source of food.....	120
5.11.2.	Nilotic goats as a source of skin.....	121
5.11.3.	Socio-cultural values of Nilotic goats.....	122
5.11.4.	Marketing of Nilotic goats.....	122
5.11.5.	Price of live Nilotic goats.....	123
5.12.	Acquisition of Nilotic goats.....	125
5.13.	Rate of Nilotic goats off-take.....	125
5.14.	Constraints.....	126
5.14.1.	Animal feed shortage	126
5.14.2.	Animal diseases.....	127
5.14.3.	Low productivity.....	128
5.14.4.	Socio-economics.....	128
5.14.5.	Marketing.....	129
5.14.6.	Security situation.....	129
6.	Chapter Six: Conclusions and Recommendations.....	130
6.1.	Conclusions.....	130
6.2.	Recommendations.....	132
7.	Chapter Seven: References.....	134
	Annexes.....	

List of tables

Table No.	Table title	Page
1	Ecology and management of goats and sheep in semi-arid Africa.....	11
2	Characteristics of small ruminant production system in West Africa.....	12
3	Age and sex structure of Nilotic goat flock in Jonglei area.....	33
4	Age of doe at puberty of the different goat breeds.....	43
5	Age at first kidding for different goats breeds.....	45
6	Kids/Doe/Year Annual Reproductive Performance (ARP).....	46
7	Gestation period for different goats breeds.....	48
8	Kidding interval for different goats breeds.....	49
9	Acquisition of Nuer and Dinka goat in Jonglei area.....	54
10	Estimated off-take of goat meat by agro-ecological zone in sub-Saharan Africa.....	55
11	Disposal Nuer and Dinka goats in Jonglei area.....	56
12	Reasons of loss Nilotic goat in Jonglei area.....	57
13	Effect of payam of respondents on herd structures.....	71
14	Effect of gender of respondents on herd structure.....	72
15	Effect of education level of respondents on herd structure.....	73
16	Effect of profession of respondents on herd structure.....	74
17	Effect of marital status of respondents on herd structure.....	75
18	Nilotic goat flock structure.....	76
19	Effect of payam of respondent on goat flock structure.....	76
20	Effect of gender of respondent on goat flock structure.....	76
21	Effect of education level of respondent on goat flock structure	76
22	Effect of profession of respondent on goat flock structure.....	77
23	Effect of marital status of respondent goat flock structure.....	77
24	Nilotic goat body measurement.....	78
25	Nilotic goat body weight description.....	78
26	Effect of payam of respondent on body weight (kg).....	78
27	Effect of gender of respondent on body weight (kg).....	78
28	Effect of education level of respondent on body weight (kg).....	79
29	Effect of profession of respondent on body weight (kg).....	79
30	Effect of marital status of respondent on body weight (kg).....	79
31	Effect of payams of respondent on utility of Nilotic goats.....	80
32	Effect of gender of respondent on utility of Nilotic goats.....	80
33	Effect of education level of respondent on utility of Nilotic.....	81
34	Effect of profession of respondent on utility of Nilotic.....	81
35	Effect of marital status of respondent on utility of Nilotic goats.....	82
36	Description of some reproductive traits of Nilotic does.....	83
37	Effect of payam of respondent on reproductive performance.....	83
38	Effect of gender of respondent on reproductive performance.....	83
39	Effect of education level of respondent on reproductive performance.....	84
40	Effect of profession of respondent on reproductive performance.....	84
41	Effect of marital status of respondent on reproductive performance.....	84
42	Effect of payam of respondent on Nilotic goats housing.....	86
43	Effect of gender of respondent on Nilotic goats housing.....	86

44	Effect of education level of respondent on Nilotic goats housing	87
45	Effect of profession of respondent on Nilotic goats housing.....	87
46	Effect of marital status of respondent on Nilotic goats housing.....	88
47	Effect of payams of respondent on use of Nilotic goats skin.....	89
48	Effect of gender of respondent on use of Nilotic goats skin.....	89
49	Effect of education level of respondent on use of Nilotic goats skin.....	90
50	Effect of profession of respondent on use of Nilotic goats.....	90
51	Effect of marital status of respondent on use of Nilotic goats skin.....	91
52	Effect of payams of respondent on uses of Nilotic goats.....	92
53	Effect of gender of respondent on uses of Nilotic goats.....	92
54	Effect of education level of respondent on uses of Nilotic goats.....	93
55	Effect of profession of respondent on uses of Nilotic goats.....	93
56	Effect of marital status of respondent on uses of Nilotic goats.....	94
57	The price (SDG) of live Nilotic goats.....	95
58	Effect of payam of respondent on price of live Nilotic goats.....	95
59	Effect of gender of respondent on price of live Nilotic goats.....	95
60	Effect of education level of respondent on price of live Nilotic goats.....	95
61	Effect of profession of respondent on price of live Nilotic goats.....	96
62	Effect of marital status of respondent on price of live Nilotic goats.....	96
63	Price (SDG) of goat edible parts.....	97
64	Description the methods of acquisition.....	97
65	Description goats slaughtered during May to October 2008.....	97

List of figures

Figure No.	Figure title	Page
1	Arrangement of animals inside the <u>Luak</u>	15
2	A detailed description of a <u>Luak</u> built to house 50 head of cattle...	16
3	A typical family hearth from the dry season cattle camp.....	19
4	Annual transhumant cycle of the Nilotic tribes in the Jonglei area	22
5	Cross sections of Dinka and Nuer <u>Luaks</u>	29
6	Location of Malakal town in Sudan map.....	61
7	Physical feature of Malakal town.....	62
8	Malakal town zoning and land use 1996/1997.....	64
9	Questionnaires administration Malakal 2008/2009.....	65

List of charts

Chart No.	Charts title	Page
1	Payam of respondents.....	68
2	Gender of respondents.....	69
3	Education level of respondents.....	69
4	Profession of respondents.....	70
5	Marital status of respondents.....	70

List of annexes

Annex No.	Annexes title	Page
------------------	----------------------	-------------

	Sudan University of Science and Technology College of Veterinary Medicine and Animal Production. The questionnaire for assessment of goats management systems in Upper Nile State: A case study Malakal Town.....	166
1		
2	Shilluk <u>Luak</u> during the wet season.....	169
3	Respondents do not have <u>Luak</u>	170
4	Nuer <u>Luak</u> during the dry season.....	171
5	Dried dung fire place <u>Ghol/Gol</u> it is located in the centre <u>Luak</u>	172
6	The riverine grazing land <u>Toich</u> during the dry season.....	173
7	Number of hearths <u>Dhien/Ghol</u> during the dry season.....	174
8	Goat scavenging.....	175
	Small ruminant kept under the different structural form, materials and	176
9.1	methods of construction.....	
9.2	The research outside goat housing.....	177
9.3	Arrangement of goats inside the housing.....	178
10	Summary of goats treated in Vet hosp INDBTT during 2007 – 2009.....	179
11	Mature Nilotic buck in the centre image.....	180
12	Mature Nilotic doe image.....	181

Abstract

The present study summarises the results of the survey on livestock management that were intended to formulate an integrated rural development plan for the Malakal area. An extensive survey of the literature has revealed a total lack of information's on the Nilotic goat in the completely Malakal area. This study was intended to obtain some information on herd structure, population size, breed, managerial practices and the production parameters, reproduction, socio-economic impacts and constrains of the Nilotic goats in the Malakal area.

The major livestock species in the study area were goats, sheep, and cattle. At present, most livestock in Malakal area are kept extensively under traditional management and have acquired knowledge of livestock keeping through field experiences. This study was based on materials and methods to evaluate the approach to analyze the system of management, performance of Nilotic goats at their natural habitat and constraints of Nilotic goats raising in the area of study. The research involves collection of primary data and secondary data on the various parameters through direct field surveys using questionnaire, interviews and participatory observations.

Means, standard error of means for tested quantitative traits and by Chi-square qualitative traits were calculated using STATISTICA software computer program. Study showed that the Nilotic goat is an important meat goat breed in the Malakal part. The native tract of the breed is the Nilotic goats' district of Malakal. Nilotic goats are small animals, short hair ruff its colour is very variable; most common is a mixture of black and whitish hair. The Nilotic goat flock structure was 17.37 ± 6.66 . The heart girth, body length and height at withers of Nilotic goats at full mouth age were 57.90 ± 3.45 cm, 52.23 ± 2.09 cm and 55.47 ± 2.17 cm respectively in male and 59.73 ± 4.33 cm, 53.80 ± 3.69 cm and 55.93 ± 2.12 cm, respectively in the female. Body weight of Nilotic goats at full mouth age was 24.5 kg. The average age at first mating was 6.0 to 8.2 months and the average age

at first kidding was 15.6 months. The survey shows that the Nilotic goat has a sex ratio of male/female 1: 3. Herdsman kept breeding bucks, when available in the herds at all times and exercised no controlled mating.

The birth weight of Nilotic goats in the present study is 2.2 ± 0.72 kg for both sexes. The weaning weight at 90 days (3 months) was 7.3 ± 1.79 kg for both sexes. Analysis of the current study is showing the means of mature weight are 17.3 ± 2.8 kg.

The management of livestock during the wet season, a few of the respondents kept their animals inside Luaks during the rainy season, while the majority of the respondents do not keep their animals inside cattle-byres during the wet season. During the dry, season that at the end of the rainy season, all the Nilotic tribes take their animals in towards the riverine grazing land (Toich) by late February or early March.

Several factors impede the productivity and reproductively of Nilotic goats in Malakal area including feed shortage, animal diseases, low productivity, socio-economic, marketing and security situation.

ملخص الأطروحة

أوضحت نتائج المسح الميدانية في الدراسة عن إمكانية إدماج منظومة إدارة حيوانات المزرعية وفق خطط برنامج قطاع التنمية الريفي بمنطقة ملكال إذ إن معظم حيوانات المزرعة بالمنطقة تدار تحت إدارة تقليدية توارثها المربي من خلال الممارسة العملية بالمرعى. و بالاطلاع على الدراسات السابقة أوضحت الدراسة عدم وجود معلومات مسبقة عن الماعز النيلي في منطقة ملكال رغم وجود أنواع أخرى تتمثل في الأبقار والضأن , ولذا ركزت الدراسة على بعض المعلومات حول شكل تركيب القطيع و حجم العشيرة و السلالة والأساليب المتبعة للرعاية إلى جانب المقاييس الإنتاجية و التناسلية و تقييم الأثر الاقتصادي و الاجتماعي والمحددات البيئية التي تواجه الماعز النيلي بالمنطقة.

وضعت الدراسة وفق منهجية علمية ارتكزت على المبادئ والأسس العامة في تقييم وتحليل الوضع البيئي إلى جانب طرق أداء و نظم إدارة الماعز النيلي في بيئة الطبيعة والتعرف على محددات ومعوقات التربية في منطقة الدراسة. و قد تضمن البحث البيانات الأساسية أو الأولية والثانوية و مختلف القياسات من خلال المسح الميداني المباشر باستخدام الاستبيان و المقابلات والمشاهدات المباشرة.

تم إجراء اختبار للمتوسطات و الخطأ القياسي فيما يتعلق بالصفات الكمية و اختبار مربع كاي للصفات النوعية و قد تمت معالجتها باستخدام الحاسب الآلي وفق برنامج التحليل الإحصائي. من خلال النتائج أشارت الدراسة إلى إن الماعز النيلي يعتبر من أهم سلالات اللحم في منطقة ملكال كما انه يتصف بصغر الحجم و قصر الشعر وتجيده إلى جانب تباين الألوان والتي تتراوح ما بين الأسود كلون سائد مع خليط من الأسود واللون الأبيض.

كما إن البنية التركيبية لسرب الماعز النيلي وفق المتوسط التالي 17.37 ± 6.66 . ومن ضمن نتائج التحليل تراوحت المتوسطات ما بين 3.45 ± 57.90 سم و 2.09 ± 52.23 سم و 2.17 ± 55.47 سم لكل من محيط الصدر وطول الجسم و الارتفاع عند الغارب للذكر الماعز النيلي مكتمل النمو على التوالي بينما للأنثى النيلي (العنزة) مكتملة النمو فان المتوسطات ما بين 4.33 ± 59.73 سم و 3.69 ± 53.80 سم و 2.12 ± 55.93 سم لكل من محيط الصدر وطول الجسم و الارتفاع عند الغارب على التوالي.

و قد وجدة الدراسة إن وزن جسم الماعز النيلي مكتمل النمو 24.5 كجم ومتوسط العمر عند أول تَسافد 6.0 إلي 8.2 أشهر و العمر عند أول ولادة في العنزة النيلية 15.6 شهراً . واستعرض المسح الميداني للماعز النيلي نسبة الذكور إلي الإناث 3:1 وراعي القطيع يحتفظ بذكر مكتمل النضج الجنسي ويتم التَسافد دون التحكم فيه.

وإشارة النتائج في الدراسة إلي وزن الميلاد لجداء النيلية 0.72 ± 2.2 كجم للجنسين و بينما كان وزن الفطام عند عمر 90 يوم (3 أشهر) 1.79 ± 7.3 كجم للجنسين. وخلصت نتائج تحليل التباين إن متوسط وزن الماعز البالغ 2.8 ± 17.3 كجم.

أوضحت الدراسة الأساليب المتبعة للرعاية حيوانات المزرعية خلال موسم الخريف حيث يتم الاحتفاظ بالحيوانات المزرعية داخل الولاك خلال فترة موسم الإمطار وبنهاية موسم الخريف تبدأ فترة موسم الجفاف وكل القبائل النيلية تتوجه للمراعي علي وديان النيل في ما يعرف بالتيجان وذلك عند نهاية شهر فبراير ومطلع شهر مارس.

هناك عدة عوامل تعوق الماعز النيلي إنتاجياً وتناسلياً في منطقة ملكال وتضمن النقص الغذائي و أمراض الحيوان و الإنتاجية المنخفضة و الوضع الاجتماعي الاقتصادي و التسويق و الحال الأمنية.