

CONTENTS

CHAPTER 1	AN INTRODUCTION TO WATER QUALITY GUIDELINES FOR LIVESTOCK, GROUND WATER AND FACTORS INFLUENCING ANIMAL WATER INTAKE.	1
1.1	International water quality guidelines for livestock	1
1.2	Ground water	7
1.3	Pollution of ground water	8
1.4	A brief synopsis of factors influencing animal water intake	9
1.4.1	Feed and water intake correlation	10
1.4.2	Environmental variables	11
1.4.3	Theories on thirst physiology	12
1.4.3.1	Cellular dehydration thirst	13
1.4.3.2	Extracellular dehydration	13
CHAPTER 2	THE ASSESSMENT AND MAPPING OF BOREHOLE WATER SAMPLES FROM THE NORTH WESTERN and NORTH EASTERN TRANSVAAL and the NORTH WESTERN CAPE for LIVESTOCK PRODUCTION	15
2.1	Introduction	15
2.2	Methods	17
2.3	Results and discussion	18
2.4	Observations	31
2.5	A brief synopsis of heavy metals and nitrates in water quality and the occurrence	

	of fluorspar deposits	32
2.5.1	Heavy metals	32
2.5.2	Nitrates	33
2.5.3	Fluorspar deposits in the Republic of South Africa	35
2.6	Conclusion	36
CHAPTER 3	THE PHYSIOLOGICAL IMPACT OF FLUORIDE IN THE DRINKING WATER ON LIVESTOCK PRODUCTION	37
3.1	Introduction to fluoride	37
3.1.1	Fluoride (F)	37
3.1.2	Fluorosis	38
3.1.3	Diagnosis of fluorosis	42
3.1.4	Toxicity	43
3.2	Research areas identified for investigation	49
3.2.1	Alleviators	49
3.2.2	Diet manipulation	50
3.2.2.1	Dietary fat and protein	50
3.2.2.2	Feeding and watering regime	50
3.2.2.3	Ca:P ratio relative to F	50
3.2.2.3	Milk production and reproduction responses to increasing fluoride	51
	(a) Milk production	51
	(b) Reproduction	52
3.2.4	Thyroid and parathyroid gland responses to increasing fluoride	52

	(a) Thyroid gland	52
	(b) Parathyroid gland	53
3.3	FLUORIDE TRIAL : THE EFFECTS OF DIFFERENT LEVELS OF FLUORIDE IN THE DRINKING WATER ON SOUTH AFRICAN MUTTON MERINO WETHERS	54
3.3.1	Motivation	54
3.3.2	Materials and methods	56
3.3.2.1	Water treatment	57
3.3.2.2	Ration	57
3.3.2.3	Housing and health	57
3.3.2.4	Parameters monitored	59
3.3.2.5	Statistical analyses	60
3.3.3	Results and discussion	61
3.3.4	Conclusion	73
CHAPTER 4	EFFECTS OF VARIOUS SALTS ON THE ACCEPTABILITY OF WATER and the EFFECT OF SALINE WATER ON THE FLUORIDE CONCENTRATION IN BONE	74
4.1	Introduction and motivation	74
4.1.1	Chloride (Cl ⁻)	74
4.1.2	Sulphate (SO ₄)	75
4.1.3	Salinity and animal performance	75

4.1.4	Objective81
4.2	Materials and methods85
4.2.1	Adaptation phase86
4.2.2	Treatments86
4.2.2.1	Ration86
4.2.2.2	Water treatments86
4.2.2.2.1	Adaptation phase87
4.2.2.2.2	Water treatments for trial period91
4.2.3	Parameters monitored	101
4.3	Results	104
4.3.1	Water intake	104
4.3.2	Average feed intake	112
4.3.3	Live weight	114
4.3.4	Blood	115
4.3.5	Urine	118
4.3.6	Slaughter parameters	121
4.3.6.1	Hot carcass weight	121
4.3.6.2	Thyroid gland weight	122
4.3.6.3	Kidney and liver histopathology	122
4.3.6.4	Fluoride concentration of metacarpal bone	122
4.3.6.5	Macroscopic pathology	124
4.3.7	Health	124
4.4	Discussion	124