

CONTENTS

DEDICATION	I
ACKNOWLEDGEMENTS	II
ABSTRACTS	III
SUMMARY	IV
1 GENERAL INTRODUCTION	1
1.1 Background and aim of the study	1
1.2 Justification	3
2 LITERATURE REVIEW	8
2.1 Animal Breeding Programmes	8
2.1.1 General overview	8
2.1.2 Programmes in developing countries	9
2.2 Production systems	10
2.3 Breeding objectives	11
2.4 Breeding schemes	12
2.4.1 Progeny selection schemes	12
2.4.2 Half-sib selection schemes	13
2.4.3 Young bull selection scheme	13
2.4.4 Nucleus schemes	14
2.5 Modelling/Simulation methodologies	17
2.5.1 Deterministic modelling	18
2.5.2 Stochastic (Monte Carlo) modelling	18
2.6 ZPLAN	19
2.6.1 Traits to include in the selection index	20
2.6.2 Gene flow	21
2.6.3 Economic aspects	21
2.6.4 Evaluation of schemes	24
2.7 Herd/Milk recording	25
2.8 Use of biotechnology in animal breeding programmes	25
2.8.1 Artificial insemination (AI)	26
2.8.2 Milk progesterone assays	27
3 MATERIALS AND METHODS	28
3.1 Study area	28
3.1.1 Production systems	29
3.1.2 Central Nucleus Farm – Njeru Stock Farm	32
3.2 Data collection and compilation	33
3.3 Data analysis	35
3.4 Genetic plan modelling	36
3.4.1 Selection Index	36
3.4.2 Economic parameters used in the model	53
3.4.3 Quantity of semen needed to be collected from a bull	56
3.4.4 Average age of Proven Bulls when their first offspring are born	57
3.4.5 Number of inseminations needed per daughter record (Ins/DR)	57
3.4.6 Population size	58
3.4.7 Gene flow	58
3.4.8 Evaluated breeding schemes	61

4 RESULTS AND DISCUSSION	64
4.1 Biological coefficients	64
4.2 Population structure	68
4.3 Gene flow	69
4.4 Breeding schemes	72
4.4.1 Scheme I – Simultaneous varying of YB and PCYB	72
4.4.2 Scheme II – Varying YB at very close range around the optimal	79
4.4.3 Scheme III – Varying the number of Inseminations per daughter record (Ins/DR)	80
4.4.4 Scheme IV – Restricting calving interval genetic gain	81
5 CONCLUSION	86
6 REFERENCES	89
7 APPENDICES	101
8 LIST OF ABBREVIATIONS	119