

Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.

**AN INVESTIGATION OF WASTAGE ON A  
COMMERCIAL SHEEP FARM IN NEW ZEALAND**



**KAMALIAH B GHAZALI**

**2007**



**AN INVESTIGATION OF WASTAGE ON A  
COMMERCIAL SHEEP FARM IN NEW ZEALAND**

A DISSERTATION PRESENTED IN PARTIAL FULFILLMENT OF  
THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF VETERINARY STUDIES  
IN EPIDEMIOLOGY

AT MASSEY UNIVERSITY,  
PALMERSTON NORTH, NEW ZEALAND

**KAMALIAH B GHAZALI**

**2007**



## **ABSTRACT**

This dissertation reports the results from an investigation of wastage on a commercial sheep farm. This traditionally summer-dry 2,952 hectares farm runs an annual average of 21,000 breeding ewes and 1,100 cattle. High levels of wastage in both ewes and lambs have been observed over the past four years, and vaginal prolapse was considered to be the major cause of loss about lambing time. The investigation described in the dissertation comprised three main parts; database analysis and disease prevalence, Androvax® vaccination, and wastage in ewes and lambs.

Database analysis and prevalence studies were conducted to provide initial animal health and production information, and aimed to quantify the extent of wastage and disease prevalence. Two databases, a farm input form and Stockpol, were used. Despite poor quality animal health records and difficulties in extracting data, a temporal pattern of ewe wastage in different age groups and lamb wastage was able to be constructed and it showed consistently high wastage of ewes and lambs over the past five years. Prevalence of disease investigations confirmed high prevalences of infectious footrot and pneumonia, and a low but significant prevalence of Johne's disease.

For a clinical trial to determine the effects of Androvax® vaccination, 300 mixed age control ewes selected in March 2006 were ultrasound scanned and their pregnancy status compared with vaccinated ewes running together in the same flock. The risk of carrying multiple lambs in vaccinates and controls was the same but vaccinates were about two times more likely to carry triplets than control ewes. A partial budget indicated that discontinuing Androvax® vaccination would result in savings of about \$115.06 per 100 ewes.

For the wastage study, a total of 531 mixed age ewes were enrolled after ultrasound scanning on 15<sup>th</sup> June 2006 and observed from scanning to weaning for any deaths. From 22<sup>nd</sup> August to 12<sup>th</sup> September 2006, all ewes and lambs that died and were found were necropsied to determine the cause of death. The incidences of wastage were 3.1% and 12.1% for ewes and lambs respectively. Dystocia and starvation were the main causes of death in ewes and lambs respectively.

This study identified certain issues and constraints for on-farm investigations which included incomplete data, difficulties in quantifying disease prevalence and prioritising control measures, evaluation of existing management techniques and determining causes of deaths. Solutions were found for most of the issues and the study in particular highlighted the usefulness of sentinel groups for investigation of causes of wastage and the value of field trials for evaluating interventions.

## **ACKNOWLEDGEMENT**

I am very fortunate to being able to further my study in Epidemiology at Epicentre. Over the past two years, I had so much wonderful time and experiences that I would not trade for anything. My thanks go to my chief supervisor Cord Heuer who has given the first direction for me to involve in this project. I am indebted to my supervisor Ron Jackson for the help that he has given in ensuring that my journey would be successful. I would also like to express my gratitude to Mark Stevenson who helps me in managing R software especially at the beginning of the project.

This project would not be successful without Professor Roger Morris who had given the opportunity for me to involve in this project, nor could it proceed smoothly with out help from Deb Prattley and Lachlan McIntyre whose contribution was much appreciated.

I am grateful to Emily and Anders Crofoot who had given me the chance to involve in this project and all the facilities and supports given especially during three weeks of my staying at Castlepoint Station. My thanks also to Brendon Daley and his team especially Jeff and Roger who had help me during post mortem.

I would also like to thanks Stuart Bruere for his help and inputs for this study and his staff Debbie who has involved in sample collection at meat works. Diane Richardson has helped me a lot in my project in various occasions and her contribution in this project would not be forgotten.

I would like to recognise the efforts that Jackie Benschop who help me occasionally on my writing, Solis Norton who enthusiastically given his spare time to be of assistance in my travelling to Castlepoint, and Caryl Lockhart who has given so many ideas in analysing the data.

Thanks also to John Munday who assist in Johne's disease confirmation and Mike from IVABS Pathology laboratory. Dave West is also thanked for his assistance and expert opinion for this project. Thanks to management of Imlay meat works at Wanganui who gave their consent and their help in samples collection.

I would like to thank all Epicentre colleagues and friends especially Sharif Haneef, Karma Rinzin and Sina Tauleolo for their supports and encouragement. Not forgotten my flatmate Letchumi who had her share in what ever I have accomplished.

Lastly my thank goes to my family who has given their support for me to further my study abroad, and my department and sponsor who has given this opportunity to extend my domain of understanding.

# TABLE OF CONTENTS

ABSTRACT .....	I
ACKNOWLEDGEMENT .....	III
TABLE OF CONTENTS.....	V
LIST OF TABLES.....	VII
LIST OF FIGURES.....	VIII
CHAPTER 1 .....	1
<b>1 LITERATURE REVIEW .....</b>	<b>1</b>
1.1 GENERAL INTRODUCTION.....	1
1.2 WASTAGE .....	2
1.2.1 Wastage definition.....	2
1.2.2 Lamb wastage.....	3
1.2.2.1 Temporal and spatial effects.....	3
1.2.2.2 Birth rank .....	4
1.2.2.3 Ewes breed differences, maternal behaviour and age.....	5
1.2.2.4 Sire effect.....	5
1.2.3 Ewe wastage .....	6
1.2.3.1 Ewe mortality.....	6
1.2.3.2 Diseases contributed to ewe wastage .....	6
1.2.4 Fecundity.....	8
1.2.4.1 Androvax.....	9
1.3 FARM SURVEILLANCE .....	9
1.4 CONCLUSION.....	10
1.5 REFERENCES .....	11
CHAPTER 2 .....	17
<b>2 PRELIMINARY INVESTIGATION.....</b>	<b>17</b>
2.1 INTRODUCTION .....	17
2.1.1 Background.....	17
2.1.2 Farm description .....	17
2.1.3 Problem description .....	18
2.2 MATERIALS AND METHODS .....	19
2.2.1 Farm data.....	19
2.2.2 Footrot investigation .....	21
2.2.3 Investigation of poor condition ewes at slaughter.....	21
2.2.4 Data analysis.....	22
2.3 RESULTS .....	23
2.3.1 Farm data.....	23
2.3.2 Footrot status.....	27
2.3.2.1 Footrot in rams with resistant allele test information .....	27
2.3.3 Investigation of poor condition ewes at slaughter .....	28
2.4 DISCUSSION .....	29
2.4.1 Farm Databases .....	29
2.4.2 Footrot study .....	32
2.4.3 Poor condition ewe study .....	33
2.4.4 Limitation of the study.....	34
2.5 CONCLUSION.....	34
2.6 REFERENCES .....	35
CHAPTER 3 .....	39
<b>3 AN INVESTIGATION OF THE EFFECTS OF ANDROVAX VACCINATION OF MIXED AGE EWES.....</b>	<b>39</b>
3.1 INTRODUCTION .....	39
3.1.1 Androvax vaccination .....	39

3.1.2	<i>Mechanism and role of androstenedione immunisation</i> .....	39
3.1.3	<i>Financial gain assessment</i> .....	41
3.1.4	<i>Objectives of the study</i> .....	41
3.2	MATERIALS AND METHODS .....	42
3.2.1	<i>Selection of ewes</i> .....	42
3.2.2	<i>Scanning</i> .....	42
3.2.3	<i>Partial budgets</i> .....	42
3.2.4	<i>Data analysis</i> .....	43
3.3	RESULTS .....	43
3.3.1	<i>Fecundity study</i> .....	43
3.3.2	<i>Partial budget</i> .....	44
3.4	DISCUSSION .....	46
3.5	STUDY LIMITATIONS .....	47
3.6	CONCLUSION .....	48
3.7	REFERENCES .....	48
<b>CHAPTER 4</b> .....		<b>51</b>
4.1	INTRODUCTION .....	51
4.1.1	<i>Reproductive wastage</i> .....	51
4.1.2	<i>Causes of reproductive wastage</i> .....	52
4.1.3	<i>Objectives of the study</i> .....	52
4.2	MATERIALS AND METHODS .....	53
4.2.1	<i>Wastage study</i> .....	53
4.2.2	<i>Post mortem examinations and diagnosis</i> .....	54
4.2.3	<i>Data analysis</i> .....	54
4.3	RESULTS .....	56
4.3.1	<i>Ewes</i> .....	56
4.3.2	<i>Lambs</i> .....	62
4.4	DISCUSSION .....	64
4.5	STUDY LIMITATIONS .....	65
4.6	CONCLUSION .....	65
4.7	REFERENCES .....	66
<b>CHAPTER 5</b> .....		<b>69</b>
5	GENERAL DISCUSSION .....	69
<b>APPENDICES</b> .....		<b>73</b>

## LIST OF TABLES

TABLE 1 DESCRIPTION OF VARIABLES IN THE DATABASES USED TO ANALYSE PRODUCTION PERFORMANCE OF CASTLEPOINT STATION FROM MARCH 1997 TO APRIL 2005.....	20
TABLE 2 MEDIAN MONTHLY OPENING STOCK NUMBERS, SALES, PURCHASED AND DEATHS IN MOBS AT CASTLEPOINT STATION FOR 88 MONTHS FROM MARCH 1997 TO APRIL 2005. DEATHS INCLUDE DEATHS, KILLED AND MISSING ANIMALS.....	23
TABLE 3 DESCRIPTIVE STATISTICS FOR FIVE ENVIRONMENTAL FACTORS RECORDED AT CASTLEPOINT STATION FROM MARCH 1997 TO APRIL 2005.....	24
TABLE 4 ANNUAL MORTALITY RATES PER 100 SHEEP FROM 1999 TO 2004 FARMING YEAR AT CASTLEPOINT STATION. FARMING YEAR WAS JULY 1 TO JUNE 30. ONLY 6 YEARS ARE REPORTED AS MONTHLY DATA FOR OTHER YEARS WAS INCOMPLETE.....	24
TABLE 5 PREVALENCE OF LUNG SCORES IN 107 LUNGS FROM 376 CULL EWES SENT TO SLAUGHTER FROM CASTLEPOINT STATION IN 5 <sup>TH</sup> APRIL 2006.....	29
TABLE 6 HISTOPATHOLOGY RESULTS FOR 102 ILEOCAECAL VALVES FROM 376 CULL EWES SENT TO SLAUGHTER FROM CASTLEPOINT STATION IN APRIL 2006.....	29
TABLE 7 NUMBERS AND PERCENTAGES OF EWES SCANNED AS NOT PREGNANT (EMPTY), SINGLE, TWIN AND TRIPLET BEARING IN VACCINATED AND NON-VACCINATED GROUPS AND OVERALL.....	44
TABLE 8 PARTIAL BUDGET FOR DISCONTINUING ANDROVAX VACCINATION AT CASTLEPOINT STATION.....	46
TABLE 9 SUMMARY DATA RECORDED FOR THE WASTAGE STUDY.....	55
TABLE 10 STATUS OF SINGLE AND TWINS BEARING EWES IN ANDROVAX TREATED AND CONTROL GROUPS AT THE END OF THE 2006 CASTLEPOINT STATION WASTAGE STUDY.....	56
TABLE 11 CAUSE OF DEATHS BETWEEN SCANNING AND WEANING AMONG 531 MIXED AGE EWES ENROLLED IN THE 2006 CASTLEPOINT STATION WASTAGE STUDY.....	57
TABLE 12 CAUSE OF DEATHS OF 28 EWES AT LAMBING TIME FROM 22 AUGUST TO 12 SEPTEMBER 2006 IN MOBS OTHER THAN THE WASTAGE STUDY GROUP AT CASTLEPOINT STATION.....	57
TABLE 13 DESCRIPTIVE STATISTICS AND QUARTILE DISTRIBUTIONS OF WEIGHTS AT SET STOCKING, DOCKING AND WEANING FOR 518 MIXED AGE EWES IN THE 2006 CASTLEPOINT STATION WASTAGE STUDY.....	58
TABLE 14 PADDOCK AND SITE DISTRIBUTION OF 518 MIXED AGE EWES ENROLLED IN THE 2006 CASTLEPOINT STATION WASTAGE STUDY, PADDOCK NITROGEN TREATMENT, AND AVERAGE WEIGHTS AT SET STOCKING, DOCKING AND WEANING.....	58
TABLE 15 NUMBERS OF LAMBS AT DOCKING AND WEANING, AND RATIOS OF LAMB WEANING WEIGHTS TO EWE WEANING WEIGHTS FOR EACH PADDOCK LOCATION.....	63

## LIST OF FIGURES

FIGURE 1 PRODUCTION OF LAMBS (TONNES X10), NUMBERS OF LAMB SLAUGHTERED, NUMBER OF SHEEP AND LAMB WEIGHTS OVER TIME FROM 1981/82 TO 2003/04. THE Y-AXIS ON THE LEFT SHOWS VALUES FOR PRODUCTION OF LAMBS, NUMBERS OF LAMB SLAUGHTERED AND NUMBER OF SHEEP, WHILE THE Y-AXIS ON THE RIGHT SHOWS VALUES FOR LAMB WEIGHTS. ....	2
FIGURE 2 NUMBERS OF RAMS TESTED ON RESISTANT ALLELES FOR FOOTROT IN CASTLEPOINT STATION. THE PINK COLOUR BAR SHOWS NUMBER OF RAMS INFECTED WITH FOOTROT AND THE BLUE COLOUR BAR SHOWS NUMBERS OF NON-INFECTED RAMS. ....	28
FIGURE 3 TIMING OF THE 2006 WASTAGE STUDY EVENTS FROM SCANNING TO WEANING FOR 531 MIXED AGE EWES AT CASTLEPOINT STATION. ....	53
FIGURE 4 DISTRIBUTION OF 518 MIXED AGE EWE WEIGHTS AT SET STOCKING, DOCKING AND WEANING IN THE 2006 CASTLEPOINT STATION WASTAGE STUDY. ....	59
FIGURE 5 WEIGHT GAINS FROM SET STOCKING TO DOCKING FOR 518 MIXED AGE EWES IN THE 2006 CASTLEPOINT STATION WASTAGE STUDY. ....	60
FIGURE 6 WEIGHT GAINS FROM DOCKING TO WEANING FOR 518 MIXED AGE EWES IN THE 2006 CASTLEPOINT STATION WASTAGE STUDY. ....	60
FIGURE 7 DISTRIBUTIONS OF BODY CONDITION SCORES (BCS) IN 531 MIXED AGE EWES IN THE 2006 CASTLEPOINT STATION WASTAGE STUDY. ....	61
FIGURE 8 PASTURE COVER IN PADDOCKS SET STOCKED WITH TWIN BEARING EWES FROM 31 JULY TO 1 DECEMBER 2006. NITROGEN WAS NOT APPLIED TO WAITE AND HORSE, AND APPLIED AT A RATE OF 60 UNITS/HA ON MARLOW AND COB, AND AT 120 UNITS ON OLIVIA AND OXEN. Paddock WAITE, OLIVIA AND MARLOW WERE LOCATED IN THE SOUTHERN BLOCK, AND HORSE, OXEN AND COB IN THE NORTHERN BLOCK. ....	62
FIGURE 9 POINT ESTIMATES AND THEIR CONFIDENCE INTERVALS (—) FOR AVERAGE LAMB WEIGHTS IN THE VARIOUS PADDOCKS AT WEANING. ....	63
FIGURE 10: LOCATION OF SHORT RIBS AND LONG RIBS IN THE LIVE SHEEP. ....	77
FIGURE 11: FEEL OF THE BACKBONE AND SHORT RIBS TO ESTIMATE BODY CONDITION SCORE. ....	77