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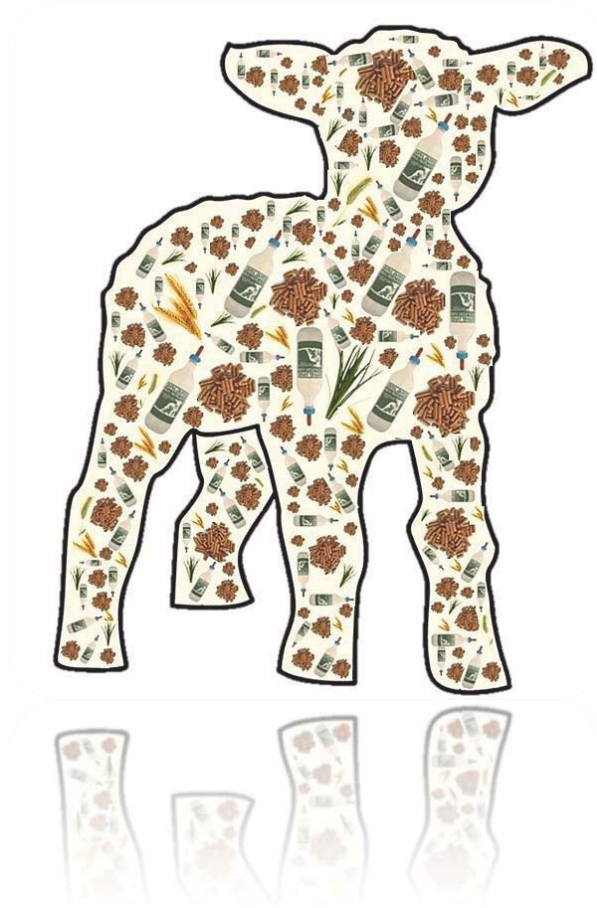
NUTRIENT UTILISATION, GROWTH AND CHEMICAL BODY COMPOSITION OF PRE-WEANED LAMBS REARED ARTIFICIALLY

Effects of feeding milk replacer and pellets

A thesis presented in partial fulfilment of the requirements for the degree of

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“Dietary inputs are of value only as long as they increase kilograms of lamb weaned, improve fibre quality or quantity, or positively impact lifetime production”

(Hatfield *et al*, 1995)

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ABSTRACT

Understanding how nutrient supply controls lamb growth is important in improving the efficiency of nutrient utilisation. Estimation of metabolisable energy (ME) requirements for lamb maintenance and growth pre-weaning has been limited to milk-only fed lambs. This is due, at least in part, to the difficulty of measuring pasture intake in pre-weaned lambs, which restricts the determination of nutrient balances and nutrient use efficiencies. The aims of this thesis were to: 1) evaluate the effect of various milk and pellets combinations on lamb growth, organ development, body composition and utilisation of energy for maintenance and growth, 2) derive equations for predicting feed intake, and 3) develop a growth simulation model for use as a tool to develop feeding strategies for lambs. Lambs were offered various diet combinations from age one day until slaughter at 18 kg live weight (LW). Addition of solid feed to the milk diet of pre-weaned lambs improved their growth rates, efficiency of gain and enhanced rumen development. Increasing daily ME intake from 1.5 times maintenance to *ad libitum* at a constant protein to energy ratio did not alter the total chemical body composition of the lambs fed to a fixed LW. Increasing the crude protein content of milk replacer, and therefore the corresponding protein to energy ratio, increased average daily gain and efficiency of gain in lambs. Further, the protein content in the empty bodies of lambs increased whilst fat content decreased. Growth and body composition of lambs were unaffected by altered pellet protein content. The study also showed that lambs fed in excess of their protein and energy requirements reached maximum potential protein deposition rates. Based on a model developed, overestimating the maintenance energy requirements of milk-only fed lambs underestimated their daily fat deposition rates and underestimating the maintenance requirements of lamb offered milk and *ad libitum*

access to pellets over estimated their daily fat deposition. A greater percentage increase in fat deposited in gain increased the energy requirements for gain in the lambs. This study has contributed to the knowledge on rearing lambs artificially with various combinations of milk and pellets. The findings will provide a useful platform for future studies aiming to develop feeding strategies to improve pre-weaning lamb growth.

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TABLE OF CONTENTS

Abstract	i
Acknowledgements	iii
Table of Contents	v
List of Tables	viii
List of Figures	xi
CHAPTER 1 General Introduction	1
1.1 Overview	2
1.2 References	6
CHAPTER 2 Literature Review	9
2.1 Preamble	10
2.2 Factors Affecting Lamb Growth	10
2.3 Lamb nutrition	15
2.4 Energy requirements and utilisation in lambs	28
2.5 Protein requirements and utilisation in lambs	37
2.6 Estimation of lamb milk and solid feed intake	43
2.7 Perspective and proposal	48
2.8 References	49
CHAPTER 3 Relationships Between Prenatal Ewe Traits, Milk Production and Pre-Weaning Performance of Twin Lambs	67
Abstract	66
3.1 Introduction	70
3.2 Materials and methods	71
3.3 Results	79
3.4 Discussion	91
3.5 Conclusion	97
3.6 References	98
CHAPTER 4 Effects of Pre-Weaning Diet on Growth, Organ Development and Chemical Body Composition of Artificially Reared Lambs	103
Foreword	102
Abstract	103

4.1	Introduction	107
4.2	Materials and Methods	108
4.3	Results	116
4.4	Discussion	126
4.5	Conclusion	132
4.6	References	133
CHAPTER 5 The Effect of Different Feeding Regimens on Energy and Protein Utilisation and Partitioning for Maintenance and Growth in Artificially Reared Lambs		139
Foreword		138
Abstract		139
5.1	Introduction	143
5.2	Materials and methods	144
5.3	Results	151
5.4	Discussion	163
5.5	Conclusions	169
5.6	References	171
CHAPTER 6 Effects of Dietary Protein to Energy Ratios on Growth, Body Composition and Nutrient Utilisation in Lambs Reared Artificially with Milk and Pellets		177
Abstract		176
6.1	Introduction	180
6.2	Materials and methods	181
6.3	Results	189
6.4	Discussion	205
6.5	Conclusion	211
6.6	References	213
CHAPTER 7 Predicting the Feed Intake of Pre-Weaned Lambs from Faecal and Dietary Chemical Composition		217
Abstract		216
7.1	Introduction	220
7.2	Materials and Methods	221
7.3	Results	226

7.4 Discussion	231
7.5 Conclusion	234
7.6 References	236
CHAPTER 8 Modelling Lamb Growth: A Mechanistic Dynamic Model of Nutrient Utilisation, Growth and Body Composition in Pre-Weaned Lambs Reared Artificially	239
Abstract	238
8.1 Introduction	241
8.2 Model description	242
8.3 Results	251
8.4 Discussion	258
8.5 Conclusion	261
8.6 Implications	261
8.7 References	263
CHAPTER 9 General Discussion	267
9.1 Introduction	268
9.2 Summary of main findings and conclusions drawn	269
9.3 Methodological Considerations	281
9.4 Practical implications and recommendations	282
9.5 Recommendations for future research	285
9.6 Overall summary and conclusions	286
9.7 References	288
Appendices	291

LIST OF TABLES

Table 2.1 Percentage composition of ewes' milk (protein, fat and lactose) obtained from various studies.....	21
Table 2.2 Efficiency of utilisation of metabolisable energy for growth in milk-fed lambs	34
Table 2.3 Estimates of protein requirements obtained from feeding trials of growing lambs	40
Table 3.1 Descriptive statistics of the ewe and lamb data sets from the two experiments	81
Table 3.2 Multiple linear regression coefficients, \pm S.E (semi partial R^2) of ewe parameters ¹ (LW_m , BCS_m , LW_{ss} and BCS_{ss}) and combined lamb birth weight (Bwt) on accumulated milk yield (MY) and Bwt in experiments one and two using forward stepwise selection.....	86
Table 3.3 Linear regression coefficients, \pm S.E (partial R^2) of milk components on combined twin lamb live weight gain from day 0 to 42 (LWG_{0-42}) in experiments one and two using forward stepwise selection.....	88
Table 3.4 Linear regression coefficients, \pm S.E (partial R^2) of ewe parameters ¹ (LW_m , BCS_m , LW_{ss} , BCS_{ss} and MY) and combined twin lamb birth weight (Bwt) on combined twin lamb live weight at day 42 (LW_{42}) and live weight gain from day 0 to 42 (LWG_{0-42}) in experiments one and two using stepwise regression	89
Table 3.5 Multiple linear regression coefficients, \pm S.E (partial R^2) of ewe and lamb parameters on combined twin lamb live weight at weaning (LW_w) and live weight gain from birth to weaning (LWG_{0-w}) in experiments one and two using forward stepwise selection	90
Table 4.1 Chemical analysis of milk replacer, start mix and performance pellets as fed to lambs.....	111
Table 4.2 The effects of feeding treatments, milk only (MO) vs milk + pellets (MP) on growth performance (mean \pm SE) of lambs	117
Table 4.3 The effects of milk only (MO) vs milk and pellet (MP) feeding on the traits at slaughter (LS means \pm SE).....	119
Table 4.4 The effects of milk only (MO) vs milk and pellet (MP) feeding on traits at slaughter (LS means \pm SE) using empty body weight (EBW) as a covariate.....	119
Table 4.5 Rumen papillary development (LS means \pm SE) of milk only (MO) and milk and pellet (MP) fed lambs at average 59 days of age	122
Table 4.6 The effects of feeding treatment; milk only (MO) vs milk and pellet (MP) on the chemical composition (LS means \pm SE) of carcass and organs of the lambs using empty body weight (EBW) as a covariate	124
Table 4.7 The chemical components (LS means \pm SE) per kilogram live weight gain (LWG) of lambs as affected by the dietary treatment; milk only (MO) vs milk and pellet (MP).	125
Table 5.1 Chemical analysis of milk replacer and pellets as fed to lambs	147

Table 5.2 Energy and nitrogen balances (LS means) in artificially reared lambs offered incremental levels of pellets (0% [MO], 30% [MP ₃₀], 60% [MP ₆₀], and <i>ad libitum</i> [MP _{ad}]) in addition to milk replacer over a four-day period at 17 kg live weight.	152
Table 5.3 Intakes and growth (LS means) of artificially reared lambs offered incremental levels of pellets (0% [MO], 30% [MP ₃₀], 60% [MP ₆₀], and <i>ad libitum</i> [MP _{ad}]) in addition to milk replacer to 18 kg live weight.	154
Table 5.4 Weights of carcass and visceral organs (LS means) of artificially reared lambs offered incremental levels of pellets (0% [MO], 30% [MP ₃₀], 60% [MP ₆₀], and <i>ad libitum</i> [MP _{ad}]) in addition to milk replacer from age one to 18 kg live weight.	157
Table 5.5 Rumen papillary development (LS means) of artificially reared lambs offered incremental levels of pellets (0% [MO], 30% [MP ₃₀], 60% [MP ₆₀], and <i>ad libitum</i> [MP _{ad}]) in addition to milk replacer to 18 kg live weight.	158
Table 5.6. Chemical body composition of artificially reared lambs offered incremental levels of pellets (0% [MO], 30% [MP ₃₀], 60% [MP ₆₀], and <i>ad libitum</i> [MP _{ad}]) in addition to milk replacer at 18 kg live weight.	160
Table 5.7 The chemical composition per kilogram live weight gain (LWG) (LS means) of artificially reared lambs offered incremental levels of pellets (0% [MO], 30% [MP ₃₀], 60% [MP ₆₀], and <i>ad libitum</i> [MP _{ad}]) in addition to milk replacer from age one to 18 kg live weight.	161
Table 6.1 Analytical chemical composition of milk replacers and pellets as fed to artificially reared lambs.	183
Table 6.2 Effect of dietary treatment on nitrogen (N) and energy balances ¹ (LS means) of lambs reared artificially on two protein levels in milk replacer and two protein levels in pellets at 9 kg and 16 kg live weights over a four-day period.	190
Table 6.3 Intake and growth (LS means) of artificial reared lambs fed two protein levels in milk replacer and two protein levels in pellets to 18 kg live weight.	194
Table 6.4 Effect of dietary treatment on blood serum metabolites (LS means) ¹ of lambs reared artificially on two protein levels in milk replacer and two protein levels in pellets from up to 18 kg live weight.	197
Table 6.5 Effect of dietary treatment on slaughter parameters (LS means) of lambs reared artificially on two protein levels in milk replacer and two protein levels in pellets to 18 kg live weight.	198
Table 6.6 Effect of dietary treatment on rumen papillary development (LS means) in lambs reared artificially on two protein levels in milk replacer and two protein levels in pellets up to 18 kg live weight.	198
Table 6.7 Effect of dietary treatment on chemical composition of carcass, organs, head, skin and empty bodies (LS means) of the baseline slaughter group and lambs reared artificially on two protein levels in milk replacer and two protein levels in pellets at 18 kg live weight.	200
Table 6.8 Effect of dietary treatment on the dry matter (DM), ash, protein, fat, water and energy deposition rates in carcass, organs, head, skin and empty bodies (LS means) of lambs reared artificially on two protein levels in milk replacer and two protein levels in pellets up to 18 kg live weight.	202

Table 7.1 Treatment and live weights of lambs at various stages of faecal collection in the two experiments	222
Table 7.2 Chemical analysis of milk replacer and pellets fed to lambs in experiments one and two.....	224
Table 7.3 Relationship between measured and predicted pellet dry matter intake (DMI _p) and organic matter intake (OMI _p) of pre-weaned lambs offered milk and pellets concurrently	227
Table 7.4 Relationship between measured and predicted dry matter intake (DMI), organic matter intake (OMI) and metabolisable energy (ME) intake in pre-weaned lambs offered milk and pellets concurrently.....	228
Table 7.5 Descriptive and equation statistics for validation data of pellet neutral detergent fibre (NDF _i), dry matter intake (DMI _p) and organic matter intake (OMI _p).	229
Table 8.1 Summary of the data used in the development and evaluation of the growth and body composition simulation model	250
Table 8.2 Statistical indicators of model performance: Mean bias, co-efficient of determination (r^2), relative predictive error (RPE) and concordance correlation co-efficient (CCC) for the growth and body composition of pre-weaned lambs consuming various combinations ¹ of milk and pellets.....	257
Table 9.1 The cost of artificially rearing lambs fed two protein levels in milk replacer and two protein levels in pellets to 18 kg live weight.....	284

LIST OF FIGURES

- Figure 2.1 Growth of slowly reared lambs of low (LL, n = 16) and high (HL, n = 12) birth weight and of rapidly reared lambs of low (LH, n = 16) and high (HH, n = 12) birth weight, individually reared from birth to approximately 20 kg live weight (LW). Source: Greenwood *et al.* (1998) 12
- Figure 2.2 Milk yield pattern for Finnish Landrace x Blackface cross ewes suckling singles, twins, triplets and quadruplets. During the first 12 weeks of lactation. Source: Adapted from Peart *et al.* (1972). 14
- Figure 2.3 Live weights of lambs whose dams were subjected to four nutritional regimes during pregnancy (HH, a high plane throughout pregnancy; HL, a high plane for the first 90 days followed by a low plane to lambing; LH, a low plane for the first 90 days followed by a high plane until lambing; LL, a low plane throughout pregnancy). Source: Adapted from Taplin and Everitt (1964). 20
- Figure 2.4 Factors affecting sheep milk composition. Farmer inputs include those controlled by the farmer to a certain extent (genetic factors) and those totally controlled by the farmer (management); others depend solely on the sheep's physiological factors. Adapted from (Peart *et al.*, 1972; Bencini and Pulina, 1997; Paten *et al.*, 2013). 23
- Figure 2.5 Transition showing decreasing ewe milk and increasing pasture intake by (a) single and (b) twin lambs during the first 12 weeks of lactation. Source: (Geenty *et al.*, 1985; Geenty, 2010). 28
- Figure 2.6 The partition of gross energy in lambs. Digestible energy (DE) is gross energy intake (GE) less faecal losses; metabolisable energy (ME) is DE less urinary and methane losses; net energy (NE) is ME less heat increment of feeding. NE can be further subdivided into net energy for maintenance and production. Adapted from (Birkett and de Lange, 2001; McDonald *et al.*, 2011). 29
- Figure 2.7 The efficiency of metabolisable energy (ME) utilisation for maintenance in milk-fed lambs calculated as the slope of the regression line relating energy retention (ER) to ME intake. Adapted from Jagusch and Mitchell (1971). $ER = 0.77 ME - 111.75$ 33
- Figure 2.8 Protein- and energy-dependent phases of growth. Protein deposition of animals on the inclined lines would be limited by protein intake whereas that of animals on the plateau surfaces would be limited by energy intake. (Campbell *et al.*, 1985; Titgemeyer, 2003; Schroeder and Titgemeyer, 2008) (Adapted). 42
- Figure 3.1. Experimental design and overview of dam size and nutrition studies of group 0 (G0) dams whose female offspring (group 1 [G1]) and grand offspring (group 2 [G2]) are used in Exp. 1. Group 0: dams were either heavy or light at mating and were randomly allocated to receive pregnancy maintenance or *ad libitum* feeding treatment from Day 21 to 140 of pregnancy (P21–P140), resulting in 4 treatment groups (heavy-*ad libitum* [HA], heavy-maintenance [HM], light-*ad libitum* [LiA] and light-maintenance [LiM]). 73
- Figure 3.2 Experimental design and overview nutrition during early and mid-to-late pregnancy of group 0 (G0) dams whose female offspring (group 1 [G1]) and grand offspring (group 2 [G2]) are used in Exp. 2. SmM = submaintenance fed from d 21 to 50 of pregnancy (P21–50) and then maintenance fed from d 50 to 140 of pregnancy

(P50–140); MM = maintenance fed throughout pregnancy, from d 21 to 140; AdM = *ad libitum* fed from d 21 to 50 of pregnancy and then maintenance fed from d 50 to 140 of pregnancy; SmAd = submaintenance fed from d 21 to 50 of pregnancy and then *ad libitum* fed from d 50 to 140 of pregnancy; MAd = maintenance fed from d 21 to 50 of pregnancy and then *ad libitum* fed from d 50 to 140 of pregnancy; AdAd = *ad libitum* fed throughout pregnancy, from d 21 to 140. Adapted from Paten *et al.* (2013 76

Figure 3.3 Pathway modelling showing the relationships between the measured ewe live weight at mating (LW_m), ewe BCS at mating (BCS_m), ewe live weight at set stocking (LW_{ss}), ewe BCS at set stocking (BCS_{ss}), accumulated ewe milk yield over a 42-d period, and combined twin lamb (birth weight [Bwt], live weight at Day 42, live weight gain from Day 0 to 42, live weight gain from Day 42 to weaning, live weight at weaning, live weight gain from birth to weaning, and age at weaning) variables from birth to weaning in Exp. 1 using estimates obtained from Pearson's correlation coefficients. †P < 0.001..... 82

Figure 3.4 Pathway modelling showing the relationships between the measured ewe live weight at mating (LW_m), ewe BCS at mating (BCS_m), ewe live weight at set stocking (LW_{ss}), ewe BCS at set stocking (BCS_{ss}), accumulated ewe milk yield over a 42-d period (MY), and combined twin lamb (birth weight [Bwt], live weight at Day 42, live weight gain from Day 0 to 42, live weight gain from Day 42 to weaning, live weight at weaning, live weight gain from birth to weaning, and age at weaning) variables from birth to weaning in Exp. 2 using estimates obtained from Pearson's correlation coefficients. **P < 0.01; †P < 0.001 83

Figure 3.5 Relationship between the accumulated ewe milk yield over a 42-day period and the combined live weight gain (from birth to day 42) (LWG_{0-42} ; kg) of twin lambs in experiment one..... 87

Figure 3.6 Relationship between the accumulated ewe milk yield over a 42-day period and the combined live weight gain (from birth to day 42) (LWG_{0-42} ; kg) of twin lambs in experiment two..... 87

Figure 4.1 Live weights of artificially reared lambs fed milk only (MO) and milk + pellets (MP) for 59 days. Asterisk (*) indicates significant differences in live weights of treatment groups at P < 0.05 from day 30 to day 45. Asterisk (**) indicates significant differences in live weights of treatment groups at P < 0.01 from day 48 to day 51. Asterisk (***) indicates significant differences in live weights of treatment groups at P < 0.001 from day 54 to average 59 days. Error bars = standard error of means..... 117

Figure 4.2 Individual lamb daily pellet intake of milk and pellet fed lambs over the study period. a to g represents individual lambs in the study. 118

Figure 4.3 Examples of liver of milk only (MO) and milk + pellet (MP) fed lambs at average 59 days of age. 120

Figure 4.4 Examples of reticulum of milk only (MO) and milk + pellet (MP) fed lambs at 59 days of age..... 120

Figure 4.5 Examples of (a) Rumen development and (b) histological differences in the rumen papillae length of the milk only (MO) and milk + pellets (MP) fed lambs at average 59 days of age. Histological slides stained with haematoxylin and eosin and photos taken at 2.5x magnification using a light microscope. 121

- Figure 4.6 Relationship between total pellet intake over the study period and rumen papillae length of the milk and pellet fed lambs at average 59 days of age (Papillae length = $929.9 (\pm 64.7) + 95.4 (\pm 6.8)$ pellet intake; $r^2 = 97.5\%$)..... 122
- Figure 5.1 Nitrogen (N; g) utilisation from milk and pellets consumed by artificially reared lambs offered incremental levels of pellets (0% [MO], 30% [MP₃₀], 60% [MP₆₀], and *ad libitum* [MP_{ad}]) in addition to milk replacer over four days at 17 kg live weight. 155
- Figure 5.2. Gross energy (GE; MJ) utilisation from milk and pellets consumed by artificially reared lambs offered incremental levels of pellets (0% [MO], 30% [MP₃₀], 60% [MP₆₀], and *ad libitum* [MP_{ad}]) in addition to milk replacer over four days at 17 kg live weight..... 156
- Figure 5.3 Relationship between total pellet intake and rumen papillae length of artificially reared lambs offered four levels of pellets (0% [MO], 30% [MP₃₀], 60% [MP₆₀], and *ad libitum* [MP_{ad}]) in addition to milk replacer to 18 kg live weight Papillae length = $741.8 (\pm 124.2) + 93.1 (\pm 24.56)$ pellet intake ($r^2 = 43\%$)..... 159
- Figure 5.4 A theoretical simulation model (solid lines) showing the crude protein (CP) to metabolisable energy (ME) requirements of lambs from 5 kg LW to 18 kg LW growing at 150 to 300 g /d. Short dashes represents actual CP:ME intake of artificially reared lambs offered four levels of pellets (*ad libitum* [MP_{ad}] or restricted to 0% [MO], 30% [MP₃₀] and 60% [MP₆₀], of the *ad libitum* intake) in addition to milk replacer from 5 kg LW to 18 kg LW growing at 180 g /d..... 163
- Figure 6.1 Graphic representation of the CP:ME intake ratio against the rate of protein and fat deposition in artificially reared lambs offered two protein levels in milk replacer (24% CP [NM]; 31.2% CP [HM]) and two protein levels in pellets (13.5% CP [LP]; 19.5% CP[HP]) up to 18 kg live weight; resulting in four treatment groups (NMLP, NMHP, HMLP and HMHP). 204
- Figure 6.2 Relationship between daily protein intake and rate of protein deposition in artificially reared lambs offered two protein levels in milk replacer (24% CP [NM]; 31.2% CP [HM]) and two protein levels in pellets (13.5% CP [LP]; 19.5% CP[HP]) up to 18 kg live weight; resulting in four treatment groups (NMLP, NMHP, HMLP and HMHP). PD_{max} = Maximum observed protein deposition..... 205
- Figure 7.1 The relationship between measured dry matter intake (DMI_{mea}) and predicted dry matter intake (DMI_{pre}) of pre-weaned lambs consuming milk and pellets concurrently. The solid (–) line depicts the equation: $DMI_{mea} = -6.18 (\pm 29.95) + 1.03 (\pm 0.09) DMI_{pre}$ ($R^2 = 0.79$; RPE = 15.09%; CCC = 0.88). The dashed (--) line depicts $DMI_{mea} = DMI_{pre}$ 230
- Figure 7.2 The relationship between measured organic matter intake (OMI_{mea}) and predicted organic matter intake (OMI_{pre}) of pre-weaned lambs consuming milk and pellets concurrently. The solid (–) line depicts the equation: $OMI_{mea} = -3.44 (\pm 27.24) + 1.05 (\pm 0.09) OMI_{pre}$ ($R^2 = 0.80$; RPE = 14.90%; CCC = 0.88). The dashed (--) line depicts $DMI_{mea} = DMI_{pre}$ 230
- Figure 7.3 The relationship between measured metabolisable energy intake (MEI_{mea}) and predicted metabolisable energy intake (MEI_{pre}) of pre-weaned lambs consuming milk and pellets concurrently. The solid (–) line depicts the equation: $MEI_{mea} = -0.26 (\pm$

0.45) + 1.02 (\pm 0.06) MEI _{pre} (R^2 =0.87; RPE = 9.48%; CCC = 0.93). The dashed (--) line depicts MEI _{mea} = MEI _{pre}	231
Figure 8.1 A schematic representation of energy and protein partitioning in a simple pre-weaned lamb growth model during artificial rearing. Upper solid box indicates the estimation of the initial body composition of lambs based on the baseline slaughter data from Chapters 5 and 6. Dashed boxes contain the model inputs. Arrows indicate the directional flow of parameters. PD _{max} = maximum protein deposition.	243
Figure 8.2 Comparison of the actual and simulated daily protein deposition rates of pre-weaned lambs consuming different milk and pellets combinations based on the proposed model. MO'13 = milk only (2013); MO'14 = milk only (2014); MP30'14 = milk + 30% of <i>ad libitum</i> pellets intake (2014); MP60'14 = milk + 60% of <i>ad libitum</i> pellets intake (2014); MPad'13 = pellets offered <i>ad libitum</i> (2013); MPad'14 = pellets offered <i>ad libitum</i> (2014); NMLP = normal-protein milk + low-protein pellet (2015); NMHP = normal-protein milk + high-protein pellet (2015); HMLP = high-protein milk + low-protein pellet (2015); HMHP = high-protein milk + high-protein pellet (2015). Error bars = standard error of means. **, *Simulated mean differs from actual mean at P < 0.05.	251
Figure 8.3 Comparison of the actual and simulated daily fat deposition rates of pre-weaned lambs consuming different milk and pellets combinations based on the proposed model. MO'13 = milk only (2013); MO'14 = milk only (2014); MP30'14 = milk + 30% of <i>ad libitum</i> pellets intake (2014); MP60'14 = milk + 60% of <i>ad libitum</i> pellets intake (2014); MPad'13 = pellets offered <i>ad libitum</i> (2013); MPad'14 = pellets offered <i>ad libitum</i> (2014); NMLP = normal-protein milk + low-protein pellet (2015); NMHP = normal-protein milk + high-protein pellet (2015); HMLP = high-protein milk + low-protein pellet (2015); HMHP = high-protein milk + high-protein pellet (2015). Error bars = standard error of means. **, ***Simulated mean differs from actual mean at P < 0.01, P < 0.001.....	252
Figure 8.4 Comparison of the actual and simulated daily water deposition rates of pre-weaned lambs consuming different milk and pellets combinations based on the proposed model. MO'13 = milk only (2013); MO'14 = milk only (2014); MP30'14 = milk + 30% of <i>ad libitum</i> pellets intake (2014); MP60'14 = milk + 60% of <i>ad libitum</i> pellets intake (2014); MPad'13 = pellets offered <i>ad libitum</i> (2013); MPad'14 = pellets offered <i>ad libitum</i> (2014); NMLP = normal-protein milk + low-protein pellet (2015); NMHP = normal-protein milk + high-protein pellet (2015); HMLP = high-protein milk + low-protein pellet (2015); HMHP = high-protein milk + high-protein pellet(2015). Error bars = standard error of means. *, **, ***Simulated mean differs from actual mean at P < 0.05, P < 0.01, P < 0.001.....	253
Figure 8.5 Comparison of the actual and simulated daily ash deposition rates of pre-weaned lambs consuming different milk and pellets combinations based on the proposed model. MO'13 = milk only (2013); MO'14 = milk only (2014); MP30'14 = milk + 30% of <i>ad libitum</i> pellets intake (2014); MP60'14 = milk + 60% of <i>ad libitum</i> pellets intake (2014); MPad'13 = pellets offered <i>ad libitum</i> (2013); MPad'14 = pellets offered <i>ad libitum</i> (2014); NMLP = normal-protein milk + low-protein pellet (2015); NMHP = normal-protein milk + high-protein pellet (2015); HMLP = high-protein milk + low-protein pellet (2015); HMHP = high-protein milk + high-protein pellet(2015). Error bars = standard error of means.	254

Figure 8.6 Comparison of the actual and simulated average daily gain of pre-weaned lambs consuming different milk and pellets combinations based on the proposed model. MO'13 = milk only (2013); MO'14 = milk only (2014); MP30'14 = milk + 30% of *ad libitum* pellets intake (2014); MP60'14 = milk + 60% of *ad libitum* pellets intake (2014); MPad'13 = pellets offered *ad libitum* (2013); MPad'14 = pellets offered *ad libitum* (2014); NMLP = normal-protein milk + low-protein pellet (2015); NMHP = normal-protein milk + high-protein pellet (2015); HMLP = high-protein milk + low-protein pellet (2015); HMHP = high-protein milk + high-protein pellet(2015). Error bars = standard error of means. *Simulated mean differs from actual mean at $P < 0.05$ 255

Figure 8.7 Comparison of the actual and simulated daily fat deposition rates of pre-weaned lambs consuming different milk and pellets using maintenance energy requirement values of 0.34 MJ ME / kg LW^{0.75} for lambs with restricted access to pellets and 0.45 MJ ME / kg LW^{0.75} for lambs with *ad libitum* access to pellets. MO'13 = milk only (2013); MO'14 = milk only (2014); MP30'14 = milk + 30% of *ad libitum* pellets intake (2014); MP60'14 = milk + 60% of *ad libitum* pellets intake (2014); MPad'13 = pellets offered *ad libitum* (2013); MPad'14 = pellets offered *ad libitum* (2014); NMLP = normal-protein milk + low-protein pellet (2015); NMHP = normal-protein milk + high-protein pellet (2015); HMLP = high-protein milk + low-protein pellet (2015); HMHP = high-protein milk + high-protein pellet (2015). Error bars = standard error of means. *Simulated mean differs from actual mean at $P < 0.05$ 256

Figure 9.1 Live weights of lambs in the first 60 days of life from the three artificial rearing studies conducted in this thesis. MO'13 = milk only; MPad'13 = pellets offered *ad libitum*, MO'14 = milk only; MP30'14 = milk + 30% of *ad libitum* pellets intake; MP60'14 = milk + 60% of *ad libitum* pellets intake; MPad'14 = pellets offered *ad libitum*, NMLP = normal-protein milk + low-protein pellet; NMHP = normal-protein milk + high-protein pellet; HMLP = high-protein milk + low-protein pellet; HMHP = high-protein milk + high-protein pellet ('number = year of study). 271

Figure 9.2. The effect of different metabolisable energy intake levels on protein deposition in lambs during the pre-weaning phase of growth. "A" represents protein deposition response in lambs to increasing ME intake, "B" and "C" = represents protein deposition response in lambs at similar ME intake but higher protein to energy intake ratio. MO'13 = milk only; MPad'13 = pellets offered *ad libitum*, MO'14 = milk only; MP30'14 = milk + 30% of *ad libitum* pellets intake; MP60'14 = milk + 60% of *ad libitum* pellets intake; MPad'14 = pellets offered *ad libitum*, NMLP = normal-protein milk + low-protein pellet; NMHP = normal-protein milk + high-protein pellet; HMLP = high-protein milk + low-protein pellet; HMHP = high-protein milk + high-protein pellet ('number = year of study). Error bars = standard error of means. 275

Figure 9.3 The relationship between CP:ME ratio and protein deposition in lambs during the pre-weaning phase of growth. MO'13 = milk only; MPad'13 = pellets offered *ad libitum*, MO'14 = milk only; MP30'14 = milk + 30% of *ad libitum* pellets intake; MP60'14 = milk + 60% of *ad libitum* pellets intake; MPad'14 = pellets offered *ad libitum*, NMLP = normal-protein milk + low-protein pellet; NMHP = normal-protein milk + high-protein pellet; HMLP = high-protein milk + low-protein pellet; HMHP = high-protein milk + high-protein pellet ('number = year of study). Error bars = standard error of means. 276

Figure 9.4. The effect of different metabolisable energy intake levels on fat deposition in lambs during the pre-weaning phase of growth. “A” and “B” represents fat deposition response in lambs to increasing ME intake in Romney and Suffolk lambs, respectively “C” represents fat deposition response in lambs at similar ME intake but different protein to ME ratios in Romney lambs. MO’13 = milk only; MPad’13 = pellets offered *ad libitum*, MO’14 = milk only; MP30’14 = milk + 30% of *ad libitum* pellets intake; MP60’14 = milk + 60% of *ad libitum* pellets intake; MPad’14 = pellets offered *ad libitum*, NMLP = normal-protein milk + low-protein pellet; NMHP = normal-protein milk + high-protein pellet; HMLP = high-protein milk + low-protein pellet; HMHP = high-protein milk + high-protein pellet (’number = year of study). Error bars = standard error of means. 277

Figure 9.5 The effect of varying the crude protein to metabolisable energy (CP:ME) ratio on fat deposition in lambs during the pre-weaning phase of growth. “A” and “C” represents fat deposition response in lambs to increasing CP:ME intake ratios in Romney lambs. “B” represents fat deposition response in lambs to increasing CP:ME intake ratios in Suffolk lambs. MO’13 = milk only; MPad’13 = pellets offered *ad libitum*, MO’14 = milk only; MP30’14 = milk + 30% of *ad libitum* pellets intake; MP60’14 = milk + 60% of *ad libitum* pellets intake; MPad’14 = pellets offered *ad libitum*, NMLP = normal-protein milk + low-protein pellet; NMHP = normal-protein milk + high-protein pellet; HMLP = high-protein milk + low-protein pellet; HMHP = high-protein milk + high-protein pellet (’number = year of study). Error bars = standard error of means. 278

Figure 9.6 The relationship between CP:ME ratio and fat:protein deposition rate in lambs during the pre-weaning phase of growth. MO’13 = milk only; MPad’13 = pellets offered *ad libitum*, MO’14 = milk only; MP30’14 = milk + 30% of *ad libitum* pellets intake; MP60’14 = milk + 60% of *ad libitum* pellets intake; MPad’14 = pellets offered *ad libitum*, NMLP = normal-protein milk + low-protein pellet; NMHP = normal-protein milk + high-protein pellet; HMLP = high-protein milk + low-protein pellet; HMHP = high-protein milk + high-protein pellet (’number = year of study). Error bars = standard error of means. 279

Figure 9.7 Comparison of the observed and predicted average daily gain of pre-weaned lambs consuming different milk and pellets using a maintenance energy requirement of 0.34 MJ ME/kg LW^{0.75} across treatment groups MO’13 = milk only; MPad’13 = pellets offered *ad libitum*, MO’14 = milk only; MP30’14 = milk + 30% of *ad libitum* pellets intake; MP60’14 = milk + 60% of *ad libitum* pellets intake; MPad’14 = pellets offered *ad libitum*, NMLP = normal-protein milk + low-protein pellet; NMHP = normal-protein milk + high-protein pellet; HMLP = high-protein milk + low-protein pellet; HMHP = high-protein milk + high-protein pellet (’number = year of study). Error bars = standard error of means *· **· ***Simulated mean differs from actual mean at P < 0.05, P < 0.01, P < 0.001. 280

