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**DEVELOPMENT OF MODELS FOR THE GENETIC  
IMPROVEMENT OF DAIRY CATTLE UNDER COOPERATIVE  
DAIRYING CONDITIONS IN BANGLADESH**

A thesis presented in partial fulfillment of the  
requirements for the degree of  
Doctor of Philosophy  
in  
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New Zealand

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**This thesis is dedicated to my late parents**



## **ABSTRACT**

The aim of this thesis is to enquire into genetic approaches for improving milk yield from dairy cattle in order to overcome the milk shortage in Bangladesh. Survey work on the dairy industry was carried out to reveal its current status. The collected data of different genotypes (Pabna cattle, Australian-Friesian-Sahiwal  $\times$  Pabna, Holstein  $\times$  Pabna, Jersey  $\times$  Pabna, and Sahiwal  $\times$  Pabna) from 1999 to 2001, and in two seasons, were used to predict model parameters, fit-statistics and total lactation yields, by fitting ten lactation curve models. Best fitting model(s) were chosen on the basis of fit-statistics. The input parameters from best fitting model(s) were used for: developing a deterministic model; estimating the profitability of individual cows; estimating whole farm profitability; and for developing a profit function to estimate the economic values of traits in breeding objectives. The individual cow performances for different traits were stochastically simulated in respect of additive genetic, permanent and temporary error, herd and age effects, and mendelian sampling under progeny and parent-average testing breeding schemes based on three selection objectives applied over on 20 year period. Genetic gains in different traits were calculated from the regression of trait values on the selection index.

The estimated lactation curves model parameters, and predicted lactation milk yield were significantly different between breeds, years and seasons. From four fit-statistics values, the CCC value was considered superior, and this value indicated that the Nelder model best represented the test day records. The net annual income for Holstein  $\times$  Pabna cattle was the highest (US\$229) and was lowest (US\$115) for Pabna cattle, while all other genotypes were intermediate. The economic values (EVs) of milk yield for all genotypes were similar (US\$0.32), and due to payment for milk volume only, the EVs of fat and protein were negative. EVs of liveweight, calving intervals and calving rate were negative, but survivability was positive in all genotypes. The parent-average testing selection scheme showed higher genetic gains than progeny testing. The highest (US\$15.80) genetic gain was obtained for milk yield when selection was for milk merit only.

The study will assist in undertaking a genetic improvement programme for the increase of milk production in Bangladesh and thereby enhance food security.

**(Key words:** Dairy cattle, genetic improvements, models, stochastic).



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## TABLE OF CONTENTS

	page
<b>ABSTRACT</b>	
<b>TABLE OF CONTENTS</b>	i
<b>LIST OF FIGURES</b>	ix
<b>LIST OF TABLES</b>	xi
<b>CHAPTER ONE</b>	1
<b>1 General Introduction</b>	1
<b>CHAPTER TWO</b>	8
<b>2 Review of Literature</b>	8
2.1 Mathematical models for the lactation curves	10
2.1.1 Introduction	10
2.1.2 Lactation curves	10
2.1.3 Types of lactation curves	10
2.1.4 Model selection on the basis of the shape of the curve and the fit statistics	11
2.1.5 Development of lactation curve	12
2.1.6 Summary	15
2.2 Farm models	16
2.2.1 Models	16
2.2.2 Use and classification of models	16
2.2.3 Simulation models	17
2.2.4 Modelling process	18
1 Define the systems and the modelling objectives	19
2 Data analysis	19
3 Model construction	19
4 Validation of the model	19
5 Sensitivity analysis	20
6 Model application	20
2.2.5 Multitrait simulation models for selection index	20
2.2.6 Summary	22

2.3	Dairy industry structures	22
2.3.1	Closed nucleus breeding scheme	23
2.3.2	Open nucleus breeding scheme	25
2.3.3	Summary	27
2.4	Development of breeding objectives for dairy cattle breeding and derivation of economic values	27
2.4.1	Specifying the breeding, production and marketing system(s)	29
2.4.2	Identification of sources of income and expenditures	31
2.4.3	Biological traits influencing revenue and costs	32
2.4.4	Derivation of economic values	33
2.4.5	Selection criteria	40
2.4.6	Phenotypic and genetic parameters	41
2.4.7	Methods of selection	42
2.4.8	Summary	44
2.4.9	Genetic gains	45
2.4.10	Summary	50
2.4.11	Conclusion	50
2.5	References	53
<b>CHAPTER THREE</b>		73
<b>3</b>	<b>Review of Bangladesh Dairy Production Systems, including Crossbreeding and a Study of the Production, Processing and Marketing of Cooperative Dairying in Bangladesh</b>	73
3.1	Basic concept of Bangladesh	74
3.1.1	Geography and climate of Bangladesh	74
3.1.2	Contribution of the agriculture and livestock sub-sector, to the economy of Bangladesh	75
3.1.3	Land use in Bangladesh	75
3.1.4	Dairy farming in Bangladesh	75
3.1.5	Increased cattle/buffalo numbers and reasons	76
3.2	Dairy production, processing and marketing systems in Bangladesh	76
3.2.1	Breeding and improvement	76
3.2.2	Cattle feeds and feeding	77
3.2.3	Processing and marketing of milk and milk products	78

3.2.4	Breeding, production and marketing system under cooperative dairying in Bangladesh	79
3.2.4.1	Breeds and dairy cattle improvement programme under BMPCUL	80
3.2.4.2	Dairy production systems under BMPCUL	81
3.2.4.3	Feeding and management for dairy cows	82
3.2.4.3.1	Bathan and Bathan management	83
3.2.5	Production and demand of milk throughout the year	84
3.2.6	Summary	86
3.3	Crossbreeding	87
3.3.1	Productive and reproductive performances of crossbreds	87
3.3.2	Economic evaluation of crossbreeding in tropics	90
3.3.3	Summary	91
3.4	A survey of dairy production under cooperative dairying	92
3.4.1	Collection of experimental data	92
3.4.2	Results and discssion	93
3.4.2.1	Breed and age groups	93
3.4.2.2	Housing	95
3.4.2.3	Feeds and fodder	95
3.4.2.4	Liveweight	95
3.4.2.5	Milk production characteristics of different genotypes	96
3.4.2.6	Survivability of different breeds under cooperative dairying conditions	99
3.4.2.7	Breeding	100
3.4.2.8	Processing and price of milk	100
3.4.2.9	Dairy products	101
3.4.2.10	Labour	101
3.4.2.11	Farm economics	101
3.4.2.12	Major constraints for Bangladesh cooperative dairy operation	104
3.4.2.13	Summary	104
3.5	Remarks	105
3.6	References	106

<b>CHAPTER FOUR</b>	114
<b>4 Lactation Curves of Different Cattle Breeds under Cooperative Dairying</b>	114
<b>Conditions in Bangladesh</b>	
4.1 Abstract	115
4.2 Introduction	116
4.3 Materials and methods	118
4.3.1 Data sources	118
4.3.2 Lactation equations	119
4.3.3 Statistical analysis	122
4.4 Results	125
4.4.1 Lactation milk yield and lactation curve of different breeds	125
4.4.2 Effects of genotypes	125
4.4.2.1 Shape of lactation curves	125
4.4.2.2 Model performance	126
4.4.2.3 Model parameters	127
4.4.2.4 Predicted lactation milk yield	127
4.4.3 Effects of years and seasons	128
4.4.3.1 Model performance	128
4.4.3.2 Model parameters	129
4.4.3.3 Predicted lactation milk yield	129
4.5 Discussion	137
4.5.1 Lactation milk yield of different breeds	137
4.5.2 Models of lactation curves for different genotypes	137
4.5.2.1 Shape of lactation curve	137
4.5.2.2 Model performance	139
4.5.3 Effects of years and seasons	140
4.6 Conclusion	141
4.7 References	142

<b>CHAPTER FIVE</b>	148
<b>5 Development of a Deterministic Dynamic Model to Estimate Individual Cow and Farm Profit for Dairy Farming under Cooperative Dairying in Bangladesh</b>	148
5.1 Abstract	149
5.2 Introduction	150
5.3 General concepts	152
5.4 Model structure and programming	153
5.5 Herd structure	153
5.6 Stock reconciliation	155
5.7 Feeds and feeding of animals under cooperative dairying	155
5.8 Number of milking cows and milk yield	156
5.9 Birth weight	157
5.10 Liveweight	157
5.11 Description of cow requirements model	157
5.12 Energy and dry matter requirements	157
5.13 Cow maintenance	158
5.14 Cow growth	159
5.15 Cow gestation	159
5.16 Cow lactation	159
5.17 Calf requirements	160
5.18 Stocking rate	161
5.19 Biological efficiency	161
5.20 Economic analysis	161
5.21 Revenue	162
5.21.1 Revenue from calves	162
5.21.2 Revenue from culled heifers	162
5.21.3 Revenue from culled cows	163
5.21.4 Revenue from sales of milk	163
5.21.5 Revenue from draught	163
5.21.6 Revenue from manure	164

5.22	Costs	164
5.22.1	Feeding costs	164
5.22.2	Health costs	165
5.22.3	Labour costs	165
5.22.4	Capital recurrent costs	165
5.22.5	Fixed costs	166
5.22.6	Marketing costs	166
5.23	Results	167
5.23.1	Costs, feed requirements revenue and profit	167
5.23.2	Total farm income	167
5.23.3	Capital investment returns	169
5.24	Discussion	171
5.24.1	Model establishment	171
5.24.2	Costs, revenue and profits	171
5.24.3	Total farm income	173
5.24.4	Income from draft and manure	174
5.24.5	Return on investment	175
5.24.6	Limitation of the current model	175
5.25	Conclusion	175
5.26	References	177
<b>CHAPTER SIX</b>		182
<b>6</b>	<b>Economic Values for Traits in the Breeding Objective and Prediction of Genetic Gains</b>	182
6.1	Abstract	183
6.2	Introduction	184
6.3	Methods	187
6.3.1	Model description and definition	187
6.3.2	Returns	188
6.3.3	Energy and dry matter requirements	189
6.3.4	Total herd requirements for ME	191
6.3.5	Phenotypic and genotypic parameters	191
6.3.6	Developing the selection index	191

6.3.7	Genetic gain in individual traits in the breeding objective	193
6.3.8	Sensitivity analysis	193
6.4	Results	195
6.4.1	Costs, revenues and profit	195
6.4.2	Economic values	195
6.4.3	Selection index and genetic gain per cow	197
6.4.4	Sensitivity analysis	198
6.5	Discussion	201
6.5.1	Costs, revenues and profit	201
6.5.2	Economic values for milk production and reproduction traits	201
6.5.3	Economic values for mature liveweight and birth weight	203
6.5.4	Economic values for survivability	204
6.5.5	Economic values of different traits when milk payment based on milk, fat and protein value	204
6.5.6	Selection index and genetic gain	205
6.5.7	Sensitivity analysis	205
6.6	Summary	208
6.7	References	209
<b>CHAPTER SEVEN</b>		216
<b>7</b>	<b>Multitrait Simulation Modelling for the Dairy Cattle Improvement under Cooperative Dairying Conditions in Bangladesh</b>	216
7.1	Abstract	217
7.2	Introduction	218
7.3	Materials and methods	220
7.3.1	Simulation of breeding values and phenotypic observations	220
7.3.2	Population structure	226
7.3.3	Genetic evaluation	227
7.3.4	Selection by using pedigree information	230
7.3.5	Selection by using progeny testing	230
7.3.6	Scenarios between selection objectives and selection schemes	231
7.3.7	Correlated response to selection	233
7.3.5	Genetic gain calculated deterministically	233

7.4	Results	234
7.4.1	Shape of the curves for responses of different traits	234
7.4.2	Responses of different traits in cows vs. bulls	235
7.4.3	Responses of traits under different selection objectives and the breeding schemes	236
7.4.4	Responses of individual traits	237
7.4.5	Stochastic vs. deterministic responses	239
7.4.6	Correlated responses	239
7.5	Discussion	245
7.5.1	Shape of the curves for responses of different traits	245
7.5.2	Responses of different traits in cows vs. bulls	246
7.5.3	Responses of traits under different selection objectives and breeding schemes	246
7.5.4	Genetic gain in individual traits	247
7.5.5	Stochastic vs. deterministic responses	248
7.5.6	Correlated responses	248
7.6	Conclusion	249
7.7	References	250
	<b>CHAPTER EIGHT</b>	253
<b>8</b>	<b>General Discussion</b>	253
8.1	General discussion	254
8.2	Meeting milk demand in Bangladesh	255
8.3	Dairy cattle genetic improvement programme	257
8.3.1	Description of the production system(s)	257
8.3.2	Objectives of the breeding systems	258
8.3.3	Breeding systems and choice of breeds	259
8.3.4	Selection parameters and economic values	260
8.3.5	Develop selection criteria	261
8.3.6	Animal evaluation and comparisons breeding schemes	262
8.4	Functional traits	263
8.5	Main findings and recommendations	264
8.6	References	267

## LIST OF FIGURES

<b>Figure</b>	<b>page</b>
Figure 3.1 Map of Bangladesh	74
Figure 3.2 Animal shed of government dairy farm (Savar Dairy Farm).	77
Figure 3.3 Fodder field under government dairy farm (Savar Dairy Farm).	78
Figure 3.4 Processing and marketing of milk and milk products in Bangladesh	79
Figure 3.5 A typical Pabna cow	81
Figure 3.6 Pabna cattle and local Deshi cattle are grazing on <i>Bathan</i> land	82
Figure 3.7 Pabna cattle and its crossbreds are in stall feeding condition during wet season	83
Figure 3.8 Yearly total milk production of Bangladesh (FAO, July, 2004)	85
Figure 3.9 Production demand and deficit of milk and meat (DLS, 2000)	86
Figure 3.10 Number of milking cows per house throughout the year in Baghabarighat milk shed area	97
Figure 3.11 Milk yield (tones) per house throughout the year in Baghabarighat milk shed area	97
Figure 4.1 Lactation curve of different genotype of cow under cooperative dairying in Bangladesh	130
Figure 4.2 Lactation curves for Pabna cows. Lines were obtained by fitting the candidate functions: Ganies, Wood, Polynomials, Legendre Polynomials, Ali and Schaeffer polynomial, Nelder, Sikka, Wilmink, Rook and Dijkstra equations	131
Figure 4.3 Lactation curves for Hosltein $\times$ Pabna cows. Lines were obtained by fitting the candidate functions: Ganies, Wood, Polynomials, Legendre Polynomials, Ali and Schaeffer polynomial, Nelder, Sikka, Wilmink, Rook and Dijkstra equations	132
Figure 5.1 Schematic representation of major components of the dairy farm model	152
Figure 5.2 Structure of the dairy farm model	153
Figure 5.3 Milking cows (%) and total milk yield (%) throughout the year in Baghabarighat milk shed area in 2005	156

Figure 7.1	Average economic merit (US\$) with standard deviation (bar) for milk yield under parent average testing (PAT) and progeny testing (PT) breeding schemes with a selection objective of milk merit for all cows born in a particular year	235
Figure 7.2	Average economic merit (US\$) with std. deviation (bar) for milk yield under parent average testing (PAT) and progeny testing (PT) breeding schemes with a selection objective of milk and survivability merit for all cows born in a particular year	236
Figure 7.3	Average economic merit (US\$) with standard deviation (bar) for milk yield under parent average testing (PAT) and progeny testing (PT) breeding schemes with a selection objective of total merit for all cows born in a particular year	237
Figure 7.4	Average economic merit (US\$) with standard deviation (bar) for milk yield under parent average testing (PAT) and progeny testing (PT) breeding schemes with a selection objective of milk merit for selected bulls born in a particular year	238
Figure 7.5	Average economic merit (US\$) with std. deviation (bar) for milk yield under parent average testing (PAT) and progeny testing (PT) breeding schemes with a selection objective of milk and survivability merit for selected bulls born in a particular year	238
Figure 7.6	Average economic merit (US\$) with standard deviation (bar) for milk yield under parent average testing (PAT) and progeny testing (PT) breeding schemes with a selection objective of total merit for selected bulls born in a particular year	239

**LIST OF TABLES**

<b>Tables</b>	<b>page</b>
Table 2.1 Economic values for milk production traits obtained after per unit change of trait	36
Table 2.2 Economic values for milk production traits obtained after a 1% increase in genetic merit	37
Table 2.3 Economic values of milk production traits obtained after quota, and in market conditions	38
Table 3.1 Productive and reproductive performance of different cattle breeds in Bangladesh	88
Table 3.2 Survivability (%) in different age groups of Sahiwal, N'Dama, Ayrshire, Africal Zebu, Jersey × N'Dama, Friesian × Tharparker and Friesian × Sahiwal genotypes in India and Ivory Coast	89
Table 3.3 Productive and reproductive performance of different genotypes of cattle in tropical countries other than Bangladesh	89
Table 3.4 The economic evaluation (\$ per day) of different dairy cow genotypes in tropical countries	91
Table 3.5 Breed composition on cooperative dairying farms in Baghabarighat milk-shed area from a survey of 50 farms	93
Table 3.6 Age distribution of milking and dry cows (number) within breed from a survey on 50 cooperative dairy farms in Bangladesh	94
Table 3.7 Estimated milk production characteristics and mature liveweight ( $\pm$ SE) of different genotypes under BMPCUL area	98
Table 3.8 Survivability (%) of different genotypes of dairy cattle in Bangladesh	100
Table 3.9 Market prices of different dairy products in year 2005 (1US\$ = Taka 70)	101
Table 3.10 Annual farm production characteristics, revenue and expenditure (in BD Taka) determined from BMPCUL farms in 2005 (1US\$ = Taka 70)	103
Table 4.1 Mathematical equations used to describe the lactation curve of dairy cows	121
Table 4.2 Effects of parameters on curve shapes	123
Table 4.3 The number of cows, lactation yield and lactation length of different breed groups as calculated by BMPCUL staff	125
Table 4.4 Comparison of model performance using different fit statistics ( $\pm$ standard error)	133

Table 4.5	Parameter estimates and other measures when models were fitted to the different breed groups under cooperative dairying in Bangladesh ( $\pm$ std. error)	134
Table 4.6	Comparisons of the predicted lactation milk yield of the different breed groups by using ten different lactation models	136
Table 5.1	Survivability of different genotypes in different age groups (information from survey presented in Chapter 3).	154
Table 5.2	Herd-level production variables	158
Table 5.3	Unit prices and costs (Based on information presented in Chapter 3)	165
Table 5.4	Feed requirements, costs, revenue and income from different breed groups	168
Table 5.5	Net farm income per year for a mixed herd <sup>1</sup> of 100 cows	169
Table 5.6	Capital investment returns (US\$) per 100 cows	170
Table 6.1	Herd-level production variables assumed for the models	190
Table 6.2	Heritability, repeatability, phenotypic and genotypic correlations of traits of different genotypes	192
Table 6.3	Costs, revenues and profit from different breed groups	195
Table 6.4	Economic values (US\$ per unit) for different genotypes on the basis of per tonne feed dry matter	196
Table 6.5	Economic values (US\$ per unit) for different genotypes on a per cow basis	196
Table 6.6	Economic values (US\$ per unit) for different genotypes on a per cow basis when milk payment is based on the value of fat and protein yield and with a penalty for milk volume	197
Table 6.7	Index weighting factors, index values and genetic gains (per i) for individual traits of the breeding objective for different genotypes	198
Table 6.8	Sensitivity analysis of economic values for milk production and reproduction traits in different genotypes on per cow basis when the milk payment to farmers is on milk volume only	199
Table 6.9	Sensitivity analysis with changes of $\pm 20\%$ price levels of fat+protein together of economic values for milk production and reproduction traits in different genotypes on per cow basis when the milk payment is based on the value of fat and protein yield and with a penalty for milk volume	200
Table 7.1	Simulated traits, their means, standard deviations, economic values and age effects	222
Table 7.2	Genotypic and phenotypic correlations between traits used in the model. Genotypic correlations are shown above the diagonal, heritabilities on the diagonal (bold) and phenotypic correlations below the diagonal	225

Table 7.3	Genotypic variance-covariance structure of different traits used in the simulation model. Genotypic covariances are shown above the diagonal and variances on the diagonal	225
Table 7.4	Environmental correlations between traits used in the model	225
Table 7.5	Environmental variance-covariance structures of different traits used in the simulation model. Environmental covariances are shown above the diagonal and variances on the diagonal	226
Table 7.6	Permanent environmental variance-covariance structure of different traits used in the simulation model. Permanent environmental covariances are shown above the diagonal and variances on the diagonal	226
Table 7.7	Population biological and technical parameters for the simulation study	227
Table 7.8	Mean and standard error (se) of genetic gain ( $\Delta g$ ) in US\$ per year and $R^2$ value of milk traits, liveweight and longevity of the simulated cow population under parent average testing and progeny testing selection schemes with a selection objective for milk merit	240
Table 7.9	Mean and standard error (se) of genetic gain ( $\Delta g$ ) in US\$ per year and $R^2$ value of milk traits, liveweight and longevity of the simulated cow population under parent average testing and progeny testing selection schemes with a selection objective for milk and survivability merit	241
Table 7.10	Mean and standard error (se) of genetic gain ( $\Delta g$ ) in US\$ per year and $R^2$ of milk traits, liveweight and longevity of the simulated cow population under parent average testing and progeny testing selection schemes with a selection objective for total merit	242
Table 7.11	Mean and standard error (se) of genetic gain ( $\Delta g$ ) in US\$ per year and $R^2$ of milk traits, liveweight and longevity of the simulated breeding bulls under different breeding schemes in three selection objectives	243
Table 7.12	Annual rate of genetic gain ( $\Delta g$ ) for different traits by a deterministic approach in consideration of the four pathways of selection	244
Table 7.13	Correlated response ( $CR_Y$ ) with longevity and other traits in consideration of two breeding schemes within three selection objectives	244
Table 8.1	Estimated lactation milk production (mean $\pm$ standard deviation) of available breed groups in bangladesh	255
Table 8.2	Sensitivity analysis with various percent of rate of genetic gain ( $\Delta g$ ) for milk yield per year per cow irrespective of breed groups	256

**APPENDIX**

<b>APPENDIX ONE</b>		273
Production, processing and marketing systems of cooperative dairying in Bangladesh		273
A.1.1 Production, processing and marketing systems of cooperative dairying in Bangladesh		274
A.1.2 Individual cow performance		284
A.1.2.a Reproductive performance		284
A.1.2.b Milk production performance		285
<b>APPENDIX TWO</b>		286
A The effects of calving years (1999 to 2001), seasons (dry and wet) and their interactions with different genotypes on the parameters of ten different mathematical models, goodness of fit (AIC, $R^2$ , CCC and RMSPE) statistics and the predicted milk yields		286
Table A 2.1 Least square means ( $\pm$ SE) of different parameters (a,b,c,d and k), fit statistics and predicted milk yield for the Gaines model		287
Table A 2.2 Least square means ( $\pm$ SE) of different parameters (a,b,c,d and k), fit statistics and predicted milk yield for the Wood model		288
Table A 2.3 Least square means ( $\pm$ SE) of different parameters (a,b,c,d and k), fit statistics and predicted milk yield for the Polynomial model		289
Table A 2.4 Least square means ( $\pm$ SE) of different parameters (a,b,c,d and k), fit statistics and predicted milk yield for the Sikka model		290
Table A 2.5 Least square means ( $\pm$ SE) of different parameters (a,b,c,d and k), fit statistics and predicted milk yield for the Ali polynomials		291
Table A 2.6 Least square means ( $\pm$ SE) of different parameters (a,b,c,d and k), fit statistics and predicted milk yield for the Legendre polynomial		292
Table A 2.7 Least square means ( $\pm$ SE) of different parameters (a,b,c,d and k), fit statistics and predicted milk yield for the Nelder model		293
Table A 2.8 Least square means ( $\pm$ SE) of different parameters (a,b,c,d and k), fit statistics and predicted milk yield for the Wilmink model		294
Table A 2.9 Least square means ( $\pm$ SE) of different parameters (a,b,c,d and k), fit statistics and predicted milk yield for the Rook model		295
Table A 2.10 Least square means ( $\pm$ SE) of different parameters (a,b,c,d and k), fit statistics and predicted milk yield for the Dijkstra model		296

<b>B</b>	Figures of lactation curves for different genotypes by fitting 10 different lactation curves	297
Figures 4.3	Lactation curves for Australian-Friesian-Sahiwal × Pabna cows. Lines were obtained by fitting the candidate functions: Gaines, Wood, Polynomials, Legendre Polynomials, Ali and Schaeffer polynomial regression, Nelder, Sikka, Wilmink, Rook and Dijkstra equations.	298
Figure 4.4	Lactation curves for Jersey × Pabna cows. Lines were obtained by fitting the candidate functions: Gaines, Wood, Polynomials, Legendre Polynomials, Ali and Schaeffer polynomial regression, Nelder, Sikka, Wilmink, Rook and Dijkstra equations.	299
Figure 4.5	Lactation curves for Sahiwal × Pabna. Lines were obtained by fitting the candidate functions: Gaines, Wood, Polynomials, Legendre Polynomials, Ali and Schaeffer polynomial regression, Nelder, Sikka, Wilmink, Rook and Dijkstra equations	300
<b>APPENDIX THREE</b>		301
A	SAS code for multitrait stochastic simulation model	301
B	Average economic merit (US\$) with standard deviation (bar) for fat, protein, liveweight and longevity under progeny and parent average testing breeding scheme with three different selection objectives	311
Figure B 7.7	Average economic merit (US\$) with standard deviation (bar) for different traits under parent average testing (PAT) and progeny testing (PT) breeding schemes with a selection objective of milk merit for all cows born in a particular year	312
Figure B 7.8	Average economic merit (US\$) with standard deviation (bar) for different traits under parent average testing (PAT) and progeny testing (PT) breeding schemes with a selection objective of milk and survival merit for all cows born in a particular year	313
Figure B 7.9	Average economic merit (US\$) with standard deviation (bar) for different traits under parent average testing (PAT) and progeny testing (PT) breeding schemes with a selection objective of total merit for all cows born in a particular year	314

- Figure B 7.10 Average economic merit (US\$) with standard deviation (bar) for 315  
different traits under parent average testing (PAT) and progeny testing  
(PT) breeding schemes with a selection objectives milk merit for the  
selected bulls born in a particular year
- Figure B 7.11 Average economic merit (US\$) with standard deviation (bar) for 316  
different traits under parent average testing (PAT) and progeny testing  
(PT) breeding schemes with a selection objective of milk and survival  
merit for the selection bulls born in a particular year
- Figure B 7.12 Average economic merit (US\$) with standard deviation (bar) for 317  
different traits under parent-average testing (PAT) and progeny testing  
(PT) breeding schemes with a selection objective of total merit for the  
selected bulls born in a particular year