7 APPENDINCES

Appendix I: Cow Lifetime Card

Farm/animal Indentification and breeding/reproduction section

THE REPUBLIC OF UGANDA

UGANDA NATIONAL DAIRY HERD RECORDING SCHEME

"COW LIFETIME CARD"

IDENTIFICATION

FARMER/FAMILY NAMES: NJUYARWO MOLLY KATE

FARM & CODE NUMBER: _____ ADDRESS: P.O. BOX SEETA, MUKONO

DISTRICT & CODE NUMBER: MUKONO COUNTY: GGOMA

COW NAME: BIRUNGI	DAM NAME: EVA
NUMBER: 3822	NUMBER: 523
BREED: FRIESIAN	BREED: FRIESIAN
BIRTH DATE: 20.11.95	SIRE NAME:
DATE ANIMAL RECEIVED:	NUMBER:
SOURCE: BORN ON THE FARM	BREED:

BREEDING / REPRODUCTION INFORMATION

(AGE AT FIRST SERVICE: 14 1/2 MONTHS)

PARITY NUMBER: ..... DATE LAST CALVING: .....

DATES ON HEAT	21.01.97				
SERVICED DATES	21.01.97				
BULL (NAME/EAR TAG)					
(BREED AND OWNER)	FRIESIAN				
AI (SIRE NAME/NUMBER, BREED)	KALUNDA				
PREG CHECK: DATE DONE & VET.	21.04.97				
RESULT & STAGE	+VE				
ABORTION (DATE/STAGE)					
PROJECTIONS - DATE TO DRY					
- DATE TO STEAM UP	25.07.97				
- DATE TO CALVE	21.10.97				

PARITY NUMBER: 1 DATE LAST CALVING: 23.10.97

DATES ON HEAT	24.03.98	20.04.98	02.05.98	25.07.98	
SERVICED DATES	24.03.98	21.04.98	02.05.98	25.07.98	
BULL (NAME/EAR TAG)					
(BREED AND OWNER)	FRIESIAN				
AI (SIRE NAME/NUMBER, BREED)	SAINT AMERICA 842539	ST. AMERICA 842539	ST. AMERICA 842539	BOXER	
PREG CHECK: DATE DONE & VET.				05.12.98	
RESULT & STAGE					
ABORTION (DATE/STAGE)					
PROJECTIONS - DATE TO DRY				30.01.99	
- DATE TO STEAM UP				10.02.99	
- DATE TO CALVE				04.05.99	

Breeding/reproduction section (continued)

Page 2

REPRODUCTION INFO ... continued

PARITY NUMBER 2	DATE LAST CALVING 03. 05. 99				
DATES ON HEAT	01. 08. 99				
SERVICED DATES	01. 08. 99				
BULL (NAME/EAR TAG)					
(BREED AND OWNER)	FRIESIAN				
AI (SIRE NAME/NUMBER, BREED)	0107K				
PREG CHECK: DATE DONE & VET.					
RESULT & STAGE					
ABORTION (DATE/STAGE)					
PROJECTIONS - DATE TO DRY	07.03.00				
- DATE TO STEAM UP	20. 03. 00				
- DATE TO CALVE	07. 05. 00				
Real date	12. 05. 2000				

PARITY NUMBER 3	DATE LAST CALVING 12. 05. 00				
DATES ON HEAT	22. 06. 00	02. 11. 00			
SERVICED DATES	23. 06 00	03. 11. 00			
BULL (NAME/EAR TAG)					
(BREED AND OWNER)	FRIESIAN	FRIESIAN			
AI (SIRE NAME/NUMBER, BREED)	FR 5774	FR 5774			
PREG CHECK: DATE DONE & VET.		08.01.01			
RESULT & STAGE		+ve			
ABORTION (DATE/STAGE)					
PROJECTIONS - DATE TO DRY		01.06.01			
- DATE TO STEAM UP		07.06.01			
- DATE TO CALVE		09. 08. 09			

PARITY NUMBER 4	DATE LAST CALVING 12. 08. 2001				
DATES ON HEAT	31.10.01	22.02.02			
SERVICED DATES	31. 10. 01	23.02.02			
BULL (NAME/EAR TAG)					
(BREED AND OWNER)					
AI (SIRE NAME/NUMBER, BREED)	BLOCK OMAR	NKATA			
PREG CHECK: DATE DONE & VET.	30. 01. 02	24.04.02			
RESULT & STAGE					
ABORTION (DATE/STAGE)					
PROJECTIONS - DATE TO DRY		24.09.02			
- DATE TO STEAM UP		14. 11. 02			
- DATE TO CALVE		25. 11. 02			

Milk recording summary section

Page 3

LACTATION OR PARTURITION NUMBER (times cow has calved): 1

DATE OF CALVING: 23.10.97 DATE WHEN DRIED: 30.01.99

DAYS IN MILK: 459

MONTH & YEAR	# DAYS DAYS IN [redacted] MILK	OTHER TOTALS TOTAL THIS MONTH	TOTAL THIS LACTATION SO FAR
OCT 97	4	61.5	61.5
NOV 97	30	386.5	448
DEC 97	31	405.5	553.5
JAN 98	31	454.5	1308
FEB 98	28	438.0	1746
MAR 98	31	545.5	2291.5
APR 98	30	409.5	2701
MAY 98	31	443.0	3144
JUN 98	30	440.0	3584.5
JUL 98	31	452.0	4036.5
AUG 98	31	431.5	4468
SEPT 98	30	386.5	4854.5
OCT 98	31	342.0	5196.5
NOV 98	30	312.0	5509
DEC 98	31	279.0	5788
JAN 99	29	218.0	6006

LACTATION OR PARTURITION NUMBER (times cow has calved): 2

DATE OF CALVING: 3.05.99 DATE WHEN DRIED: 29.02.00

DAYS IN MILK: 299

MONTH & YEAR	# DAYS DAYS IN [redacted] MILK	OTHER TOTALS TOTAL THIS MONTH (Kg)	TOTAL THIS LACTATION SO FAR (Kg)
MAY 99	25	489.5	489.5
JUN 99	30	671	1160
JULY 99	31	694	1854.5
AUG 99	31	685	2539.5
SEP 99	30	660	3199.5
OCT 99	31	660.5	3860
NOV 99	30	554.5	4414.5
DEC 99	31	399	4813.5
JAN 00	31	314	5127.5
FEB 00	29	214	5341.5
	299		

MILK RECORDING SUMMARIES

This section is usable in 2 ways:

First - as a place to record a sample monthly (1 day) milk production (This might be recorded for instance every 15th of the month).

Second - as a running total of amount of milk actually produced. [This would involve totalling the daily milks as kept in the daily milk sheet and placing each month's total in the appropriate column (TOTAL THIS MONTH) - One line per month until a lactation finishes. Then the cumulative (TOTAL THIS LACTATION SO FAR) is gotten by summing the previous accumulation with the current month's total].

N.B. (1) Either or both of the above uses can be made of this milk section depending on farmer/project preference and farmer ability. And either use of this section will provide useful management information.

(2) The lactation summaries Table (for 6 lactations) at bottom of page 4 may be completed at the end of each lactation (when the cow has dried) with the extensionist's help where needed. For lactations after the 4th (and breeding cycles after 5th) note that a new (Second) card is required for that cow.

CALCULATIONS OF INTERVALS (IN NUMBER OF DAYS) FOR CALVING NUMBER

	1	2	3	4	5	N.B. DESIRED TO BE ABOUT
CALVING TO 1ST SERVICE	150	90	42	80		60
CALVING TO CONCEPTION	275	90	175	195		80-100
CALVING TO CALVING	557	374	457			365

Milk recording summary section (continued)

Page 4

LACTATION OR
PARTURITION NUMBER 3
(times cow has calved)

DATE OF CALVING 12.05.00 DATE WHEN DRIED 11.06.01

DAYS IN MILK 392

MONTH & YEAR	DAYS	OTHER TOTALS	
	DAYS IN [redacted] MILK	TOTAL THIS MONTH	TOTAL THIS LACTATION SO FAR
MAY 00	16	285	285
JUN 00	30	612	897
JULY 00	31	704.5	1601.5
AUG 00	31	728.5	2330
SEPT 00	30	698.5	3028
OCT 00	31	708.5	3737
NOV 00	30	622	4359
DEC 00	31	516.5	4875.5
JAN 01	31	414	5289.5
FEB 01	28	366	5655.5
MAR 01	31	402.5	6058
APR 01	30	365	6423
MAY 01	31	321.5	6744.5
JUNE	11	166.5	6851

LACTATION OR
PARTURITION NUMBER
(times cow has calved)

DATE OF CALVING DATE WHEN DRIED

DAYS IN MILK

MONTH & YEAR	DAYS	OTHER TOTALS	
	DAYS IN [redacted] MILK	TOTAL THIS MONTH	TOTAL THIS LACTATION SO FAR

LACTATION OR
PARTURITION NUMBER
(times cow has calved)

DATE OF CALVING DATE WHEN DRIED

DAYS IN MILK

MONTH & YEAR	DAYS	OTHER TOTALS	
	DAYS IN [redacted] MILK	TOTAL THIS MONTH	TOTAL THIS LACTATION SO FAR

LACTATION OR
PARTURITION NUMBER
(times cow has calved)

DATE OF CALVING DATE WHEN DRIED

DAYS IN MILK

MONTH & YEAR	DAYS	OTHER TOTALS	
	DAYS IN [redacted] MILK	TOTAL THIS MONTH	TOTAL THIS LACTATION SO FAR

LACTATION SUMMARIES **FOR LACTATION NUMBER ...**

	1	2	3	4	5	6	N.B. DESIRED TO BE ABOUT
DAYS DRY PRIOR TO CALVING		66	70				45 - 60
DAYS IN MILK	459	299	392				305
LITRES MILK TO 305 DAYS							perhaps 2500
TOTAL MILK FOR LACTATION	6006	5341.5	6851				or more

Prophylactic measures section

Page 5

PROPHYLACTIC MEASURES Vet./Extensionist to assist completing card for measures shown with *

TICK CONTROL

(S=SPRAY, P=POUR-ON)			
DATES OF USE	(S/P)	DATES OF USE	(S/P)
		EVERY WEEK	

***DEWORMING**

DATE DONE	DRUG USED	DATE TO DO
DAIRY DRENCH		

*** VACCINATIONS - (when done/due)**

	TRYPS	BQ/ANTHRAX	FMD	CBPP	RINDERPEST	BRUCELLOSIS	LSD			
DATE VAC'D			11-01-00							
DATE DUE										
DATE VAC'D										
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Health and offspring detail section

HEALTH

Please record only major health events/problems on this card.
Datails (treatment, etc.) are to be put in your health exercise book.
Attending Veterinarian to sign the form.

DATE	ILLNESS/EVENT	OUTCOME & SIGNATURE
03.04.98	HOOF INJURY	

DATE	ILLNESS/EVENT	OUTCOME & SIGNATURE

CALVES

(ID) NUMBER	NAME	SEX	SIRE ID	BIRTH			WEANING			12 MONTHS			OTHER
				DATE	WEIGHT (kg)	WFA	DATE	WT	WFA	DATE	WT	WFA	
	RUGABO	M	KALUNDA	23.10.97	36		22.11.97	80					
				03.05.99	37		04.08.99	82					

NOTE: WFA means Weight For Age and should be estimated by your extension officer as Above, Average or Below at the times indicated.

NOTE: Disposal of calves may be noted in the "OTHER INFO" column with date and description of the disposal (i.e. died 24-2-88 or sold 3-9-90 or passed 4-6-87).

Appendix II: Daily Milk Record book

Milk Production section

Form 1

DAILY MILK PRODUCTION RECORD

Cow No 132 Breed Type FRIESIAN Date of Birth _____ Lact. No. 4

Last Calving Date 30·06·98 Dam (mother) No. _____ Dam Breed FRIESIAN Sire (father) No. _____ Sire Breed FRIESIAN

Name of Farmer NJUYAHWO MOLLY District MUKOND County GOMMA Address SEETA-MUKONDO

MONTH JULY '98	MILK YIELD kg/litres		TOTAL kg/litres	MONTH AUG '98	MILK YIELD kg/litres		TOTAL kg/litres
DATE	A.M.	P.M.		DATE	A.M.	P.M.	
1	COLOSTRUM			1	8	7	15
2				2	8·5	6·5	15
3				3	9	7	16
4				4	9	7·5	16·5
5	5	5	10	5	9	7	16
6	5	5	10	6	9	7·5	16·5
7	5·5	5	10·5	7	10	8	18
8	6	5	11	8	10	8	18
9	7	5	12	9	10	8·5	18·5
10	7	6	13	10	10	8	18
11	7	5	12	11	10	8	18
12	8	7	15	12	10	8	18
13	7·5	5	12·5	13	10·5	8	18·5
14	7	5	12	14	10	8	18
15	8	7	15	15	10	8	18
16	8	7	15	16	11	8	19
17	8	7	15	17	11	8·5	19·5
18	8	6·5	14·5	18	11	8	19
19	8	7	15	19	11	8	19
20	8	7	15	20	11	8·5	19·5
21	8	7	15	21	11	8	19
22	8	6·5	14·5	22	11	8	19
23	8·5	7	15·5	23	11	8·5	19·5
24	8	7	15	24	11	9	20
25	8	7	15	25	11	8	19
26	8	7	15	26	11	8·0	19
27	8	7	15	27	11	8	19
28	8·5	6·5	15	28	11	8.5	19·5
29	8	7	15	29	11	9	20
30	8	7	15	30	11	8	19
31	8	7	15	31	11	8	19
TOTAL			372	TOTAL			565·5

Milk Disposal section

Form 2

MILK DISPOSAL RECORD

Farmer's Name ______________________ Farm Name ______________________

for Month of ______________________

This form is a Record of how milk is used on farm.

Date	Total Amount produced (kg)	Total Amount fed to calves (kg)	Total Amount consumed (kg)	Total Amount wasted (kg)	Total Amount sold (kg)	Price per kg	Total Value Sale	Place of Sale

Farm Input section

Form 3

FARM INPUT RECORD

Farmer's Name ________________________ Farm Name ________________________ Month ________________________

This form is a Record of Feed, Drugs, Equipment and other inputs purchased and services (AI, Vaccinations) paid for.

Date	Item Description	Unit	Quantity	Price/Unit Ug.Shs.	Total Cost

Appendix III: Daily Milk Recording Sheet

UGANDA HERD RECORDING SCHEME: DAILY MILK RECORDING SHEET

199 (Form 3)

COW NAME	ID No.	Calving Date	Lact. No.	ACCUM PRODN	1st am pm	2nd am pm	3rd am pm	4th am pm	5th am pm	6th am pm	7th am pm	8th am pm	9th am pm	30th am pm	31st am pm	Mnth Total	Aggr Total
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
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15																	
16																	
17																	
18																	
19																	
20																	
21																	
22																	
23																	
24																	
25																	

Notes:

Concentrate use: Type: Cost/k

for MONTH lt.

APPENDIX IV: Scheme I - Simultaneous varying of YB and PCYB (Population size:100,000 Nucleus size:700)

		GENETIC GAIN			RETURN			COSTS				PROFIT	ACCURACY		GI
YB	PCYB	Milk	CI	monetary	Total	Milk	CI	Total	Fixed	Semen	Recording		RIA	DR	
5	0.5	33.58	0.13	0.87	1.05	1.05	0.00	0.05	0.03	0.00	0.02	1.00	0.673	11	5.72
	0.6	33.38	0.13	0.87	1.04	1.04	0.00	0.05	0.03	0.00	0.02	0.98	0.714	14	5.59
	0.7	32.58	0.13	0.84	1.00	1.00	0.00	0.05	0.03	0.00	0.02	0.95	0.735	16	5.45
	0.8	30.97	0.12	0.80	0.94	0.94	0.00	0.05	0.03	0.00	0.02	0.89	0.753	18	5.32
10	0.5	38.63	0.15	1.00	1.32	1.32	0.00	0.08	0.03	0.03	0.02	1.24	0.542	5	5.72
	0.6*	**39.13**	**0.16**	**1.01**	**1.36**	**1.37**	**0.00**	**0.08**	**0.03**	**0.03**	**0.02**	**1.29**	**0.597**	**7**	**5.59**
	0.7	38.07	0.15	0.99	1.34	1.35	0.00	0.08	0.03	0.03	0.02	1.27	0.619	8	5.45
	0.8	35.91	0.14	0.93	1.29	1.29	0.00	0.08	0.03	0.03	0.02	1.21	0.640	9	5.32
15	0.5	37.51	0.15	0.97	1.29	1.29	0.00	0.10	0.03	0.06	0.02	1.19	0.466	3	5.72
	0.6	37.85	0.15	0.98	1.33	1.33	0.00	0.10	0.03	0.06	0.02	1.23	0.507	4	5.59
	0.7	37.19	0.15	0.96	1.34	1.34	0.00	0.10	0.03	0.06	0.02	1.24	0.542	5	5.45
	0.8	35.06	0.14	0.91	1.30	1.31	0.00	0.10	0.03	0.06	0.02	1.20	0.571	6	5.32
20	0.5	35.49	0.14	0.92	1.21	1.21	0.00	0.13	0.03	0.08	0.02	1.08	0.415	2	5.72
	0.6	36.48	0.14	0.95	1.29	1.29	0.00	0.13	0.03	0.08	0.02	1.16	0.466	3	5.59
	0.7	36.12	0.14	0.94	1.32	1.32	0.00	0.13	0.03	0.08	0.02	1.19	0.507	4	5.45
	0.8	32.58	0.13	0.84	1.21	1.22	0.00	0.13	0.03	0.08	0.02	1.08	0.507	4	5.32

*Basic run - basic breeding programme, optimal option in the scheme

YB = Number of Young Bulls
GI = Mean Generation Interval
RIA = Correlation between selection Index and Aggregate genotype
PCYB = Proportion of Cows mated to Young Bulls
DR = expected Daughter Records per tested young bull
CI = Calving Interval

APPENDIX V: Scheme I - Relative increase or decrease in % (+/-) of the different options to the optimal one 10 YB + 0.6 PCYB as a result of varying young bulls (YB) and proportion of recorded cows mated with young bulls (PCYB) on annual monetary gain (AMGG), discounted returns, discounted profit in Ugcp; accuracy of selection (RIA) and mean generation interval (GI) in years.

		AMGG		RETURN		PROFIT		ACCURACY OF SELECTION			GI	
YB	PCYB		+/-		+/-		+/-	RIA	+/-	DR	Years	+/-
5	0.5	0.87	-13.86	1.05	-22.79	1.00	-22.48	0.673	12.73	11	5.72	2.33
	0.6	0.87	-13.86	1.04	-23.53	0.98	-24.03	0.714	19.60	14	5.59	0.00
	0.7	0.84	-16.83	1.00	-26.47	0.95	-26.36	0.735	23.12	16	5.45	-2.50
	0.8	0.80	-20.79	0.94	-30.88	0.89	-31.01	0.753	26.13	18	5.32	-4.83
10	0.5	1.00	-0.99	1.32	-2.94	1.24	-3.88	0.542	-9.21	5	5.72	2.33
	0.6*	**1.01**	**0.00**	**1.36**	**0.00**	**1.29**	**0.00**	**0.597**	**0.00**	**7**	**5.59**	**0.00**
	0.7	0.99	-1.98	1.34	-1.47	1.27	-1.55	0.619	3.69	8	5.45	-2.50
	0.8	0.93	-7.92	1.29	-5.15	1.21	-6.20	0.640	7.20	9	5.32	-4.83
15	0.5	0.97	-3.96	1.29	-5.15	1.19	-7.75	0.466	-21.94	3	5.72	2.33
	0.6	0.98	-2.97	1.33	-2.21	1.23	-4.65	0.507	-15.08	4	5.59	0.00
	0.7	0.96	-4.95	1.34	-1.47	1.24	-3.88	0.542	-9.21	5	5.45	-2.50
	0.8	0.91	-9.90	1.30	-4.41	1.2	-6.98	0.571	-4.36	6	5.32	-4.83
20	0.5	0.92	-8.91	1.21	-11.03	1.08	-16.28	0.415	-30.49	2	5.72	2.33
	0.6	0.95	-5.94	1.29	-5.15	1.16	-10.08	0.466	-21.94	3	5.59	0.00
	0.7	0.94	-6.93	1.32	-2.94	1.19	-7.75	0.507	-15.08	4	5.45	-2.50
	0.8	0.84	-16.83	1.21	-11.03	1.08	-16.28	0.507	-15.08	4	5.32	-4.83

* optimal option in the scheme

APPENDIX VI: Scheme II - Varying the number of Young Bulls (YB) at very close range around the optimal number.
(Population size:100,000 Nucleus size:700)

		GENETIC GAIN			RETURN			COSTS				PROFIT	ACCURACY		GI
YB	PCYB	Milk	CI	monetary	Total	Milk	CI	Total	Fixed	Semen	Recording		RIA	DR[1]	
0.6	8	38.00	0.15	0.99	1.29	1.30	0.00	0.07	0.03	0.02	0.02	1.23	0.619	8	5.59
	9	38.39	0.15	1.00	1.32	1.32	0.00	0.07	0.03	0.03	0.02	1.25	0.597	7	5.59
	10*	**39.13**	**0.16**	**1.01**	**1.36**	**1.37**	**0.00**	**0.08**	**0.03**	**0.03**	**0.02**	**1.29**	**0.597**	7	**5.59**
	11	38.92	0.15	1.01	1.36	1.36	0.00	0.08	0.03	0.04	0.02	1.28	0.571	6	5.59
	12	38.37	0.15	0.99	1.34	1.34	0.00	0.09	0.03	0.04	0.02	1.25	0.542	5	5.59

* optimal option in the scheme [1]rounded to full numbers

APPENDIX VII: Scheme III – Varying number of Inseminations/Daughter record (Ins/DR)
(Population size:100,000 Nucleus size: 700)

	GENETIC GAIN			RETURN			COSTS				PROFIT	ACCURACY		GI
Ins/DR	Milk	CI	monetary	Total	Milk	CI	Total	Fixed	Semen	Recording		RIA	DR	
4	**40.89**	**0.16**	**1.06**	**1.45**	**1.45**	**0.00**	**0.08**	**0.03**	**0.03**	**0.02**	**1.37**	**0.657**	**10**	**5.59**
6	39.13	0.16	1.01	1.36	1.37	0.00	0.08	0.03	0.03	0.02	1.29	0.597	7	5.59
8	37.49	0.15	0.97	1.28	1.29	0.00	0.08	0.03	0.03	0.02	1.21	0.542	5	5.59
10	36.45	0.14	0.94	1.23	1.24	0.00	0.08	0.03	0.03	0.02	1.15	0.507	4	5.59

YB = Number of Young Bulls
GI = Mean Generation Interval
RIA = Correlation between selection Index and Aggregate genotype
PCYB = Proportion of Cows mated to Young Bulls
DR = expected Daughter Records per tested young bull
CI = Calving Interval

APPENDIX VIII: Scheme IV – Restriction imposed on calving interval genetic gain
(Population size: 100,000 Nucleus size:700)

		GENETIC GAIN			RETURN			COSTS				PROFIT	ACCURACY		GI
YB	PCYB	Milk	CI	monetary	Total	Milk	CI	Total	Fixed	Semen	Recording		RIA	DR	
5	0.5	32.92	0.0041	0.85	1.03	1.03	0.00	0.05	0.03	0.00	0.02	0.98	0.650	11	5.72
	0.6	32.71	0.0018	0.85	1.02	1.02	0.00	0.05	0.03	0.00	0.02	0.97	0.690	14	5.59
	0.7	31.92	0.0003	0.83	0.98	0.98	0.00	0.05	0.03	0.00	0.02	0.93	0.711	16	5.45
	0.8	30.33	-0.0012	0.79	0.93	0.92	0.00	0.05	0.03	0.00	0.02	0.87	0.729	18	5.32
10	0.5	37.86	0.0047	0.98	1.30	1.30	0.00	0.08	0.03	0.03	0.02	1.22	0.522	5	5.72
	0.6*	**38.32**	**0.0001**	**1.00**	**1.34**	**1.34**	**0.00**	**0.08**	**0.03**	**0.03**	**0.02**	**1.26**	**0.575**	**7**	**5.59**
	0.7	37.27	-0.0022	0.97	1.32	1.32	0.00	0.08	0.03	0.03	0.02	1.24	0.597	8	5.45
	0.8	35.14	-0.0047	0.91	1.27	1.26	0.00	0.08	0.03	0.03	0.02	1.19	0.617	9	5.32
15	0.5	36.79	0.0079	0.95	1.27	1.27	0.00	0.10	0.03	0.06	0.02	1.16	0.448	3	5.72
	0.6	37.10	0.0052	0.96	1.31	1.31	0.00	0.10	0.03	0.06	0.02	1.20	0.488	4	5.59
	0.7	36.44	0.0022	0.95	1.31	1.31	0.00	0.10	0.03	0.06	0.02	1.21	0.522	5	5.45
	0.8	34.33	-0.0012	0.89	1.28	1.28	0.00	0.10	0.03	0.06	0.02	1.18	0.550	6	5.32
20	0.5	34.82	0.0076	0.90	1.19	1.19	0.00	0.13	0.03	0.08	0.02	1.06	0.399	2	5.72
	0.6	35.77	0.0068	0.93	1.26	1.26	0.00	0.13	0.03	0.08	0.02	1.13	0.448	3	5.59
	0.7	35.39	0.0036	0.92	1.29	1.29	0.00	0.13	0.03	0.08	0.02	1.16	0.488	4	5.45
	0.8	31.93	0.0025	0.83	1.19	1.19	0.00	0.13	0.03	0.08	0.02	1.06	0.488	4	5.32

*Basic run - basic breeding programme, optimal option in the scheme

YB = Number of Young Bulls
GI = Mean Generation Interval
RIA = Correlation between selection Index and Aggregate genotype
PCYB = Proportion of Cows mated to Young Bulls
DR = expected Daughter Records per tested young bull
CI = Calving Interval

APPENDIX IX: Comparison of selection groups in optimal options of **Scheme I** (no restriction on CI) and **Scheme IV** (restricted CI genetic gain)
Relative change (+/-) to optimal option in scheme I

	NUCLEUS					BASE POPULATION	
per generation	**1. PB>PB**	**2. CN>PB**	**3. YB>CN**	**4. PB>CN**	**5. CN>CN**	**6. PB>CPB**	**7. CBP>CBP**
Monetary genetic gain (MGG)							
Scheme I	10.985	2.214	4.758	10.985	2.214	0	0
Scheme IV	10.792	2.175	4.670	10.792	2.175	0	0
+/- change (%)	-1.757	-1.762	-1.850	-1.757	-1.762		
Genetic gain for Milk (GG MY)							
Scheme I	423.747	85.419	183.536	423.747	85.419	423.747	0
Scheme IV	414.541	83.819	180.339	414.541	83.819	414.541	0
+/- change (%)	-2.173	-1.873	-1.742	-2.173	-1.873	-2.173	0
Genetic gain for Calving Interval (GG-CI)*							
Scheme I	1.687	0.338	0.719	1.687	0.338	1.687	0
Scheme IV	-0.058	0.018	0.078	-0.058	0.018	-0.058	0
+/- change (%)	-103.438	-94.675	-89.152	-103.438	-94.675	-103.438	
Total return for the selection group							
Scheme I	0.006	0.034	0.013	0.005	0.006	1.299	0
Scheme IV	0.006	0.034	0.013	0.005	0.006	1.276	0
+/- change (%)	0.000	0.000	0.000	0.000	0.000	-1.771	0
Return for Milk per generation							
Scheme I	0.006	0.034	0.013	0.005	0.006	1.303	0
Scheme IV	0.006	0.034	0.013	0.005	0.006	1.275	0
+/- change (%)	0.000	0.000	0.000	0.000	0.000	-2.149	
Return for Calving Interval (CalvIn)							0
Scheme I	0	0	0	0	0	-0.004	0
Scheme IV	0	0	0	0	0	0.002	0
+/- change (%)							

* for calving Interval the negative is positive in the breeding perspective

APPENDIX X: Scheme V - Nucleus size reduced to 500 (Population size: 100,000)

		GENETIC GAIN			RETURN			COSTS				PROFIT	ACCURACY		GI
YB	PCYB	Milk	CI	monetary	Total	Milk	CI	Total	Fixed	Semen	Recording		RIA	DR	
5	0.5	31.61	0.12	0.82	0.97	0.97	0.00	0.05	0.03	0.00	0.01	0.92	0.619	8	5.72
	0.6	31.29	0.12	0.81	0.95	0.96	0.00	0.05	0.03	0.00	0.01	0.90	0.657	10	5.59
	0.7	30.33	0.12	0.79	0.91	0.91	0.00	0.05	0.03	0.00	0.01	0.86	0.673	11	5.45
	0.8	28.63	0.11	0.74	0.85	0.85	0.00	0.05	0.03	0.00	0.01	0.80	0.701	13	5.32
10	0.5	35.88	0.14	0.93	1.21	1.21	0.00	0.07	0.03	0.03	0.01	1.13	0.507	4	5.72
	0.6*	**35.70**	**0.14**	**0.93**	**1.22**	**1.22**	**0.00**	**0.07**	**0.03**	**0.03**	**0.01**	**1.14**	**0.542**	**5**	**5.59**
	0.7	33.91	0.13	0.88	1.16	1.16	0.00	0.07	0.03	0.03	0.01	1.09	0.542	5	5.45
	0.8	31.81	0.13	0.82	1.11	1.12	0.00	0.07	0.03	0.03	0.01	1.04	0.571	6	5.32
15	0.5	33.50	0.13	0.87	1.12	1.12	0.00	0.10	0.03	0.06	0.01	1.02	0.415	2	5.72
	0.6	34.22	0.13	0.89	1.18	1.18	0.00	0.10	0.03	0.06	0.01	1.08	0.466	3	5.59
	0.7	32.13	0.13	0.83	1.11	1.12	0.00	0.10	0.03	0.06	0.01	1.02	0.466	3	5.45
	0.8	30.15	0.12	0.78	1.09	1.09	0.00	0.10	0.03	0.06	0.01	0.99	0.507	4	5.32
20	0.5	33.55	0.13	0.87	1.14	1.14	0.00	0.12	0.03	0.08	0.01	1.02	0.415	2	5.72
	0.6	31.96	0.13	0.83	1.09	1.09	0.00	0.12	0.03	0.08	0.01	0.97	0.415	2	5.59
	0.7	29.66	0.12	0.77	1.02	1.03	0.00	0.12	0.03	0.08	0.01	0.90	0.415	2	5.45
	0.8	27.85	0.11	0.72	1.02	1.02	0.00	0.12	0.03	0.08	0.01	0.90	0.466	3	5.32

*Basic run - basic breeding programme, optimal option in the scheme

YB = Number of Young Bulls
GI = Mean Generation Interval
RIA = Correlation between selection Index and Aggregate genotype
PCYB = Proportion of Cows mated to Young Bulls
DR = expected Daughter Records per tested young bull
CI = Calving Interval

Scheme XI: Population size reduced to 50,000 (Nucleus size: 700)

		GENETIC GAIN			RETURN			COSTS				PROFIT	ACCURACY		GI
YB	PCYB	Milk	CI	monetary	Total	Milk	CI	Total	Fixed	Semen	Recording		RIA	DR	
5	0.5	33.58	0.13	0.87	1.06	1.07	0.00	0.10	0.06	0.00	0.03	0.96	0.673	11	5.72
	0.6	33.38	0.13	0.87	1.05	1.05	0.00	0.10	0.06	0.00	0.03	0.95	0.714	14	5.59
	0.7	32.58	0.13	0.84	1.01	1.02	0.00	0.10	0.06	0.00	0.03	0.91	0.735	16	5.45
	0.8	30.97	0.12	0.80	0.95	0.96	0.00	0.10	0.06	0.00	0.03	0.85	0.753	18	5.32
10	0.5	38.63	0.15	1.00	1.33	1.34	0.00	0.13	0.06	0.03	0.03	1.21	0.542	5	5.72
	0.6*	**39.13**	**0.16**	**1.01**	**1.37**	**1.38**	**0.00**	**0.13**	**0.06**	**0.03**	**0.03**	**1.25**	**0.597**	**7**	**5.59**
	0.7	38.07	0.15	0.99	1.35	1.36	0.00	0.13	0.06	0.03	0.03	1.23	0.619	8	5.45
	0.8	35.91	0.14	0.93	1.30	1.30	0.00	0.13	0.06	0.03	0.03	1.17	0.640	9	5.32
15	0.5	37.51	0.15	0.97	1.30	1.30	0.00	0.15	0.06	0.06	0.03	1.15	0.466	3	5.72
	0.6	37.85	0.15	0.98	1.34	1.34	0.00	0.15	0.06	0.06	0.03	1.19	0.507	4	5.59
	0.7	37.19	0.15	0.96	1.35	1.35	0.00	0.15	0.06	0.06	0.03	1.20	0.542	5	5.45
	0.8	35.06	0.14	0.91	1.31	1.31	0.00	0.15	0.06	0.06	0.03	1.16	0.571	6	5.32
20	0.5	35.49	0.14	0.92	1.22	1.22	0.00	0.18	0.06	0.08	0.03	1.04	0.415	2	5.72
	0.6	36.48	0.14	0.95	1.29	1.30	0.00	0.18	0.06	0.08	0.03	1.12	0.466	3	5.59
	0.7	36.12	0.14	0.94	1.32	1.33	0.00	0.18	0.06	0.08	0.03	1.15	0.507	4	5.45
	0.8	32.58	0.13	0.84	1.22	1.22	0.00	0.18	0.06	0.08	0.03	1.04	0.507	4	5.32

*Basic run - basic breeding programme, optimal option in the scheme

YB = Number of Young Bulls
GI = Mean Generation Interval
RIA = Correlation between selection Index and Aggregate genotype
PCYB = Proportion of Cows mated to Young Bulls
DR = expected Daughter Records per tested young bull
CI = Calving Interval

APPENDIX XII: Relative comparison of optimal options in the different schemes with the basic breeding optimal option in scheme I

		GENETIC GAIN			RETURN			COSTS				PROFIT	ACCURACY		GI
YB	PCYB	Milk	CI	monetary	Total	Milk	CI	Total	Fixed	Semen	Recording		RIA	DR	
I	Pop 100,000 N 700	39.13	0.16	1.01	1.36	1.37	-0.0039	0.08	0.03	0.03	0.017	1.29	0.597	7	5.59
II	Vary YB	39.13	0.16	1.01	1.36	1.37	-0.0039	0.08	0.03	0.03	0.02	1.29	0.597	7	5.59
	+/- change (%)	0	0	0	0	0		0	0	0	0	0	0	0	0
III	Ins/DR	40.89	0.16	1.06	1.45	1.45	-0.0039	0.08	0.03	0.03	0.02	1.37	0.657	10	5.59
	+/- change (%)	4.49	5.34	4.95	6.62	5.84		0.00	0.00	0.00	0.00	6.20	10.05	43	0
IV	CI - restricted	38.32	0.00	1.00	1.34	1.34	0.0015	0.08	0.03	0.03	0.02	1.26	0.58	7	5.59
	+/- change (%)	-2.06	-100	-0.99	-1.47	-2.19		0.00	0.00	0.00	0.00	-2.33	-3.69	0	0
V	Pop 100,000 N 500	35.70	0.14	0.93	1.22	1.22	-0.0035	0.07	0.03	0.03	0.01	1.14	0.54	5	5.59
	+/- change (%)	-8.75	-9.21	-7.92	-10.29	-10.95		-12.50	0.00	0.00	-50.00	-11.63	-9.21	-29	0.00
VI	Pop 50,000 N 700	39.13	0.16	1.01	1.37	1.38	0.0040	0.13	0.06	0.03	0.034	1.25	0.59	7	5.59
	+/- change (%)	0.00	0.00	0.00	0.74	0.73		62.50	100	0.00	100	-3.10	0	0	0

Pop = Population size
N = Nucleus size
CI – restricted = restricted calving interval
Ins/DR = Number of inseminations per daughter record
YB = Young bull
GI = Mean generation interval