Modelling extended lactations of dairy cows

B. Vargas*[1,2], W. Koops[3] and J.A.M. van Arendonk[2].
[1]Escuela de Medicina Veterinaria, Universidad Nacional de Costa Rica, P.O. Box 304-3000, Heredia, Costa Rica,
[2]Wageningen Institute of Animal Sciences, Wageningen University, P.O. Box 338, 6700 AH Wageningen, The Netherlands,
[3]Wageningen Institute of Animal Sciences, Wageningen University, P.O. Box 338, 6700 AH Wageningen, The Netherlands.

General objective: Compare existing models on their ability to provide consistent predictors of partial and total milk yield in extended lactations

① Introduction

- Little attention has been paid to modelling of extended lactations.
- Costs of prolonged calving interval greatly depend on milk yield in the later part of lactation.

② Material

- 129 dairy herds (Costa Rica)
- 7608 Holstein cows
- 303876 test day records
- 22.1±12.9 records/lactation
- 19.6±8.4 kg milk/day/cow
- 328±61.4 days in lactation

③ Methods

- Lactations were classified in 26 groups according to length, parity and days open.
- 9 models were fitted to group mean yields (2-weeks periods).
- Goodness of fit was evaluated for complete lactations and also within 100-d intervals.

④ Results

Table 1. Ranking of models according to adjusted multiple correlation coefficient (R^2), residual standard deviation (RSD) and Durbin-Watson coefficient (DW) averaged over groups.

Model[1]	R^2	Score[2]	RSD	Score	DW	Score
M1	0.961±0.04	-1	0.78±0.28	-1	0.90±0.48	-1
M2	0.987±0.01	+2	0.48±0.13	+2	1.74±0.44	+2
M3	0.965±0.02	-1	0.80±0.16	-1	0.91±0.29	-1
M4	0.973±0.02	+1	0.66±0.17	+1	0.86±0.42	-1
M5	0.985±0.03	+2	0.42±0.26	+2	1.79±0.60	+2
M6	0.961±0.03	-1	0.83±0.19	-1	0.74±0.27	-1
M7	0.969±0.03	-1	0.69±0.22	+1	0.85±0.48	-1
M8	0.968±0.03	-1	0.70±0.22	-1	0.81±0.46	-1
M9	0.957±0.03	-2	0.87±0.22	-2	0.56±0.27	-2

[1]Models: M1/Coby & Le-Du (78); M2/Diphasic(Grossman and Koops,88); M3/Monophasic (Grossman and Koops,88); M4/Morant and Gnanasakthy(89); M5/Lactation Persistency Model (Grossman et al,98); M6/Rook et al (93); M7/Reduced Lactation Persistency Model (Grossman et al,98); M8/Wilmink (87); M9/Wood (67).
[2]Scores are assigned as number of SD respect to average R2, RSD and DW (+2= best; -2=lowest).

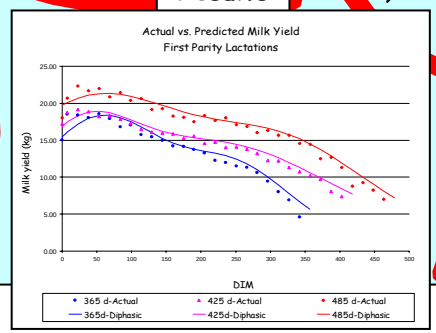
⑤ Results

Table 2. Ranking of models according to Mean Absolute Difference (MAD)[1] averaged over groups.

Model[2]	1-100 days		101-200 days		201-305 days		306-end	
	MAD	Score[3]	MAD	Score	MAD	Score	MAD	Score
M1	30.9±27.5	-1	29.5±21.0	-1	45.2±28.9	-1	33.0±27.8	-1
M2	11.4±4.1	+1	8.9±6.5	+2	12.1±9.6	+2	12.3±18.1	+2
M3	11.3±7.4	+1	37.2±17.5	-2	24.6±20.4	+1	25.8±15.1	+1
M4	40.4±15.2	-1	31.6±19.1	-1	26.0±21.3	+1	26.0±15.8	+1
M5	18.8±30.3	+1	14.9±22.5	+2	10.1±10.4	+2	27.4±59.5	+1
M6	11.2±8.5	+1	32.9±20.7	-1	42.0±25.4	-1	30.9±24.5	-1
M7	70.2±22.6	-2	25.2±19.6	+1	34.7±26.9	-1	25.3±19.4	+1
M8	20.4±12.7	+1	27.0±14.8	-1	38.4±29.4	-1	28.3±22.7	+1
M9	9.5±6.6	+1	32.6±19.4	-1	55.5±27.2	-2	48.5±35.2	-2

[1]MAD: Mean Absolute Difference between Actual vs. Predicted milk yield averaged over groups.
[2] See Table 1 for reference of models.
[3]Scores are assigned as number of SD respect to average MAD within period (+2= lowest MAD, best performance ; -2= highest MAD, lowest performance).

⑥ Results



General conclusion: Diphasic model best fits extended lactations and provides accurate estimates of total and partial milk yield.