PRODUCTION, HEALTH AND WELFARE CHARACTERISTICS OF COWS SELECTED FOR EXTENDED LACTATION

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SELECTING COWS FOR EXTENDED LACTATION

Extended lactation*:

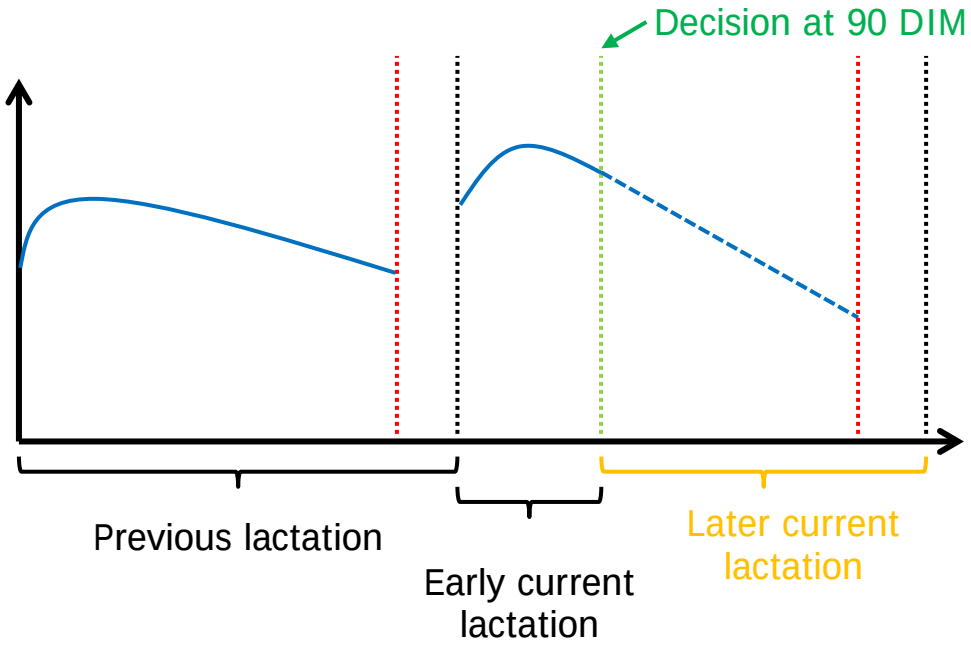
- Potential to utilise high milk yields for longer
- Large variation in ability to maintain milk yield**

How do we select the most suitable cows for extended lactation?

* Reviews by Borman *et al.* (2004), Knight (2008) & Abdelsayed *et al.* (2015)

** Bertilsson *et al.* (1997), Kolver *et al.* (2007) & Lehmann *et al.* (2016)

FARMER'S CHALLENGE: HOW TO SELECT?



Information available at time of decision:

- Milk yield
- Fertility
- Health

- Welfare (extra recordings)
  - Body condition score
  - Lameness
  - Hock lesions
  - Weight, skin, mood

- Total no of variables: 31

DATA: 4 FARMS WITH EXTENDED LACTATIONS

	Herd 1	Herd 2	Herd 3	Herd 4
Annual cows	157	93	154	132
Breed	Holstein	Holstein	Crosses	Jersey
Barn type / milking system	Cubicles / Parlour (3x)	Cubicles / Robot	Deep litter / Parlour (2x)	Deep litter / Robot
Feeding system	TMR or PMR fed ad libitum			
Grazing	No	Yes	Yes	Yes
Kg ECM per annual cow	12,315	10,209	7,842	7,849

Annual herd characteristics – averages of 2013 - 2015

FARMERS SELECTED COWS FOR LONG LACTATIONS

	Herd 1	Herd 2	Herd 3	Herd 4
Planned short interval, mo.	13	14	15	13
Planned long interval, mo.	16	17	18	16
Selected for a long lactation, no. (%)	462 (97)	150 (82)	165 (46)	259 (73)
Completed long lactation, no. (%)	208 (45)	53 (35)	70 (42)	91 (35)
Culled during a long lactation, no. (%)	98 (21)	22 (15)	37 (22)	42 (16)
Still lactating at data retrieval, no. (%)	156 (34)	75 (50)	58 (35)	126 (49)

Most important selection criteria were:

- Variables related to milk yield performance
- Body condition score and health

ANALYTICAL SETUP: COMBINING METHODS

Aim:

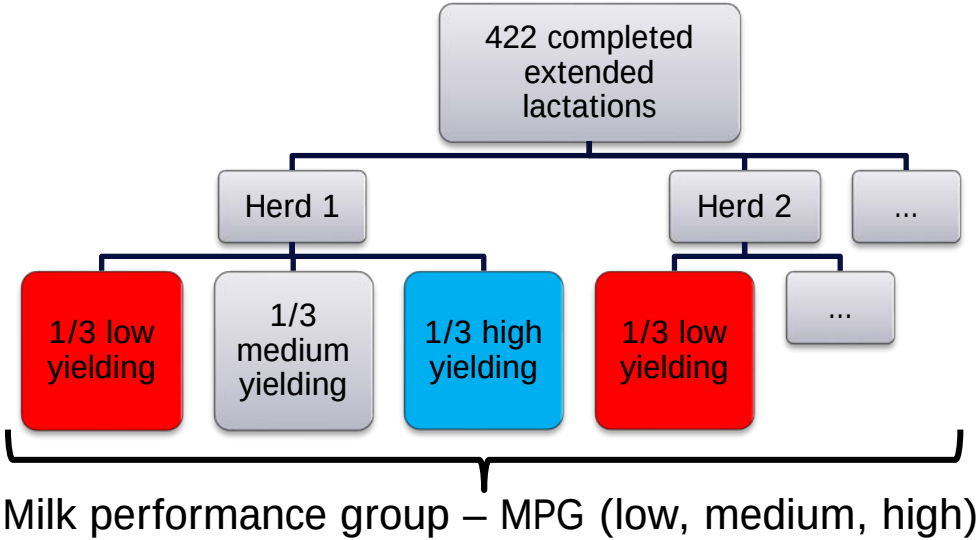
Select individual cows for extended lactation

Questions:

1. Which variables explain most of the total variation?
2. Which variables relate with milk performance group (MPG)?

Methods:

1. Principal component analysis
2. Variable = Herd + PAR + MPG + PAR x MPG + ε



RESULTS: PRINCIPAL COMPONENT ANALYSIS

Primiparous cows
Previous: First insemination, % pregnant
Previous: First insemination to conception, d
Previous: Inseminations / conception, no.
Current: Hoofs and legs, % treated
Current: All treatments, % treated
Current: Kg ECM at second recording
Current: Kg ECM at third recording
Current: Calving process

Multiparous cows
Previous: Kg ECM at peak yield
Previous: DIM at peak yield
Previous: 305-d lactation yield, kg ECM
Previous: Milk yield at dry off, kg ECM
Previous: First insemination, % pregnant
Previous: First insemination to conception, d
Previous: Inseminations / conception, no.
Current: Kg ECM at second recording
Current: Kg ECM at third recording

RESULTS: PRIMIPAROUS COWS (1)

	PAR	MPG	PAR x MPG	R^2
Previous: First insemination, % pregnant	NS	NS	NS	0.02
Previous: First insemination to conception, d	†	†	NS	0.21
Previous: Inseminations / conception, no.	NS	*	NS	0.07
Current: Hoofs and legs, % treated	NS	†	NS	0.18
Current: All treatments, % treated	NS	NS	NS	0.10
Current: Kg ECM at second recording	***	***	*	0.83
Current: Kg ECM at third recording	***	***	*	0.86
Current: Calving process	**	†	NS	0.05

RESULTS: PRIMIPAROUS COWS (2)

	Milk performance group (MPG)		
	Low	Medium	High
Kg ECM at second recording (SE)	25.0 (0.5)^{c}	27.1 (0.5)^{b}	30.2 (0.5)^{a}
Kg ECM at third recording (SE)	25.1 (0.5)^{c}	27.3 (0.5)^{b}	30.5 (0.5)^{a}

RESULTS: MULTIPAROUS COWS (1)

	PAR	MPG	PAR x MPG	R^2
Previous: Kg ECM at peak yield		NS		0.48
Previous: DIM at peak yield		**		0.26
Previous: 305-d lactation yield, kg ECM		**		0.69
Previous: Milk yield at dry off, kg ECM		***		0.73
Previous: First insemination, % pregnant	NS	NS	NS	0.02
Previous: First insemination to conception, d	†	†	NS	0.21
Previous: Inseminations / conception, no.	NS	*	NS	0.07
Current: Kg ECM at second recording	***	***	*	0.83
Current: Kg ECM at third recording	***	***	*	0.86

RESULTS: MULTIPAROUS COWS (2)

	Milk performance group (MPG)		
	Low	Medium	High
305-d lactation yield, kg ECM (SE)	8,171 (157)^{b}	8,666 (160)^{ab}	8,837 (156)^{a}
Milk yield at dry off, kg ECM (SE)	19.4 (0.4)^{c}	21.1 (0.5)^{b}	22.8 (0.4)^{a}
Kg ECM at second recording (SE)	34.0 (0.5)^{c}	38.0 (0.5)^{b}	41.8 (0.5)^{a}
Kg ECM at third recording (SE)	32.4 (0.5)^{c}	36.7 (0.5)^{b}	40.1 (0.5)^{a}

CONCLUSIONS & PERSPECTIVES

Potential selection indicators for extended lactation:

- Previous lactation milk yield
- Early lactation milk yield

Not potential selection indicators:

- Health and welfare recordings

Results are:

- Dissappointing
- Unsurprising

Way forward:

- Combine survival analysis with future predicted milk yield?

THANK YOU FOR YOUR ATTENTION

Further reading:

- Poster about economics of extended lactation (Abstract24052)
- Paper about milk yield and extended lactation – JDS 99, issue 1, 621-633 (2016)
- Paper about selection indicators is under way – second round of review

RESULTS: PRINCIPAL COMPONENT ANALYSIS

Primiparous cows

PC	Eigen	Cum var	∑ Rot sq load	Name
1	3.36	11.1 %	2.38	Fertility
2	2.46	19.2 %	1.56	Disease
3	2.15	26.4 %	1.97	Milk yield
4	1.81	32.3 %	1.00	Calving1
5	1.68	37.9 %	0.96	Calving2

Multiparous cows

PC	Eigen	Cum var	∑ Rot sq load	Name
1	6.09	13.1 %	5.35	Milk yield
2	3.56	20.7 %	2.77	Fertility
3	2.43	25.9 %	1.20	DIM peak