Extended Lactations: Consequences for Cow, Calf, and Farmer

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This presentation

- Why reconsidering the **lactation length?**
    - Motivation of farmers
- Consequences of **extended lactation length**
    - Milk, health, fertility, calves and economics
- **Customizing lactation length**

Advice for a one-year calving interval

...results in a maximal milk yield during the lactation.

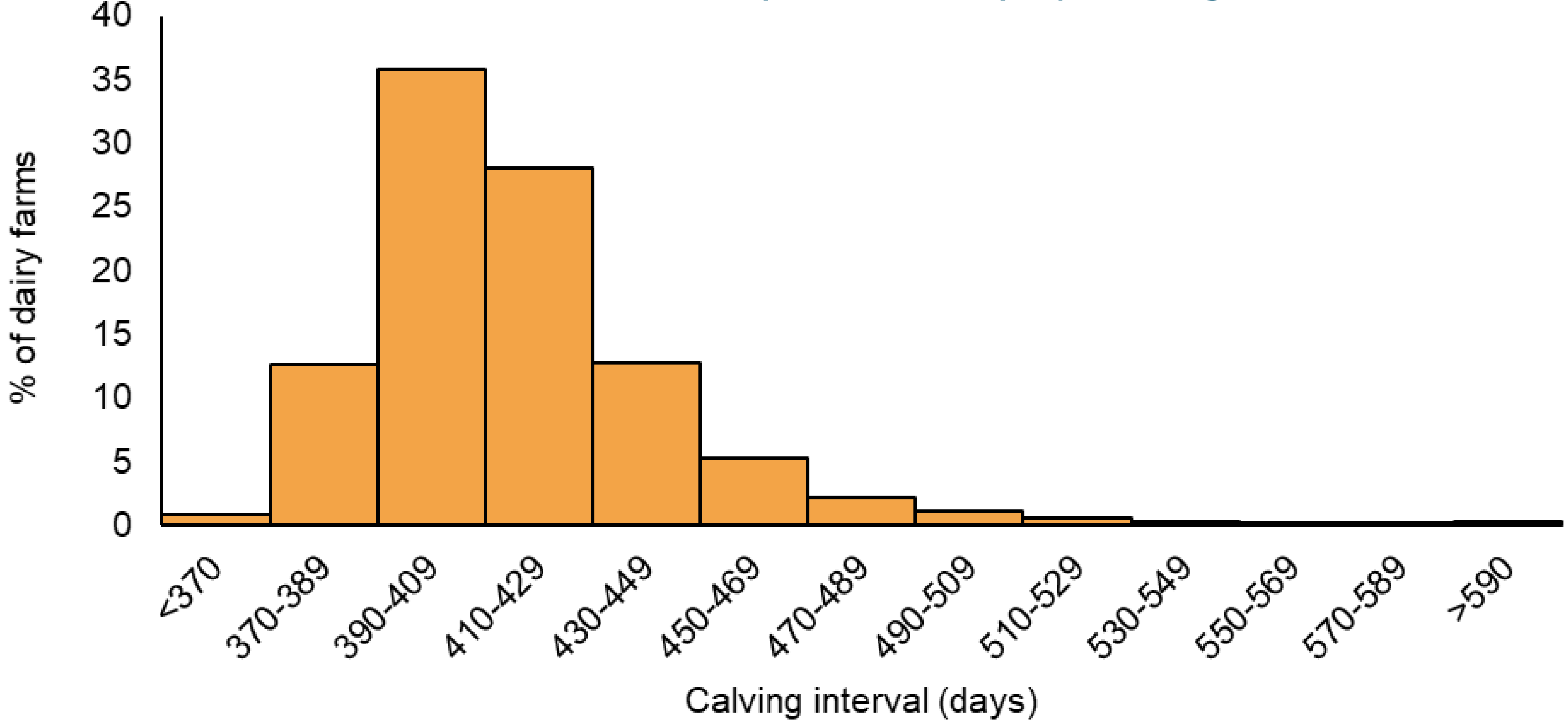
At this moment farmers aim mostly for a **short calving interval.**

But existing studies are:

- Limited
- Retrospective!
- Not consistent in their results
- Focus on milk production (not animal health)
- Executed in semi-extensive systems
  (Australia, NZ, Ireland)

Calving interval at commercial dairy farms

Distribution of Dutch dairy herds (N = 11,405) by calving interval.



(CRV jaarstatistieken, 2024)

Network of dairy farmers

- 'Pioneer- farmers' (N=13): exchange knowledge and data
- Each apply an extended voluntary waiting period (VWP) for insemination to extend the lactation length

(Van Dooren., 2019; Burgers et al., 2021)

Motivation of dairy farmers

Motivation of farmers to extend the voluntary waiting period:

→ Less **calving moments** per time unit

improved health

less labour

→ Less **calves**

image of the veal sector

low value

less labour for calving and calf care

→ **Insemination at a later moment** in the lactation

→ better fertility

(Van Dooren., 2019; Burgers et al., 2021)

Why is application of an extended VWP limited?

<u>**Questions**</u>:

→ possible milk yield losses

[especially in late lactation – persistency]

→ how to avoid fattening?

→ **which cows to select for an extended VWP?**

→ (short) calving interval used as an indicator for ‘good farm management’

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Consequences of an extended lactation length

Experimental set-up at Dairy Campus research farm

154 cows, 6 weeks after calving assigned to VWP (voluntary waiting period)

Group	Insemination start	Mean CI	Min	Max
VWP50	From 50 DIM	384	324	565
VWP125	From 125 DIM	452	400	586
VWP200	From 200 DIM	501	469	575

Measures:

- Milk yield and body weight
- Body condition score
- Blood sampling and dry matter intake

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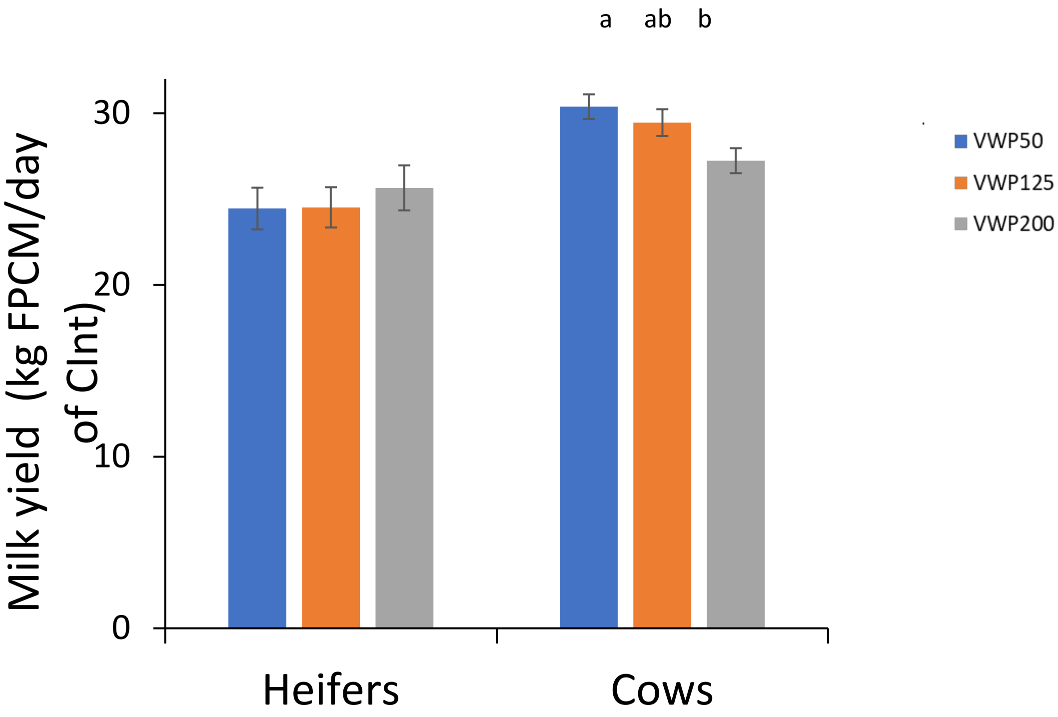
(Burgers et al., 2021)

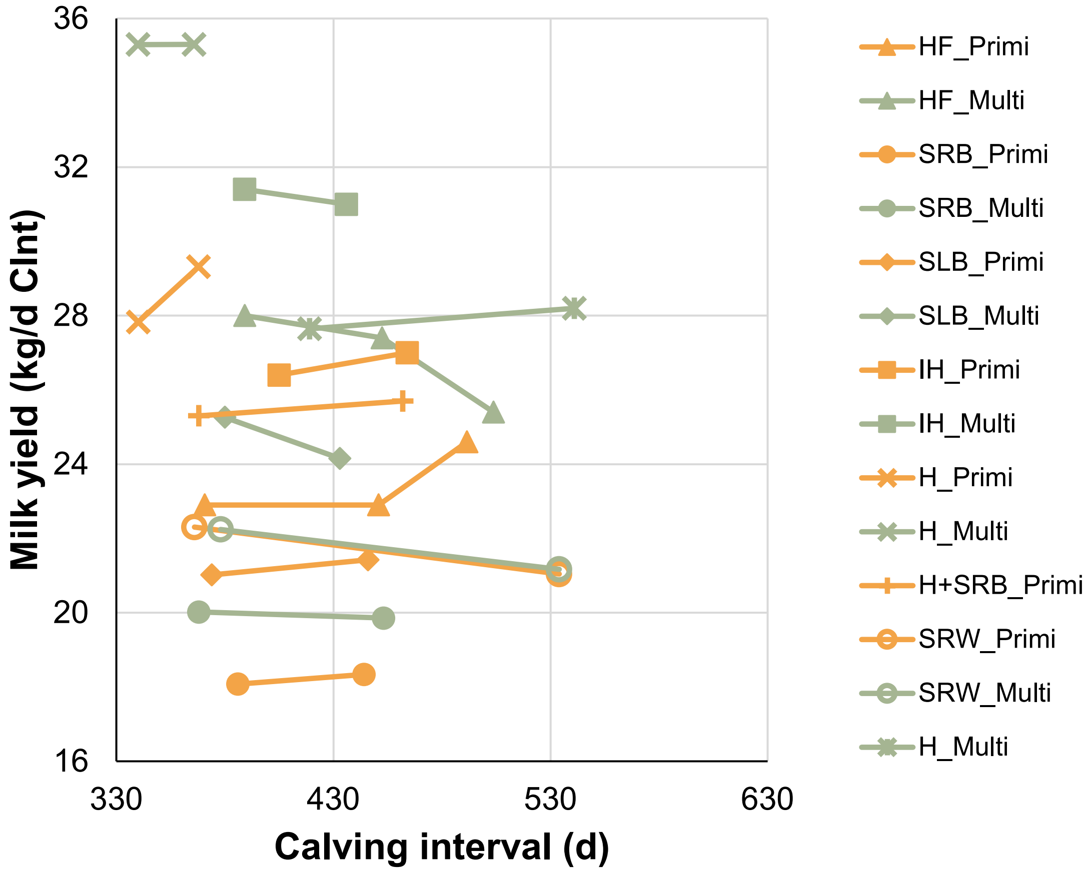
Milk yield per day calving interval

- Primiparous cows: milk per day CInt not affected
- Multiparous cows: VWP200: less milk per day of CInt



(Burgers et al., 2021)

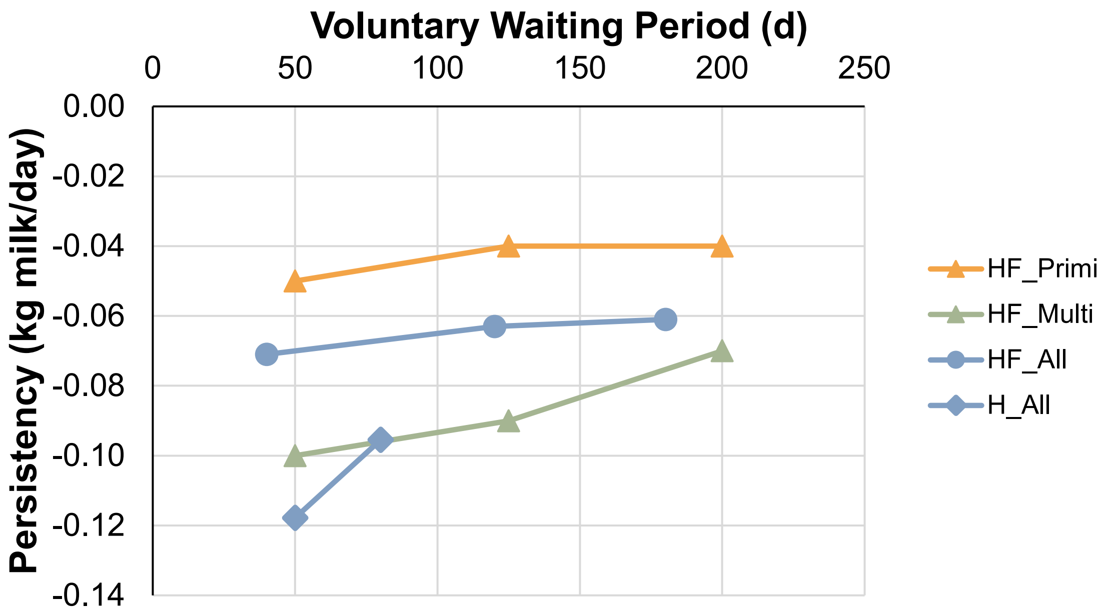
Milk yield consequences: *what do others report?*



Milk yield per day of calving interval in experimental studies with deliberate extension of VWP **(**one data point per parity per treatment group).

H = Holstein (Stangaferro et al. 2018); HF = HF cows (Burgers et al. 2021); SRB = Swedish R&W (Rehn et al., 2000); SLB = Swedish Holstein (Rehn et al., 2000); IH = Israeli Holstein (Arbel et al. 2001); H+SRB = (Holstein and Swedish R&W (Edvardsson Rasmussen et al., 2023); SRW = Swedish R&W (Osterman and Bertilsson, 2003); H_Multi = Holstein (Van Amburgh et al., 1997)

Lactation persistency



- Primiparous cows more persistent than older cows
- Overall: longer VWP → greater persistency

HF_Primi, HF_Multi = Holstein Friesian cows (Burgers et al., 2021); HF_All = Holstein Friesian cows (Niozas et al., 2019); H_All = Holstein cows (Schneider et al., 1981)

Milk yield before dry off reduced ....

... from **19.1** kg/d to **16.9** kg/d (with **34%** vs **54%** of the cows dried off below 15 kg/d) when the VWP is extended from **40 to 180 days** (Niozas et al., 2019).

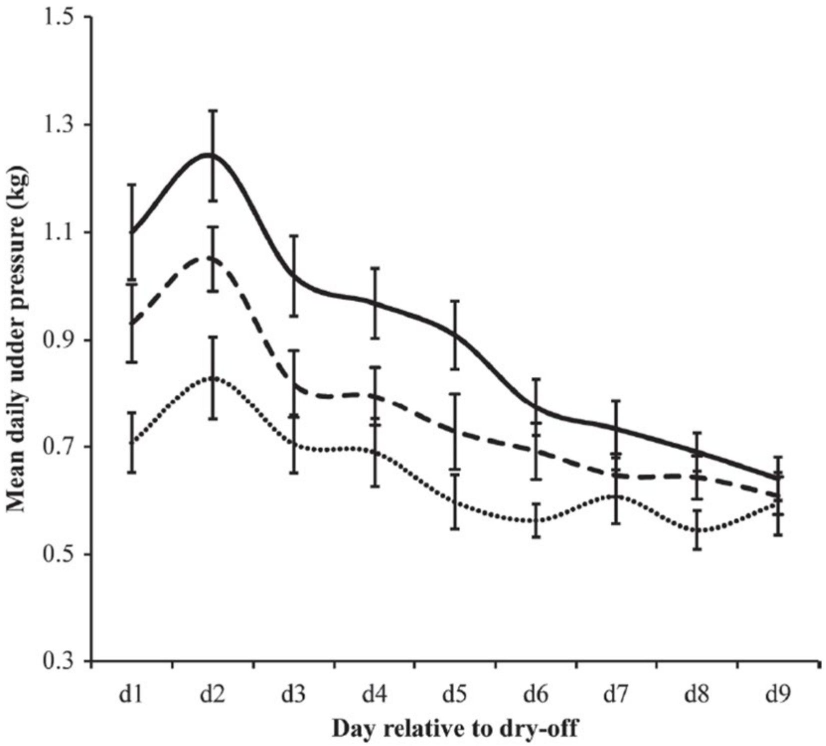
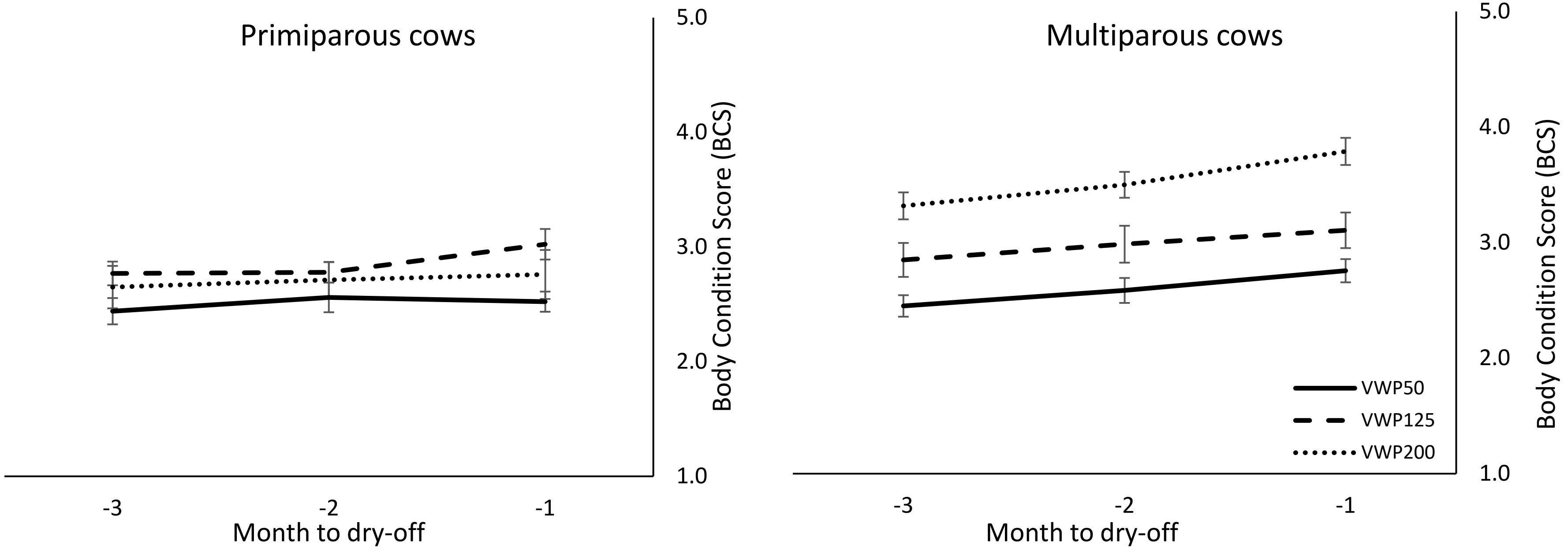


Figure 2. Udder pressure (mean ± SE; kg) after dry-off considering low- (n = 25; <15 kg/d; dotted line), medium- (n = 27; 15–20 kg/d; dashed line), and high- (n = 24; >20 kg/d; solid line) yielding cows.

- High milk at dry off:
  ↑ udder pressure
  ↑ stress (fecal glucocorticoids)
  leakage
- Tissue damage, pain
- Lower yield at dry-off:
  ↓ pressure; ↓ stress;
  ↓ leakage

Bertulat et al. 2013

Body condition before dry-off



- Primiparous cows: no effect of VWP on BCS
- Multiparous cows: ↑ VWP = ↑ BCS

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(Burgers et al., 2021)

Expectations for health

Potential health benefits

- Less (critical) calving moments per time unit
- Less drying-off moments and lower milk yield at dry off

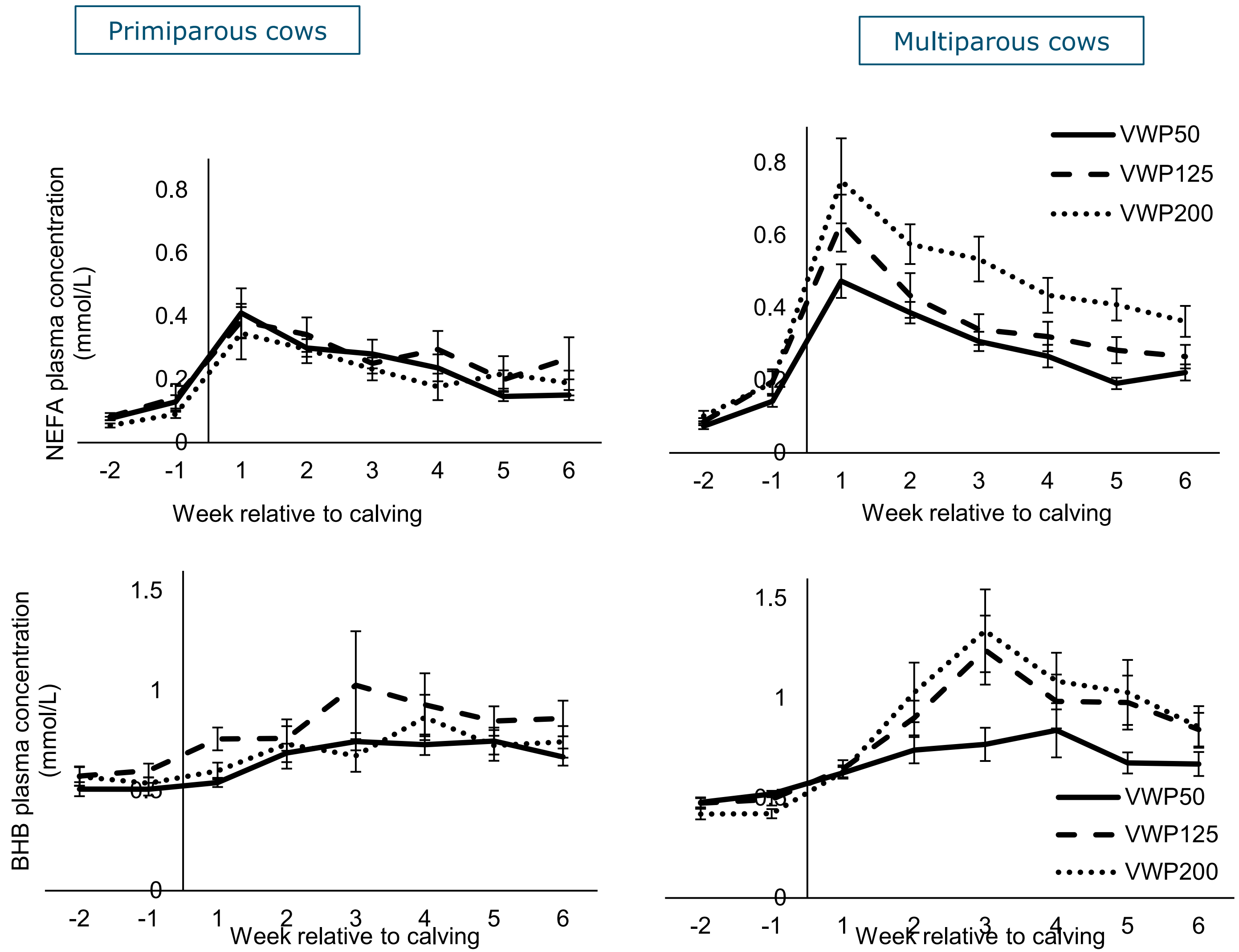
→ less risk for diseases associated with these transition moments

Potential health drawbacks

More time in late lactation:

- with higher somatic cell count → consequences for udder health?
- with increased risk for fattening → consequences for next lactation?

More negative EB in subsequent lactation



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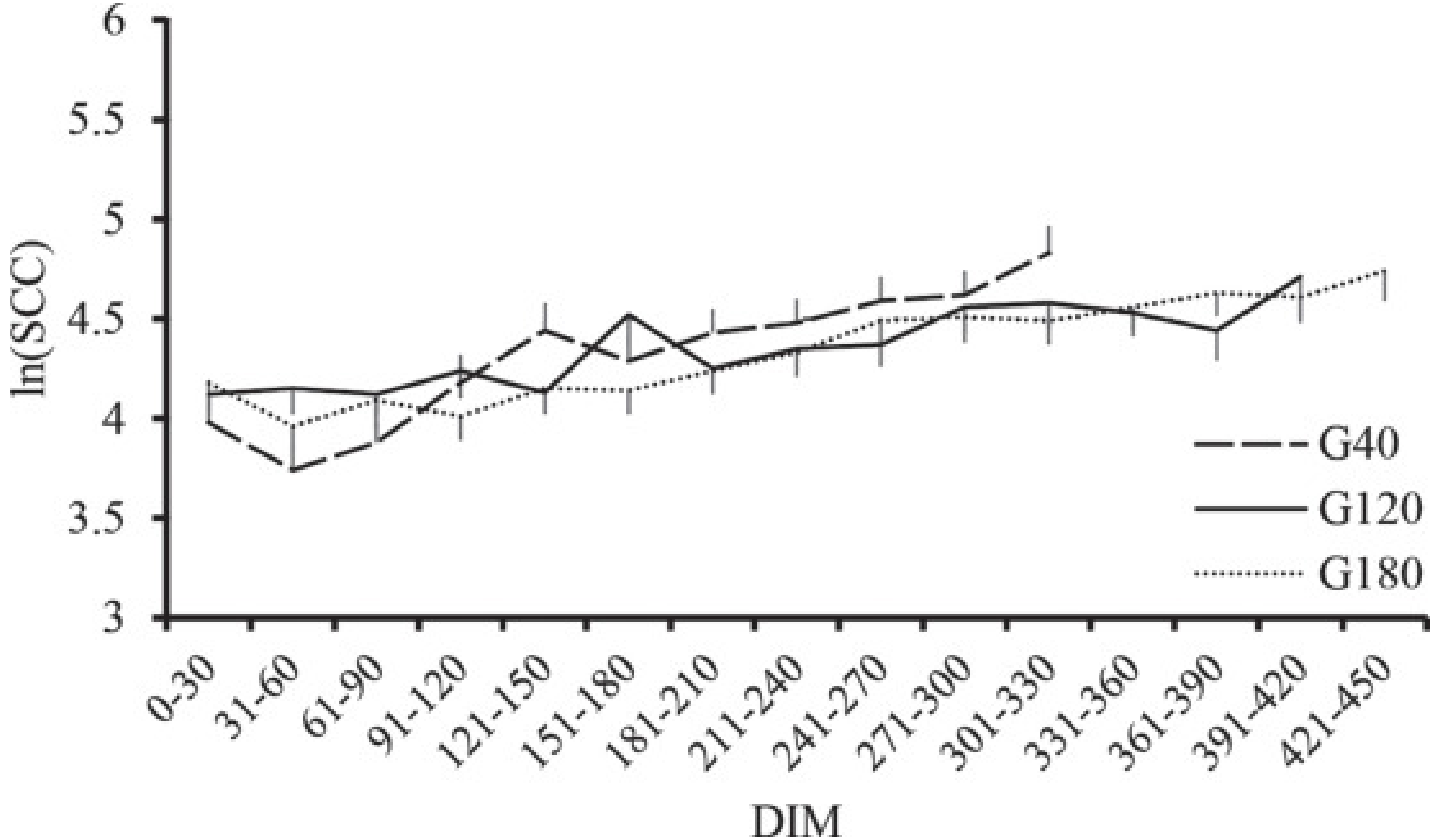
(Burgers et al., 2023)

Consequences for udder health

No effect on **mastitis** or **somatic cell count**, with an increase in voluntary waiting period from 40 DIM to 120 or 180 DIM.



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(Niozas et al., 2019)

Expectations for fertility

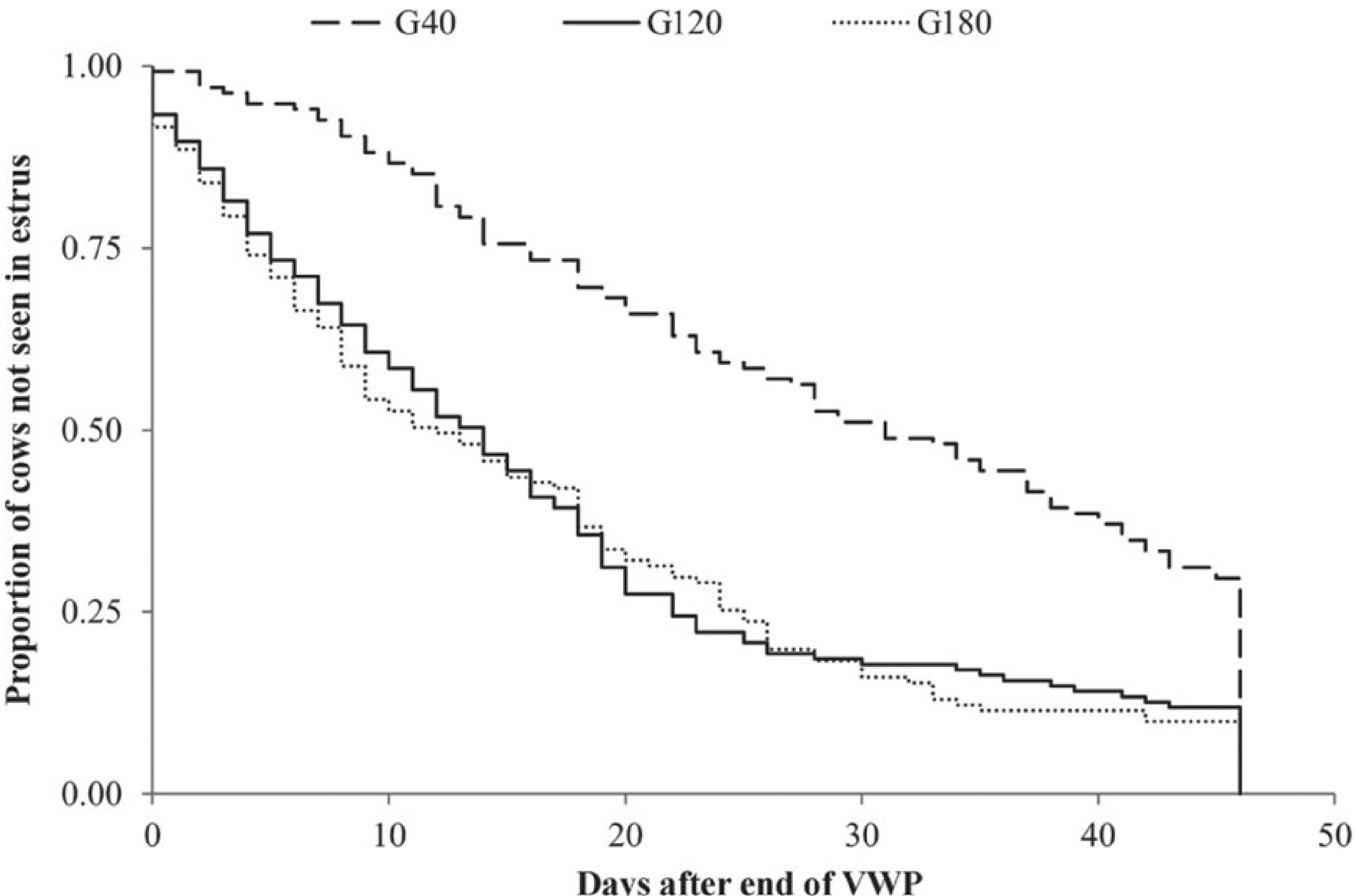
Fertility

- More time to recover from calving
- When the cow is in a better energy balance

results in better reproductive performance

Estrous

→ Proportion of cows seen in **estrous** increased with an increase in voluntary waiting period from 40 to 120 or 180 DIM



(Niozas et al., 2019)

Reduced days after VWP till pregnancy

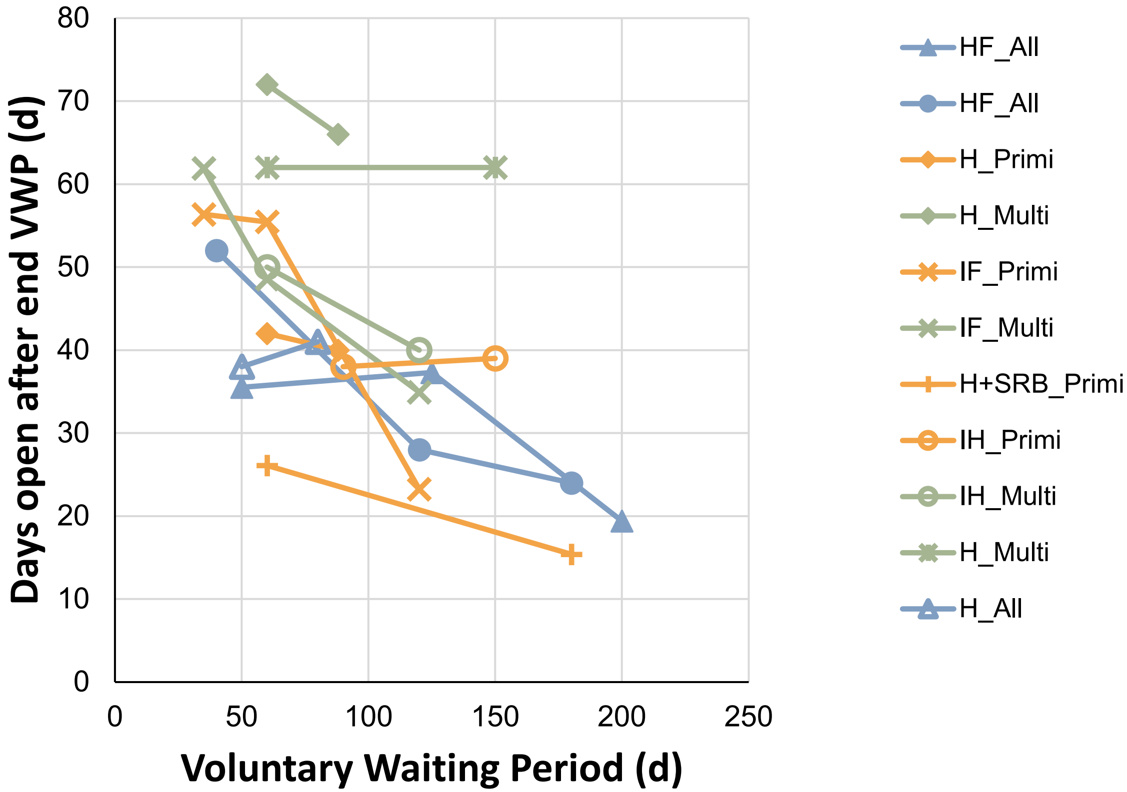
VWP	50 dgn	125 dgn	200 dgn
Conception rate after first insem.(%)	43.8	42.0	63.3
Days open (d)	85.5[a]	162.3[b]	219.4[c]
Days open after end VWP (d)	35.3[a]	37.3[a]	19.4[b]

[**VWP** = Voluntary waiting period from calving till insemination]

→ Extending VWP resulted in **less milk**, **better body condition** and **more regular ovarian cycles** around end of the VWP

(Ma et al., 2022)

Reproduction consequences: *what do others report?*



Days open after end of the VWP per VWP per experiment (one data point per treatment group).

Orange = primiparous cows; Green = multiparous cows; Bleu: both primi and multiparous cows

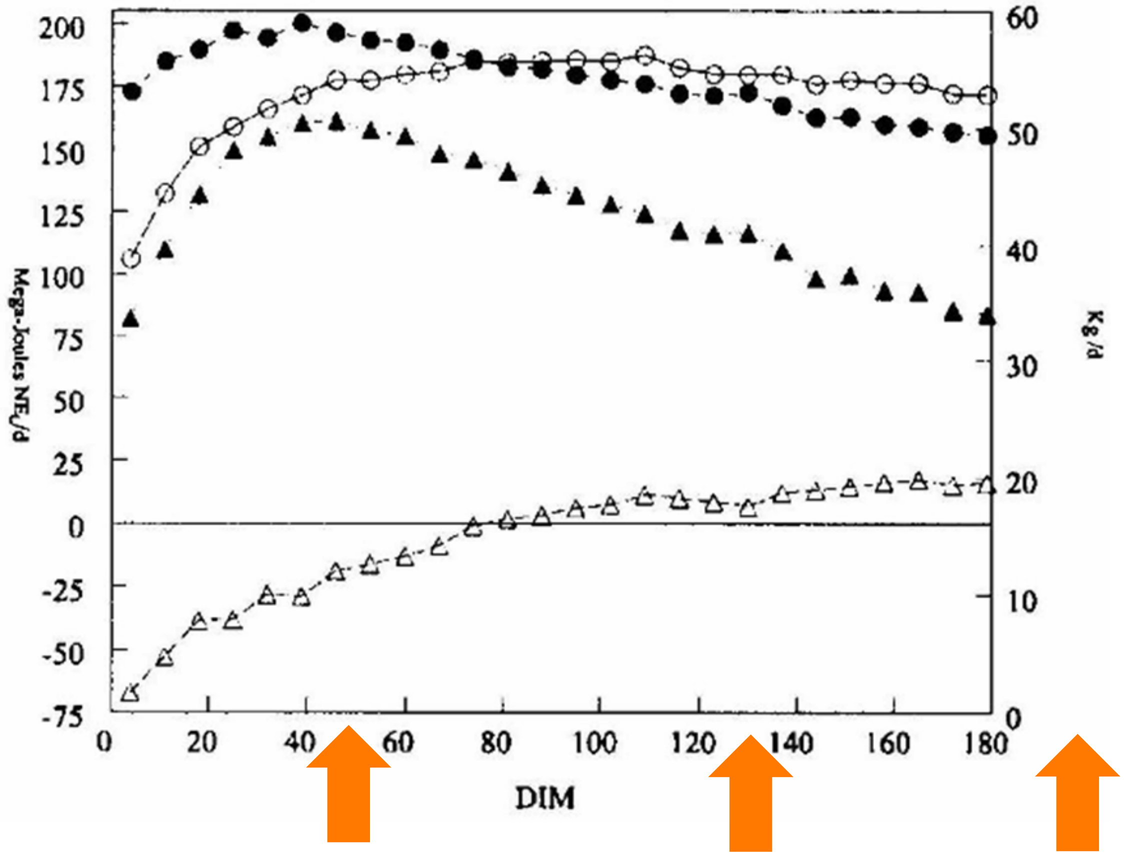
(Arbel et al., 2001; Edvardsson Rasmussen et al., 2023; Ma et al., 2022; Niozas et al., 2019; Schindler et al., 1991; Schneider et al., 1981; Stangaferro et al., 2018)

Consequences for calves?

→ **Insemination** at a later moment in the lactation cycle

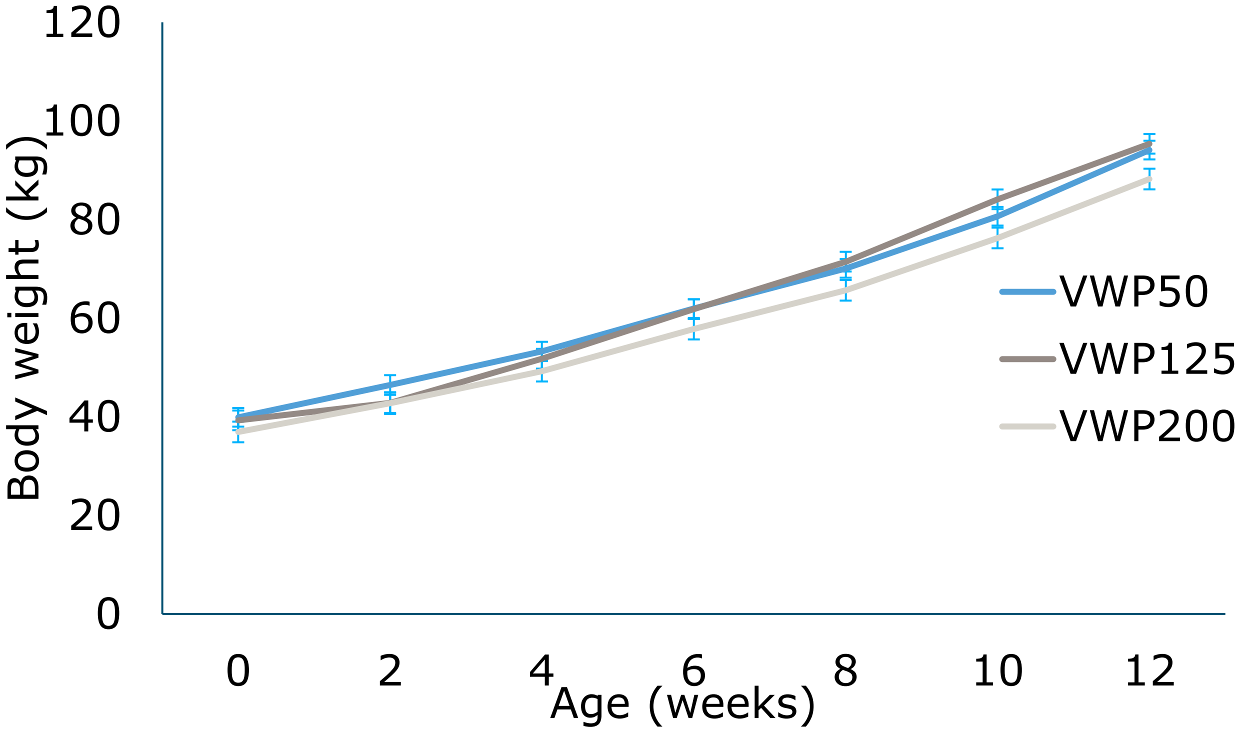
Energy balance of second parity cows at Dairy Campus

(De Vries et al., 1999)



→ Results in conception at a **different metabolic status**

Calf development



Body weight of female calves born to cows with a voluntary waiting period of 50, 15 or 200 days.

- No effect on **growth** or **body weight** during the weaning and rearing phase (till their first calving);
- **Greater plasma antibody level** for calves from dams with a short calving interval

(Wang et al., 2024)

Calves during 100 DIM of their first lactation

Calving Interval Dam	**Cint_1** (324-408 d)	**Cint_2** (409-468 d)	**Cint_3** (469-568 d)
Inseminations per pregnancy	1.4	1.4	1.4
Age at first calving (months)	24.9	24.8	25.3
Body weight (kg)	544[b]	536[b]	564[a]
Milk yield (kg/d)	25.0	23.3	24.6
Fat-and-protein corrected milk yield (kg/d)	30.0[a]	28.5[b]	29.3[b]

→ **Calving interval of the dam** was related with **body weight** and **FPCM yield** of the calves during the 100DIM of their first lactation

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(Wang et al., 2024)

Net partial cash flow - calculations

→Summed per cow for experimental period

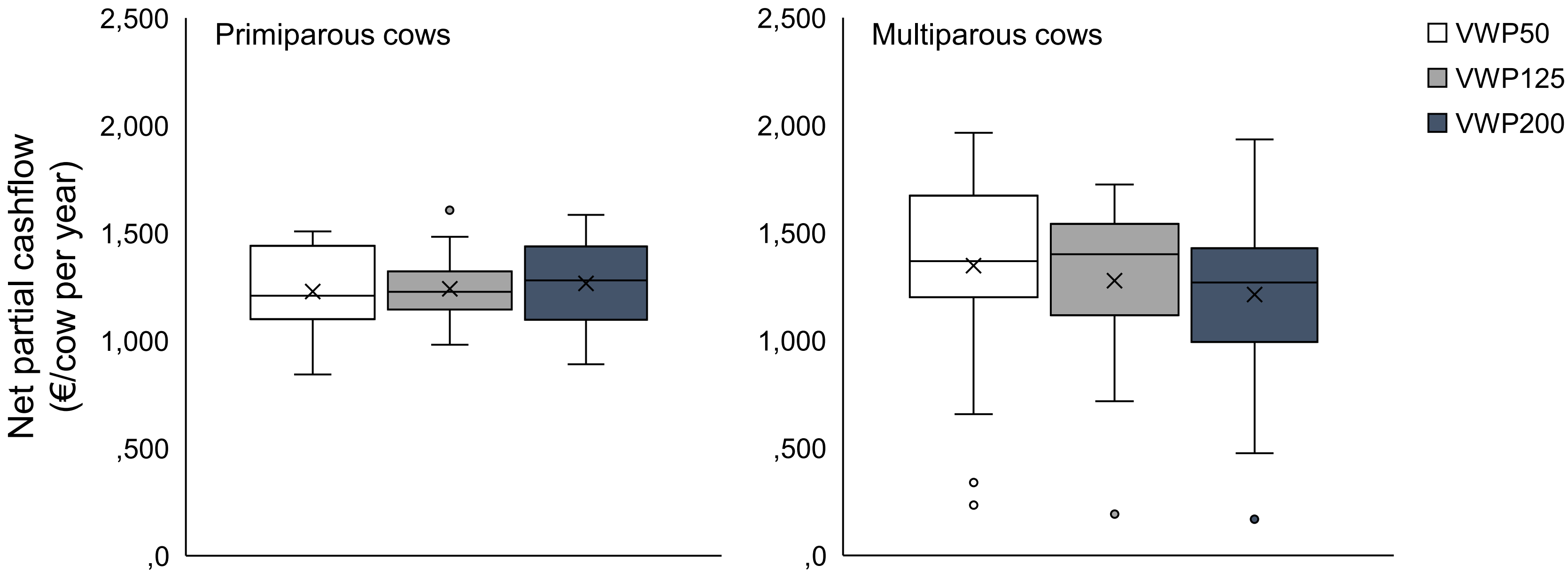
- Price per variable from several Dutch dairy institutes
- Expressed per cow per year (/ days in study x 365)

Revenues and costs per cow per year

	VWP50	VWP125	VWP200
N cows	47	39	35
Revenues	**3,141[a]**	**3,009[ab]**	**2,848[b]**
Milk	3,131[a]	3,000[ab]	2,840[b]
Calves	11[a]	9[b]	8[c]
Costs	**1,837[a]**	**1,751[ab]**	**1,632[b]**
Basal ration	1,126	1,111	1,097
Concentrate	476[a]	434[ab]	393[b]
Disease treatments	177	151	107
Inseminations	59[a]	54[a]	35[b]
Net partial cashflow	**1,304**	**1,258**	**1,216**

(Burgers et al., 2021)

Individual variation in net partial cashflow



- Multiparous cows: more variation
- Cows with high net partial cashflow / year:
  - High milk + contents and few diseases treatments
  - Regardless of VWP or calving interval

(Burgers et al., 2021)

Customising lactation length

Extended lactation length

- ✓ Limit critical transition periods per cow (herd?) per time unit
- ✓ Inseminate during a period with less reproductive problems
- ✓ No effect on udder health
- ✓ Dry off at a lower milk yield & limit labour
- × Possible milk losses and body fattening of the end lactation

Can we use **cow information in early lactation** to limit **milk yield losses** and **body fattening** at the end of the lactation?

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Strategies of farmers to extend lactation

VWP based on:	Primiparous cows	Multiparous cows
Peak production (kg/d) (n=2)		
Days in lactation (n=3)		
Milk yield level (kg/d) (n=2)		
Combination of criteria (n=6)		

Main strategies:

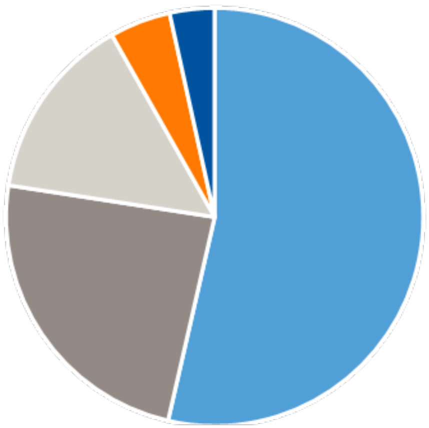
- Delay insemination until certain number of **days** for all cows
- Delay insemination until **milk yield** has dropped below a certain level
- Combination of factors

Customising lactation length

What makes a cow suitable for an extended lactation?

We can predict:

- Milk (FPCM) end of the lactation
- Condition end of the lactation
- Milk (FPCM) total lactation



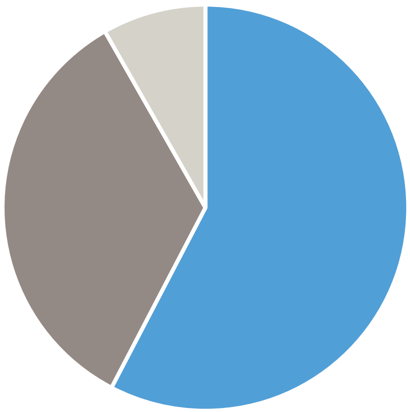
$R^2 = 82\ \%$

Cow-characteristic	P-value
Milk production	< 0.01
Peak milk yield	< 0.01
Protein	< 0.01
Parity	< 0.01
Breeding value for persistency	< 0.01

(Burgers et al., 2023)

Cow factors to predict FPCM end lactation

FPCM end lactation

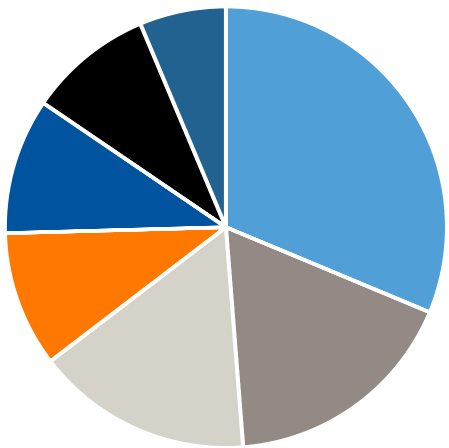


Cow characteristic	P-value
Milk production	< 0.01
Parity	< 0.01
Breeding value for persistency	< 0.01

R^2 = 43 %

- ↑ Milk before insemination: ↑ milk end of the lactation
- Primiparous cows: ↑ milk end of the lactation

Cow factors to predict BCS end of the lactation



Cow-characteristic	P-value
Body condition (BCS)	< 0.01
Lactose	< 0.01
Body weight	< 0.01
Concentrate intake	< 0.01
Protein	< 0.01
Milk production	0.01
Parity	0.04

- ↑ BCS before insemination: ↑ BCS end of the lactation
- Multiparous cows: ↑ BCS end of the lactation

Extended lactations *or* ***Customising lactation length***

- Reduce frequency of critical moments in a cow’s life

..but (total) effects depend on cow characteristics!

- Improve cow health, welfare and fertility
- Consequences for the (unborn) calf seem to be limited
- Consequences for labour and work pleasure

Decisions support models *could facilitate selection of cows for a cow-specific lactation length*

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Current *OptiLac-project*

- **Validation of prediction models** for cow performance in an extended lactation
  - part of the PhD of Brigitte de Bruijn
- Development of a **decision support model** for the optimal insemination moment per individual cow
  - PhD Jan Aarts
- Evaluate **feeding strategies** for cows with an extended lactation

Collaboration with:

- ~40 dairy farmers
- In a Public-Private-Partnership project:

ZuivelNL
Ketenorganisatie van de zuivelsector
for farmers
LELY
Ministerie van Landbouw, Visserij, Voedselzekerheid en Natuur
CRV
BETTER COWS > BETTER LIFE
DUURZAME ZUIVELKETEN

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Thank you for your attention

More information?

- Project website at www.adp.wur.nl
- Ariette.vanKnegsel@wur.nl