PhD – Midway seminar

Cow-calf contact (CCC) in dairy farming with emphasis on CCC on pasture

Juni Rosann E. Johanssen 19.05.2022
Supervisors

Main supervisor:
• Knut Egil Bøe, Norwegian University of Life Sciences (NMBU)

Co-supervisors:
• Julie Foske Johnsen, Norwegian Veterinary Institute
• Steffen Adler, Norwegian Institute of Bioeconomy Research (NIBIO)

«Extra» supervisors:
• Kristin M. Sørheim, Norwegian Centre for Organic Agriculture (NORSØK)
• Mette Vaarst, Aarhus University
Projects and financing

**SUCCEED** “Establish science based and practically feasible methods to allow increased contact between cow and calf in dairy production”:

- The Norwegian Research Council, Research funding for the agriculture- and food industry (FFS-JA)

**Kalvelykke** (Calf Happiness):
- Regional Research fund Mid-Norway

**Dairy cow and calf together on pasture**:
- The Norwegian Animal Protection Alliance's Research Fund
My PhD (aug. 2020 - aug. 2023)

- Researcher NORSØK, Tingvoll (2017-)
- PhD-candidate NMBU, Ås (2020-)

Aim:

- Acquire new knowledge about dairy farming systems with cow-calf contact, with emphasis on cow-calf contact on pasture
Planned scientific articles

1. **Johanssen, J. R. E. et al.** 2022. How Norwegian dairy farmers with cow-calf contact systems practice these systems and how they perceive the interrelationships between cow and calf and human in them

2. Co-author **Johanssen, J. R. E.** 2022. *What has impact on farmers’ decision to establish and sustain systems of prolonged cow-calf contact at their farms?*

3. **Johanssen, J. R. E.** et al. 2023. *Behaviour in dairy calves with and without their dams on pasture*

4. **Johanssen, J. R. E.** et al. 2023. *Effects of dairy cow-calf contact on pasture on calf weight gain, cow milk yield and composition of milk*

5. Co-author **Johanssen, J. R. E.** 2023. *Identification of dairy calf suckling behaviour by using automatic surveillance technology on pasture*
<table>
<thead>
<tr>
<th>Original plan</th>
<th>A) Activities/Milestones</th>
<th>Gjennomføres</th>
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<tbody>
<tr>
<td></td>
<td>Planning of PhD, interviews with farmers having CCC and experiment with cow and calf on pasture</td>
<td>Vår ☐ Høst ☒ År 2020</td>
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<td>Farm visits, interviews and transcription</td>
<td>Vår ☐ Høst ☒ År 2020</td>
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<td>Start seminar (9. February)</td>
<td>Vår ☒ Høst ☐ År 2021</td>
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<td>More interviews, transcription, analysis of interviews</td>
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<td>Planning of experiment with cow and calf on pasture</td>
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<td>Conducting experiment with cow and calf on pasture (May-August)</td>
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<td>Process and analyse results from experiment</td>
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<td>Publish Norsøk-report and article in Buskap from the interviews</td>
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<td>Write scientific article 1 and 2 from interviews</td>
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<td>Be finished analysing results from experiment</td>
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<td>Write scientific article 3, 4 and 5 from experiment</td>
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<td>Mid way seminar / evaluation (August)</td>
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<td>Publish article 3 from experiment</td>
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<td>Publish article 4 and 5 from experiment</td>
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<td>End seminar (June)</td>
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# Old course plan

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<td>PHI401</td>
<td>1. Qualitative interview methodologies in agricultural and veterinary research</td>
<td>Aarhus universitet</td>
<td>Ph.d. ☒</td>
<td>Master ☐</td>
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<td></td>
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<td>HET401</td>
<td>4 Animal emotion</td>
<td>Wageningen University &amp; Research</td>
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<td>V ☒  H ☐</td>
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<td>5. Individual PhD Course in Ethology</td>
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<td>6 Animal pain</td>
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**Total number of ECTS in ORIGINAL course plan**: 36

**ECTS OUT**: 6
# New course plan

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<td>PVS0170</td>
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<td>VET414</td>
<td>5. Biology of lactation in dairy systems with cow and calf contact</td>
<td>SLU</td>
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<td>6. Applied statistics for experimental and laboratory oriented studies in veterinary science</td>
<td>NMBU</td>
<td>Ph.d. ☒</td>
<td>V ☐ H ☒ 2022</td>
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**Total number of ECTS in ORIGINAL course plan**: 35
Travel abroad

• Nordic ISAE, Sweden - 26.-28.January (on Zoom instead)

Will not go to Canada, but:

• Aarhus University Foulum, Denmark, 3 weeks (30. January - 18. February 2022)
• Swedish University of Agricultural Sciences (SLU), Uppsala, Sweden, 2 weeks (12. - 24. June 2022)
• Ethology congress ISAE, Ohrid, Macedonia, 4. - 8. September

Other travelling:

• Visit Ruralis in Trondheim 25.May and maybe again in June?
• Visit Ås two times in the autumn, work with my supervisors there?
The interviews (Article 1 & 2)

1. **Aim:** Explore and analyze how Norwegian dairy farmers with CCC-systems allowing the dam to be with her own calf for periods between one and four months, practice their CCC-systems and how they experience and perceive the interrelationships between cow and calf and human in these systems.

2. **Hypothesis:** Factors supporting a change to a system of cow-calf contact at the farm level locate across farmers’ overall action space, including the presence of factors beyond farmers’ control.

   **Aim:** To have an in-depth exploration of this change, and identify factors important in that regard, including factors important for sustain such a system.
About the interviews

• Interview guide: Autumn 2020
• Interviews carried out: October 2020- March 2021
• 18 farmers, 13 farms, 1 excluded from article 1
• 7 with farm visits and 5 on teams
• 51-130 minutes
• 8 500 – 23 000 transcribed words per interview
• Analysed on NVIVO: Modified grounded theory
<table>
<thead>
<tr>
<th>Short version of interview guide</th>
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<tbody>
<tr>
<td>- About the farmer, the farm, the housing, the animals</td>
</tr>
<tr>
<td>- Practice with cow-calf contact from before, the beginning and until today</td>
</tr>
<tr>
<td>- The change/why they started with cow-calf contact</td>
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<tr>
<td>- Economy questions (for SUCCEED-report)</td>
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<tr>
<td>- Benefits and challenges with cow-calf contact</td>
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<tr>
<td>- If they want any changes, what’s important for cow-calf contact, advises for other farmers</td>
</tr>
<tr>
<td>- Obstacles and benefits for more farmers to have cow-calf contact</td>
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Ku og kalv sammen i melkeproduksjon
- Intervjuer med melkeprodusenter

Forfattere: Juni Rosann E. Johansen & Kristin M. Sørlie, NORSØK

**Utgave 2 – 2022**

**LEDER**

- Sosialhusholdningsutvalget
- Avl
- Endringsforløpsutvalget
- Melkeindicater i utvikling
- Helsesøknadser, avl og melkeproduksjon av ettekter.

**REPORTEJEL**

- Når er kunst ikke ser
- Organisasjon
- Avl og god økonomi for storkøen
- SANT

**AVL**

- Hva skjer da ændrer jeg ikke i
- Høsteringens grunnkost
- Genotype 2021

**EPIDEMIOLOGI**

- Kjøttviltene har løfta økonomien
- Trakt, geheie, og sammenheng
- Norsk geheie tørr og nå
- Husdyrgodset som rosses
- Glidere på flekk
- Visse hensyn til grønsaks

**RISIKOFLEK**

- Lokal avlssynest og grunnlag for Norsk melkeproduksjon
- Endret geheiesstyring med bruk av
- Husdyrgodset på eng

**REVISJON**

- Felt til sikkerhet
- FOR
- Avvik fra normen på vegne av

**Utgave**

- Ku og kalv sammen i melkeproduksjon

*Juni Rosann E. Johansen, Kristin M. Sørlie, NORSØK*

*rosanne.johansen@norsok.no*
## About the farmers and farms

<table>
<thead>
<tr>
<th>Farmer ID code</th>
<th>Age (years)</th>
<th>Type of farming</th>
<th>Animal housing</th>
<th>Cows per year (2020)</th>
<th>Milk Quota (tonnes 2020)</th>
<th>Calving time</th>
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<tbody>
<tr>
<td>1M &amp; 1W</td>
<td>47 &amp; 34</td>
<td>Organic</td>
<td>Free stall, milking parlour</td>
<td>14,1</td>
<td>44 (+cheese)</td>
<td>Spring</td>
</tr>
<tr>
<td>2W</td>
<td>52</td>
<td>Conventional</td>
<td>Tie stall</td>
<td>14,4</td>
<td>118</td>
<td>Autumn</td>
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<tr>
<td>3W</td>
<td>38</td>
<td>Conventional</td>
<td>Free stall, AMS</td>
<td>52,8</td>
<td>440</td>
<td>All year</td>
</tr>
<tr>
<td>4M &amp; 4W</td>
<td>35 &amp; 36</td>
<td>Conventional</td>
<td>Free stall, AMS</td>
<td>36,0</td>
<td>276</td>
<td>All year</td>
</tr>
<tr>
<td>5M &amp; 5W</td>
<td>39 &amp; 39</td>
<td>Organic</td>
<td>Free stall, AMS</td>
<td>24,5</td>
<td>196</td>
<td>Sept.-March</td>
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<tr>
<td>6S &amp; 6F</td>
<td>35 &amp; 61</td>
<td>Conventional</td>
<td>Tie stall</td>
<td>14,7</td>
<td>173</td>
<td>Autumn</td>
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<td>7M &amp; 7W</td>
<td>32 &amp; 36</td>
<td>Conventional</td>
<td>Free stall, AMS</td>
<td>14,1</td>
<td>122</td>
<td>All year (focus spring)</td>
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<td>8W</td>
<td>39</td>
<td>Conventional</td>
<td>Free stall, AMS</td>
<td>60,0</td>
<td>320</td>
<td>All year</td>
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<td>Conventional</td>
<td>Free stall, AMS</td>
<td>38,7</td>
<td>365</td>
<td>All year</td>
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<td>10M</td>
<td>61</td>
<td>Organic</td>
<td>Free stall, milking parlour</td>
<td>20,7</td>
<td>81 (+cheese)</td>
<td>All year</td>
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<tr>
<td>11M</td>
<td>58</td>
<td>Organic</td>
<td>Tie stall</td>
<td>18,8</td>
<td>137</td>
<td>Spring and late summer</td>
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<td>12M</td>
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<td>Conventional</td>
<td>Tie stall</td>
<td>16,0</td>
<td>99</td>
<td>All year</td>
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Cow-calf contact practice

- From 1 to more than 20 years experience with CCC
- 3 farms started in the 90s and 9 farms between 2015-2019
- CCC: 6 weeks-4 months
- Most had cow-calf alone in calving pen for some days after calving (bonding)
- All farms with CCC in cow area
- 7 farms with CCC on pasture
- 2 farms continued with milk feeding after full separation
- 10 farms had CCC whole milk feeding period
- Separation and weaning: Abrupt, nose flap, gradually with fenceline and/or less time together
Farm 1

- Organic, 14 cows, free stall, milking parlour
- Started cow-calf 2017 (took over farm)
- Mostly spring calving
- Preferably calvings and CCC on pasture
- Calving pen
- Calf hide
- Together fulltime 3 months
- Gradual separation and weaning till 4 months
Farm 3

- Conventional, 53 cows, free stall, milking robot
- Cow and calf together since 2019 –
  - New free stall, more space
- Spread calving
- Calving pen 4 days → welfare area for a period from a few days up till 2-3 weeks, depending on the milking → free stall area
- Calf hide
- Together fulltime 10 weeks, 2 weeks with nose flap before separation
- (Not on pasture together yet)
Farm 5

- Organic, 25 cows, free stall, milking robot,
- Cow and calf together since 2018
- Calvings sep-march
- Calving pen 2-5 days
- Fulltime with mum in free stall till 4 weeks
- 2-4 calves are moved to pen with nurse cow
- Fenceline contact with dam for some days
- Suckle until weaning at 12 weeks
- (Not on pasture together)
Farm 6

- Conventional, 18 cows, tie stall, calvings autumn
- Father had CCC since late 90s, son continued 2019
- Preferably calvings and CCC on pasture
- Calving pen
- Fulltime 4 weeks – calves loose in tie stall – opened to an own room and a corner with straw
- Period after milking morning and evening till 8 weeks, period evening till weaning 9 weeks
Themes in article 1 from the interviews

- Provision of colostrum
- Relation between the dam and her calf
- Relation between the cow and the farmer
- Milking of cows (with calves)
- Relation between the calf and the farmer – handling
- Calves learning (from cows and calves)
- Calves suckling or sucking others
- Housing when calves are with cows
- Challenges with calves in cow area
- Cow-calf on pasture (yes or no, experience)
- Natural behaviour and animal welfare
- Working environment and focus
- Separation and weaning
Farmers perceptions about cow-calf – maternal instincts

10M: «She came to her calf, and then you saw that face and the eyes and the body of that cow, it was absolutely amazing, it was, the eyes shone and the body, it showed a happiness that I had not seen before»

2W: “I get a little provoked when I see on Facebook that NRF has no maternal instincts. Of course, they have! Like that cow, she doesn’t have a bad temper, she just has a strong maternal instinct, out in the free nature, she would have saved her calf. So, that’s just nonsense, NRF have more than enough maternal instincts.”
Farmers perceptions about cow-human

10M: «You need to have a good relationship with your cows, the cows need to be used to you and to feel safe around you, and the person that the cow feel safe around, that person, she will not be angry at during and after calving.»

10M: “If you have a lot of employees working, who the animals don’t know, then it will be much easier to take the calf from the cow immediately, milk the cow and give milk to the calf. You must think about the health risk for the employee. If you, as an employee, shall be there when cow and calf are together, make sure the calf are suckling, be present and pay a lot of attention towards them, this can be a bigger challenge, maybe the biggest.”
Farmers perceptions about handling calves

2W: “I think it’s a lot nicer now, to be around the calves, they come to me when I’m milking the cows as well. People say that they don’t get any attachment with me now, but that’s not true, because now, they don’t associate me with food, they come to me when they want to be cuddled, and that’s a lot nicer compared to standing there being pushed, eaten on, and butted because they don’t get their food.”

1W: “The first calves we weaned, they were so wild, they were not used to being handled you know. It’s something completely different when you’re standing there, and the calf know it’s you who’s giving the food. But here, you are kind of the enemy when you are out there (on pasture). So, we had to do something about that, we had to start socializing them. It was our veterinarian who gave us advises about that we could make sort of a calf hide out there, where they could get some hay and concentrates, a teat, and some water, and then we could take them in there and sort of force them to get cuddled.” 1M: “Two times a day, we handle them.”
Farmers perceptions of cow and calf on pasture

5W: “If the small calves should have run far up in the mountains as well, then they wouldn’t come back in the evening ever again. The cow wouldn’t have any reason to come back in the evening, she could just stay in the mountains with the calf, ah, no.”

6S: “The advantage of having calving in the autumn is that then they can be outside and calf outside on pasture, I want to have as much calving outside as possible. When they calve outside the animals are much faster, or healthier and fitter.”

10M: “All mothers are amazing, the cows are very kind and very good mothers, like most mothers regardless of species. And, if you thrive at home, you will always come back home, it’s like that with the calves as well. The calves can be away exploring on their own when they are outside, but they always come back home. So that’s not a problem. But it has been many people calling me, saying like “There are some calves here..”, it’s a problem if they go to the big road or the railway or something like that, but they have never done that.”
Natural behaviour and animal welfare

7M: “We think it’s better animal welfare when the calf is together with the cow. This is our way of interpreting animal welfare. Because it’s a bit like a soluble concept. But that the cow can get to express her natural needs because it’s a natural need. When you see how they handle the calf, after calving and how they follow it in the free stall, calling for it and it comes and suckles from its mother. It’s natural instincts, a need that is being covered, that mother role. So that’s what we think is good animal welfare. But it doesn’t mean that we think it’s poor animal welfare to separate them early.”

5W: “I feel like the animal welfare has increased. Or, I don’t know, they had very good welfare when we separated them early as well.”
Working environment and focus

5W: “You use the time in a completely different way, you’re often walking around with a plank, which you are going to place somewhere. We use some time on that. Adjustments in the barn, moving animals here and there, look at them. But before you went around carrying buckets, warming milk, carrying buckets, emptied buckets, and all that.”

4W: “Now we can, when we have the robot, if we suddenly go to the barn very early in the morning, or if we go there an hour later in the evening, it doesn’t matter for the calves, we don’t have anyone standing and waiting and to feel sorry for because they don’t get their food.”

11W: “I think it’s pleasant, it’s nice to see, they have a good interaction. Instead of having to stand holding the bottle for the calf, I can stand and watch them enjoy themselves together»
Separation and weaning

1W: “It’s much easier when you are separating them to separate more calves from the cows together, but we have had some problems with the separation. When they are used to be suckling their mothers, you cannot just stop this abruptly, because then we get a huge drop in the calves’ growth, and stomach trouble, and things like that.”

11W: «It can be a bit noisy at weaning, but it has to do with how you do it, so I have found a method that actually works quite well, for the calf it’s not a problem, but the mum, some mothers can make a little noise for a day or something, but now I do it successively and then they are so tired of those bullies that are fooling around with them when they are 3 months old, so they are happy to get rid of them, because they can see them, they pass them and sniff them every day». 
The experiment (Article 3, 4 & 5)

- What effects does having cow and calf together on pasture have on the behaviour and health of cow and calf, calf weight gain, cow milk production and composition of milk?
About the experiment

- 20 cow-calf pairs, 4 groups

**Early separation (ES):**
- Separated within 1-3 hours after calving
- Natural milk 4 meals/day till week 6: (offered 12-14 l/calf/day)
- Week 7: Milk 2 meals/day, 8 l/calf/day
- Week 8: Milk 2 meals/day, 4 l/calf/day
- Week 9: Weaned from milk

**Cow-calf contact (CC):**
- Together fulltime for 6 weeks (free suckling)
- Week 7 and 8: Physical contact through fenceline (without suckling), except:
  - Week 7: 2 hours together after milking 2 x day
  - Week 8: 1 hour together after milking 2 x day
  - Week 9: Separated and weaned, cows moved to another pasture
Animals in the experiment

- Calvings 7-May-14.June, birth weight 30-56 kg
- Divided into groups by calving date
- Age variation for calves: 6-8 days within each group
- Norwegian red cattle, except 3 pairs with Holstein crosses in separate groups
- ES-cows: 1 primiparous- and 9 multiparous cows
- CC-cows: 4 primiparous- and 6 multiparous cows
- ES-calves: 6 bulls, 4 heifers
- CC-calves: 2 bulls, 8 heifers
- Out on pasture when youngest calf in group was 3-4 days
Summer farm in Nerskogen, ca 720 moh
Behaviour

• Direct observations of calves on pasture - Day 1, week 3, 6 and 9
• Play, suckling/drinking milk, allogrooming, vocalisations (week 9)
• Grazing, lying, standing/moving, eating hay/silage, in calf hide
• Feeding test week 8: 4 buckets:
  - Concentrates, novel feed-hay, novel feed-carrots, empty

• Nofence-collars (cows and calves):
  - GPS-positions
  - Accelerometer-data activity
  - Accelerometer-data suckling CC-calves (compare with beh.reg.)
Calves use of calf hutch, week 3, 6 & 9

- Means with common letters are not significantly different (P< 0.05) according to Tukey’s test.
Means with common letters are not significantly different (P< 0.05) according to Tukey’s test

- Means with common letters are not significantly different (P< 0.05) according to Tukey’s test
Means with common letters are not significantly different (P< 0.05) according to Tukey’s test.

Calves lying, week 3, 6 & 9

Behaviour in % (mean ± SE) of total instantaneous sample points per day (8 hours).

Week 3
- Early separation
- Cow-calf contact till 8 weeks

Week 6
- Early separation
- Cow-calf contact till 8 weeks

Week 9
- Early separation
- Cow-calf contact till 8 weeks

- Means with common letters are not significantly different (P< 0.05) according to Tukey’s test.
Calves standing/moving, week 3, 6 & 9

Behavior in % (mean ± SE) of total instantaneous sample points per day (8 hours)

- Means with common letters are not significantly different (P< 0.05) according to Tukey's test

- Early separation
- Cow-calf contact till 8 weeks
Means with common letters are not significantly different (P< 0.05) according to Tukey’s test.
• Abnormal suckling week 9 (not registered)
Means with common letters are not significantly different (P< 0.05) according to Tukey’s test.

- Means with common letters are not significantly different (P< 0.05) according to Tukey’s test.
Registrations health & performance – cow & calf

- Daily health checks
- Calves: Health assessments: After birth, day 1 pasture, week 3, 6, 9
  Calves: Weighing: After birth, week 6, 9 + some weighings later until 6 months
- Cows: Health assesments, weighing, breast measure, body condition score: day 1 pasture, week 9 (+ breast measure after calving)

- Calves: Milk intake ES-calves, ap.4 days/week till week 8
- Calves: Concentrate intake, ap. 4 days/week till week 9

- Cows: Daily milk yield (milked), teat samples mastitis bacteria & milk samples chemical composition: week 5 & 9
- Cows: Rests of concentrates morning milking till week 9

- Pasture registrations and samples
Preliminary results health and performance
Calves concentrate intake

- Average week 0-9:
  - ES: 0.34 kg/calf/day
  - CC: 0.13 kg/calf/day
ES-calves milk intake

- Average week 0-8: 9.8 l/calf/day
- Average week 1-6: 11.1 l/calf/day
Calves weight gain

- Preliminary analysis: No sign.differences treatment or gender

- Average weight gain birth till 6 weeks:
  - ES: 1,21 kg/calf/day
  - CC: 1,25 kg/calf/day

- Birth till 9 weeks:
  - ES: 1,13 kg/calf/day
  - CC: 1,17 kg/calf/day

### Table: BWG

<table>
<thead>
<tr>
<th>treat</th>
<th>calfgen</th>
<th>week 0-15</th>
<th>week 0-1</th>
<th>week 1-6</th>
<th>week 6-9</th>
<th>week 9-13</th>
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• Birth till 9 weeks:
  - ES: 1,13 kg/calf/day
  - CC: 1,17 kg/calf/day
Calves with highest weight gain week 0-15: Grim & Georg (ES-groups)

- Grim: 117.5 kg around 7 weeks
- Georg: 111.5 kg around 6 weeks
Cows milk yield

- Average delivered milk/cow/day
  week 0-8:
  - ES: 34.5 l/cow/day
  - CC: 10.7 l/cow/day
The cows with most and least milk til week 8

- ES-cow 1474 (third lactation) 40 l/day
- CC-cow 1586 (first lactation): 5 l/day
- All 4 CC-primiparous cows: 5-6,5 l/day
- ES-primiparous cow: 27,9 l/day
Cows milk quality – chemical composition

<table>
<thead>
<tr>
<th></th>
<th>ES 5 weeks</th>
<th>ES 9 weeks</th>
<th>CC 5 weeks</th>
<th>CC 9 weeks</th>
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<tbody>
<tr>
<td></td>
<td>Morning</td>
<td>Evening</td>
<td>Morning</td>
<td>Evening</td>
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<tr>
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- Sign. diff. in fat, urea, fatty acids week 5 (lower in CC)
- No sign. diff. in protein
Cows health

<table>
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<th>Groups</th>
<th>Poor milk let down</th>
<th>Diarrhea</th>
<th>Mastitis</th>
<th>Mastitis bacteria</th>
<th>Mastitis bacteria, glands</th>
<th>Teat wounds</th>
<th>Udder injury</th>
<th>Ketosis</th>
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<tr>
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<td>1</td>
<td>1</td>
<td>2</td>
<td>0</td>
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</tr>
</tbody>
</table>

Number of cows with clinical diagnosis through the experiment, and with mastitis-bacteria in samples week 5 and 9

- 1417 ES1: Mastitis bacteria sample 15.7, treatment later in same gland
- 1482 ES2: Teat wound and mastitis bacteria in gland, treatment
- 1558 CC1: Incipient mastitis, oxytocin
- 1537 & 1575 CC2: Treatment mastitis

- Milk let down problems with CC-cows through the whole experiment, problems with 8 of 10 cows, especially 4 primiparous cows
  - Farmers and veterinarians were worried
  - Oxytocin given to some cows on 21 different days
Calves health

- Good health on all calves through the experiment
- Some coughing in 2-3 calves ES2
  - General condition or appetite not reduced
  – Blood samples to check for virus
Thank you! 😊