(oppgave i skjæringspunkt avl - etologi - veterinærfag)

1. **HEALTH/WELFARE/BREEDS; Raseforskjeller i overlevingsrelevante egenskaper hos søyer og lam rundt fødsel: potensielle egenskaper for seleksjon. Norsk kvit sau og gammelnorsk spælsau. MSc thesis 2020-2021.**

(Breed differences in traits relevant for survival in lambs at birth and during the neonatal period: modern Norwegian White Sheep and the lighter, old nordic type Gammelnorsk Spæl)

Vi har data (samlet i 2018) egenskaper hos søyer og lam av Norsk kvit sau (NKS) ved lamming, bl.a. lammingsvansker og hvor raskt lam etter fødsel lam får i seg råmelk. Vi har nå eb besetning med Gammelnorsk spælsau (GNS), og ønsker å samle samme type data for å kunne se på raseforskjeller.

Vi kan lære mer om viktige atferder / egenskaper hos søyer & lam, for å kunne sette inn tiltak + kunne avle for redusert tidlig dødelighet. NKS har ca. 8% dødelighet for lam f.o.m. fødsel til beiteslepp (4% dødfødte), dette er like mye som på sommerbeite (se tab. Under, tall fra Animalia 2019: Årsrapport Sauekontrollen). Dødelighet før/ved fødsel hos GNS er på omtrent halvparten (1,9%): *Hvorfor er det slik?*. Vi vil ikke få nok data til å direkte analysere dødelighet, men vil se på egenskaper som er kjent som viktige for overleving - og som er enkle å observere.

Datainnsamling: Lange dager og netter med jobb mars-april 2020, Ås gård. Ca. 25 lamminger hos GNS. Ev. i samarbeid med veterinærstudenter på nattevakt.

Finansiering: Kostnader ved feltforsøk/observasjoner dekkes av støtte fra Mina og Samson Berges Forskningsfond.

(*Register at birth: traits linked to early lamb survival, e.g. time until first suckling; compare traits btw. A light, old Nordic short-tail breed, and a modern, heavier and more prolific breed. We have applied for financing, will know autumn 2019 if work can commence)*

		Antall fødte lam per:		% dødfødte for:	
Rase	**% av populasjon**	**Voksen søye**	**Gimre**	**Voksen søye**	**Gimre**
Norsk kvit sau (NKS)	69,1	2,3	1,6	4,4	5,1
Kvit spælsau	9,6	2,1	1,4	3,5	3,8
Gammelnorsk spælsau (GNS)	5,2	1,9	1,2	1,9	2,1
Farga spælsau	2,6	2,0	1,4	3,2	3,9
Norsk pelssau	2,0	2,0	1,3	2,8	2,8
Gammelnorsk sau	2,1	1,6	1,1	1,0	1,8
Dala	1,1	2,1	1,2	2,9	2,9
Texel	1,1	1,9	1,1	2,9	5,1
Sjeviot	0,8	1,9	1,2	4,0	5,3

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(oppgave innen avl – produktkvalitet – teori allometri/vekst/modning)

2a. BREEDING/GENETICS; New traits for selecting for improved carcass conformation while restricting adult size in Norwegian sheep: skeletal measurements on neonatal lambs. MSc thesis 2021 or 2022

(*Nye egenskaper for seleksjon for slakteegenskaper / slaktemodenhet og størrelse hos norsk sau: skjelettmål hos nyfødte lam)*

In our sheep breeding scheme selection for carcass quality is based on EUROP-classification, and lamb autumn weights, successfully: EUROP-classification greatly improved. Adult ewe size has increased, meaning some (unknown prop.) gain disappears as increased need for winter forage.

Alternative traits for selection, using information easily measured on newborn lambs at weighing? Potential traits will include length of various bones as well as circumferences of some body parts. Approach inspired by international research on beef cattle and sheep.

Some info: www.sheepcrc.org.au/files/pages/fact-sheets/pw31-quality-sheepmeat-series/Bone_growth_and_selection_for_muscling_for_web.pdf

- Note: goal for Norwegian sheep will (probably) be to improve carcass quality / composition without increasing carcass size - our sheep are 'big enough'?
- Note: possible unintended consequences of selection (see link), risk for animal welfare?

Work: challenging field-work in March-April 2020, visiting 15 large sheep farms in spring to collect information on ≈75 newborn lambs per farm → total 1 000 lambs. In autumn collect (existing database) weaning weights (+EUROP data) for the lambs. If possible collect data 2021, on (some of) the study animals as young ewes (2 years field work → 60 study credits?).

Need some funding for the field work (travel + accommodation for student / students); ≈15 000,- .

In concl.: Find correlations between skeletal / anatomical traits in newborn lambs (0 -1 days old) and carcass conformation + weights (≈140 days). New knowledge for Norwegian sheep. Alternative traits for (early) selection for carcass quality without increasing size. If data also 2021: estimate correlation skeleton traits with (young) adult body size.

- Basic scientific research on allometry and maturation in ruminants, or a more applied breeding perspective

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2b. BREEDING/GENETICS/HEALTH; Udder condition / score and mastitis: genetic parameters

*Design in many ways similar to **2a** 'Skeletal measurements'* but focus on trait 'udder condition' as indicator of risk of mastitis. Field work autumn: stroking & squeezing the udder of ≈1000 ewes (farms, etc., as **2a**), register knots etc. (indications of problems). Choose farms with unusually good data on health (occurrence of mastitis). Observation protocols to be developed with veterinarians.

Motivation: Mastitis is the most important reason for culling ewes, economically important – and very relevant for animal (ewes and lambs in summer!) welfare. Health data often too low quantity (and quality?).

Estimate genetic parameters of udder condition / -score trait. Est. correlations with occurrence of mastitis. Will an easily observed score be an alternative trait for selection against risk of mastitis?

As for 2a - pending funding for costs associated with field work.

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(breeding, behaviour)

3. FLOCK BEHAVIOUR/BREED DIFFERENCES/GENOTYPES; Flock behaviour in sheep: how to measure it? Breed comparisons

We are now establishing a flock of the old Nordic-type breed 'Gammelnorsk spælsau' (GNS) at NMBU. This breed is known to be more active, agile and vigilant than the modern 'Norwegian White Sheep' (NKS), and, importantly, to have a much stronger flock affinity. We have both breeds at the university farm (SHF).

Flock behaviour is potentially important for:

- Work effort needed for monitoring on + collecting animals from summer pastures; with or without herding dogs
- Predation by large, protected predators, perhaps
- Effects of the grazing sheep on landscapes and biodiversity

So,

- How can we describe sheep flock behaviour? How can we describe + quantify it to compare genotypes, and, conceivably, select for genetic change?

Field work at NMBU, on the near-campus summer pastures. May - September 2020. Direct observations. Possibly some technological aids.

Basic biological research, potential breeding application of results. Flock behaviour theory, anti-predator strategies, old vs. modern livestock breeds, ecological effects of sheep grazing.

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4. **BREEDING/GENETICS; Birth weight in sheep: is it possible to select for reduced variation without altering the mean?**

(*Fødselsvekter hos norsk sau: Er det mulig å selektere for redusert variasjon i egenskapen, uten å endre gjennomsnittet?*)

See MSc thesis Anne Kristiansen (2016) https://nmbu.brage.unit.no/nmbu-xmlui/handle/11250/2391511 for an introduction to selection for / against variation in a trait (Kristiansen studied variation in litter size, a categorical and hard-to-handle trait to model).

We know that for lambs being close to average sized is the best for lamb survival at and after birth. Bigger or smaller: both mean trouble → reduced production, reduced welfare, waste of resources.

How can we (can we?) select for reduced variation in birth weight? I.e., a need to describe the genetics of the trait 'variation in birth weight'. Genetic variation, heritability, BV estimation. Using a prototype program. Existing dataset with pedigree on Norwegian sheep. Method seem promising for other traits as well, model birth weight to develop the methods.

Student should have a good grasp on statistical modelling / quantitative genetics, and/or breeding theory / life history theory & -evolution. And be quite fearless around not so user-friendly software.

(*Kan vi selektere for redusert variasjon i fødselsvekter, uten å påvirke gjennomsnittsvekten? Arbeide med eksisterende databaser, relativt nyskapende modellering, til dels avansert statistikk, ikke helt brukervennlig software*)

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5. **Bell collars on ewes on pasture: effect on behaviour and welfare**

(Sauebjeller – effekter på atferd og dyrevelferd)

Bells will emit sound > 100 dB, close to the sheep's ears - louder than allowed to expose employees for. If you had a bell around your neck, tolling away at your every movement, would your welfare be affected? The practice of bells on sheep is dominating in Norway, makes it easirt to locate animals. But at what cost, in terms of animal welfare?

Field work on near-campus pastures at NMBU, summer months. Ewes with / without bell collars. Measure dB and compare movements, activity pattern, foraging, lamb-ewe interactions, stress indicators (heart rate?). Effect on hearing. Previous research done on dairy in Europe, effects found on foraging behaviour, activity pattern.

Cooperation with NIBIO (Tjøtta) and veterinarians?

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(*registrere atferd, aktivitetsmønster, søye-lam interaksjoner etc., for søyer med/uten bjelle*)

6. GHG-EMISSION/SHEEP/BREEDS/PAC-MEASUREMENTS; GHG emissions in sheep: the ERA-net project 'Grass To Gas' 2020-2021

(Metanutslipp fra norsk sau, målt med PAC-utstyr, i EU-prosjektet 'Grass To Gas')

IHA/NMBU takes part in an EU project with focus on measuring and analyzing methane emissions from sheep production. Emissions will be registered on study animal (Norwegian White sheep and the old short-tail breed Gammelnorsk spælsau) at SHF/NMBU, using mobile PAC equipment / methods. Experiments autumn 2020 and 2021, breed effects and effect of forage quality / type. Cooperation with NSG and several foreign institutions.

Students may suggest topics for theses in connection with the project. Perhaps some of this: Modelling emissions - effect of breed forage; or study the PAC-method: workload, effects on animals, sensitivity of measurements, etc. (method will potentially be used on a quite large scale in years to come).

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De to sauerasene på sommerbeite ved Årungen – hvor mye metan produserer de?