Current sheep activities at NordGen

Mervi Honkatukia
NordGen Farm Animals

Nordic Genetic Resources Center, NordGen

Our Activities

Plant, farm animal, and forest genetic resources

Operation of the Svalbard Global Seed Vault

Farm Animal Focus

Support Nordic countries in national conservation efforts

Act as a Nordic knowledge and research center for farm animal genetic resources

Collaboration & Support

Strong Nordic and international networks

Advice, training, and education tailored to stakeholders

Research

Scope

All Nordic countries

All Nordic farm animal breeds

Location

At the Norwegian University of Life Sciences (NMBU), Ås

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Native local breeds are an underutilised resource

— Genetic diversity is essential for sustainable production, cultural heritage, and resilience to climate-change.

— The potential of many native breeds remains unexplored due to limited research.

— Better knowledge of wool characteristics is needed to increase the value of sheep production and support conservation of endangered breeds.

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Why sheep and wool?

— Wool has recently gained renewed attention, shifting from a by-product to a value-adding resource.

— This development is highly relevant for work involving native breeds and their conservation.

— Identifying "new" uses for native breeds is essential for management of animal genetic resources (AnGR).

— To meet environmental expectations, production systems should minimize ecological impact and make use of animals for multiple purposes, including wool, meat, and the maintenance of traditional landscapes.

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Adding value to native breeds

— There is strong momentum around native-breed wool, e.g., establishment and growth in mini-mills and small-scale businesses.

— Some breeds include individuals with wool suitable for high-end products but achieving consistent quality and securing enough supply to meet demand remains a challenge.

— Genetic studies can support breeding by identifying animals that reliably produce high-quality wool.

— A major hurdle is scaling up: how to expand successful approaches and ensure sufficient volumes of raw material.

--> **More research and stronger promotion are essential to move this development forward.**

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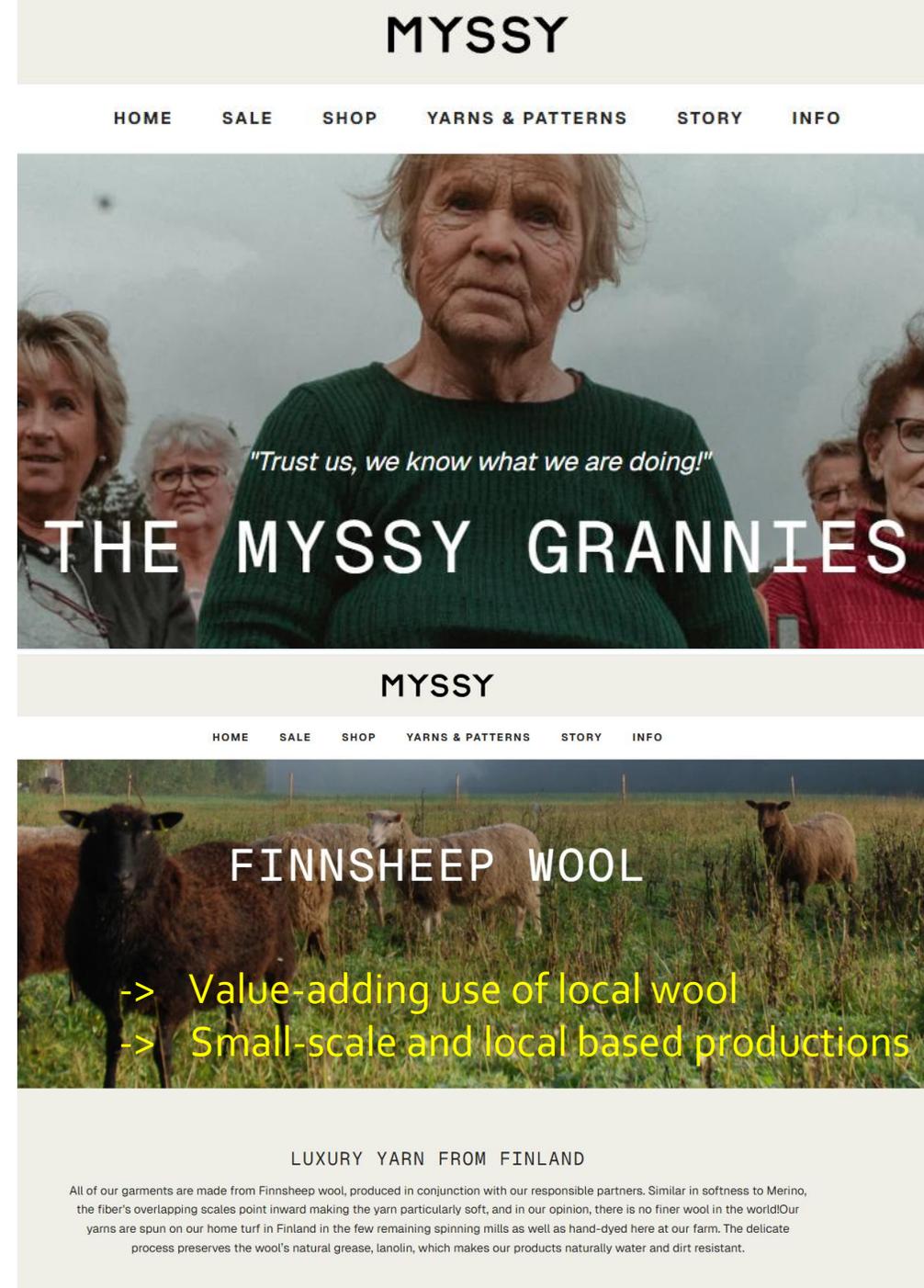
MYSSY

HOME   SALE   SHOP   YARNS & PATTERNS   STORY   INFO

"Trust us, we know what we are doing!"

THE MYSSY GRANNIES

MYSSY

HOME   SALE   SHOP   YARNS & PATTERNS   STORY   INFO

FINNSHEEP WOOL

->   Value-adding use of local wool
->   Small-scale and local based productions

LUXURY YARN FROM FINLAND

All of our garments are made from Finnsheep wool, produced in conjunction with our responsible partners. Similar in softness to Merino, the fiber's overlapping scales point inward making the yarn particularly soft, and in our opinion, there is no finer wool in the world! Our yarns are spun on our home turf in Finland in the few remaining spinning mills as well as hand-dyed here at our farm. The delicate process preserves the wool's natural grease, lanolin, which makes our products naturally water and dirt resistant.

NordWool: a Network for Nordic Landrace Sheep

"A network for a more sustainable future in Nordic sheep farming, leveraging wool as a valuable resource while conserving genetic and cultural heritage"

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The Core group

— The core group was established to ensure broad Nordic collaboration.

— It was intentionally kept small to enable agile and efficient activities.

— Selection focused on experts with a strong interest in, or active involvement with, native breeds.

— NordGen serves as the coordinating body.

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Anna Maria Johansson
SLU, Sweden

Cathrine Brekke
NMBU, Norway

Dorthea Joensen & Jens Ivan
Búnaðarstovan, Agricultural Agency of Faroe Islands

Birna Kristín Baldursdóttir
Genetic Resource Center Iceland

Satu Kumpulainen
Isokummun Kehräämö Finland

Ingvild Espelien
Selbu Spinneri Norway

Stakeholder involvement

— Alongside the core group, an open and active stakeholder group plays a key role in ensuring effective information flow and provides a long-term platform for mutual knowledge exchange.

— The stakeholder network currently includes 63 members, representing broad wool value chain and extending well beyond academia.

— Members come from research, advisory services, genetic resource conservation, and primary production, with farmers playing a central role in the practical conservation of native breeds.

— Stakeholders—from sheep farmers to spinneries and wool brokers—help strengthen the connection between scientific knowledge and real-world practice.

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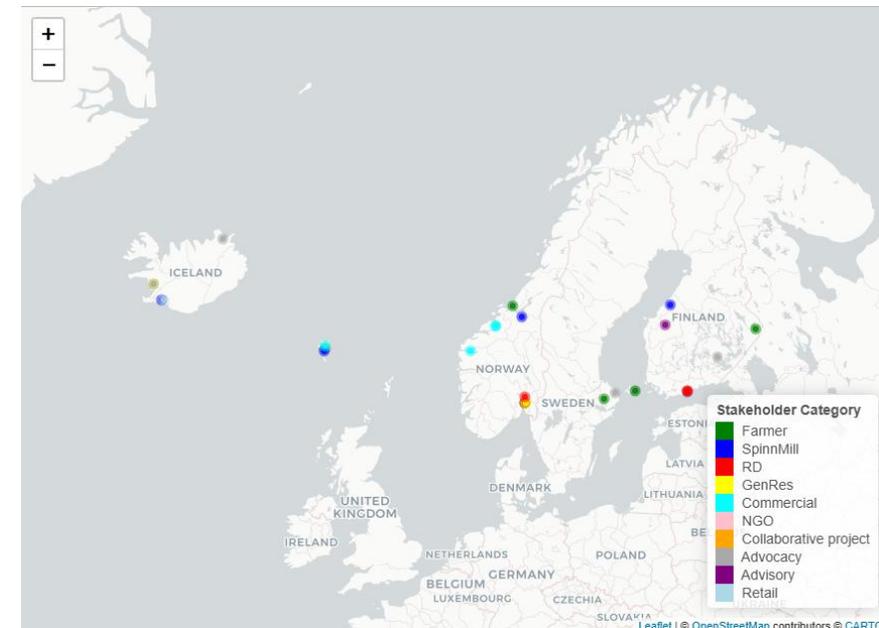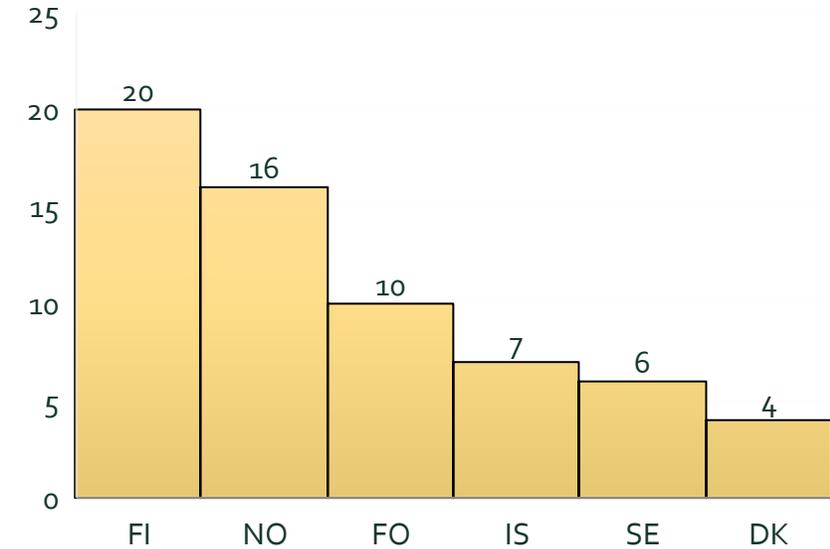
Long-term goals

— A collaborative **network** promoting wool characterisation and the sustainable use of Nordic native sheep breeds.

— **Showcasing** the unique and often under-recognised wool properties of native breeds.

— Increasing the **visibility** of impactful, but frequently small-scale, initiatives that address wool underutilisation in sheep farming.

— Promoting a **holistic** use of Nordic native sheep breeds by highlighting wool production alongside meat, supporting sustainable utilisation of genetic resources.
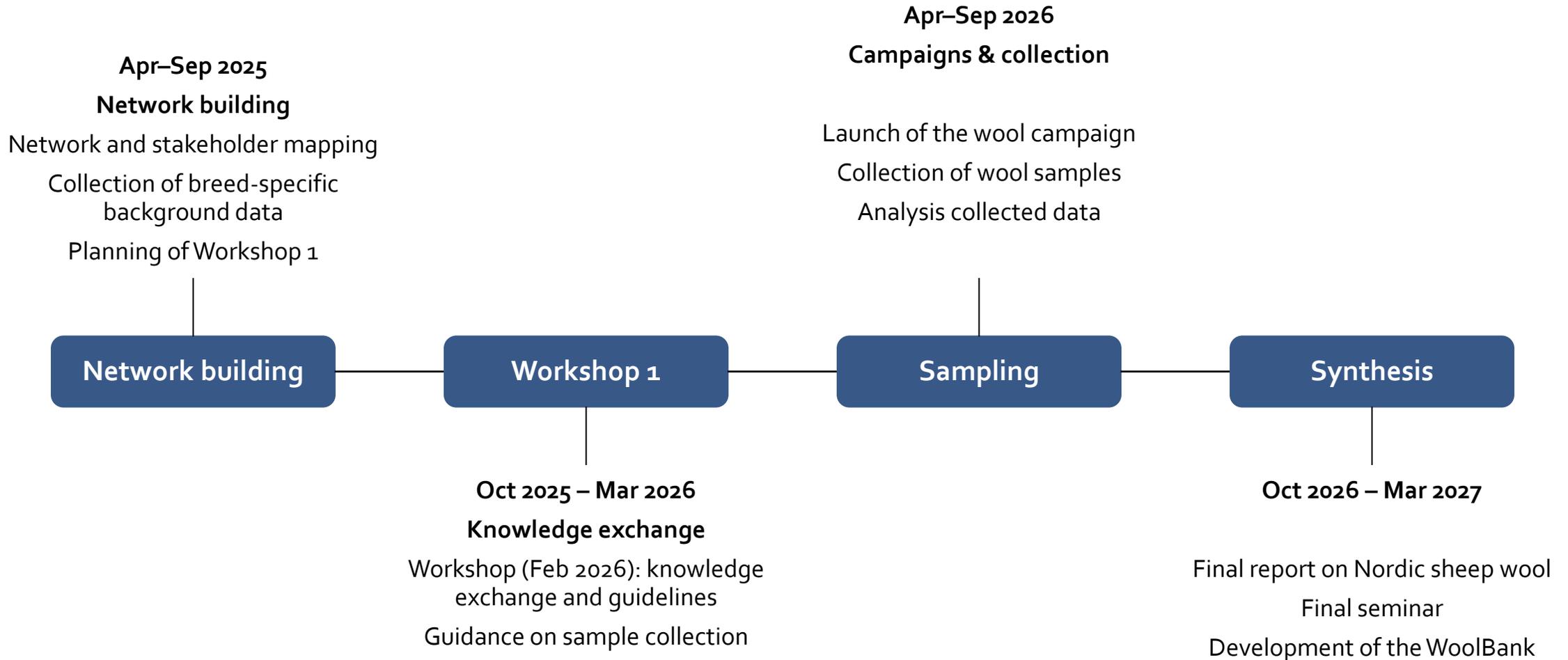
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Short-term goals

— Map and characterise Nordic native sheep wool.

— Establish a Nordic wool reference collection.

— Connect stakeholders across the value chain.

— Promote sustainable and innovative wool use.

— Strengthen long-term genetic resource sustainability.

NordWool Roadmap 2025-207

Apr–Sep 2025
Network building

Network and stakeholder mapping

Collection of breed-specific background data

Planning of Workshop 1

Apr–Sep 2026
Campaigns & collection

Launch of the wool campaign

Collection of wool samples

Analysis collected data

| Network building | Workshop 1 | Sampling | Synthesis |

Oct 2025 – Mar 2026
Knowledge exchange

Workshop (Feb 2026): knowledge exchange and guidelines

Guidance on sample collection

Oct 2026 – Mar 2027

Final report on Nordic sheep wool

Final seminar

Development of the WoolBank

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Harmonising wool sampling

— Before the fieldwork, we need a harmonised collection protocol.
— Transition from protocol agreement to field implementation.
— Standardising sampling across Nordic breeds and countries.

— Key harmonisation questions:

✓ **When to sample:** optimal season for representative wool samples.

✓ **Where to sample**: body sites and number of samples per animal.

✓ **How to collect**: agreed sampling method (e.g. cutting technique, amount of wool needed).

✓ **How to handle samples**: labelling, storage, and transport.
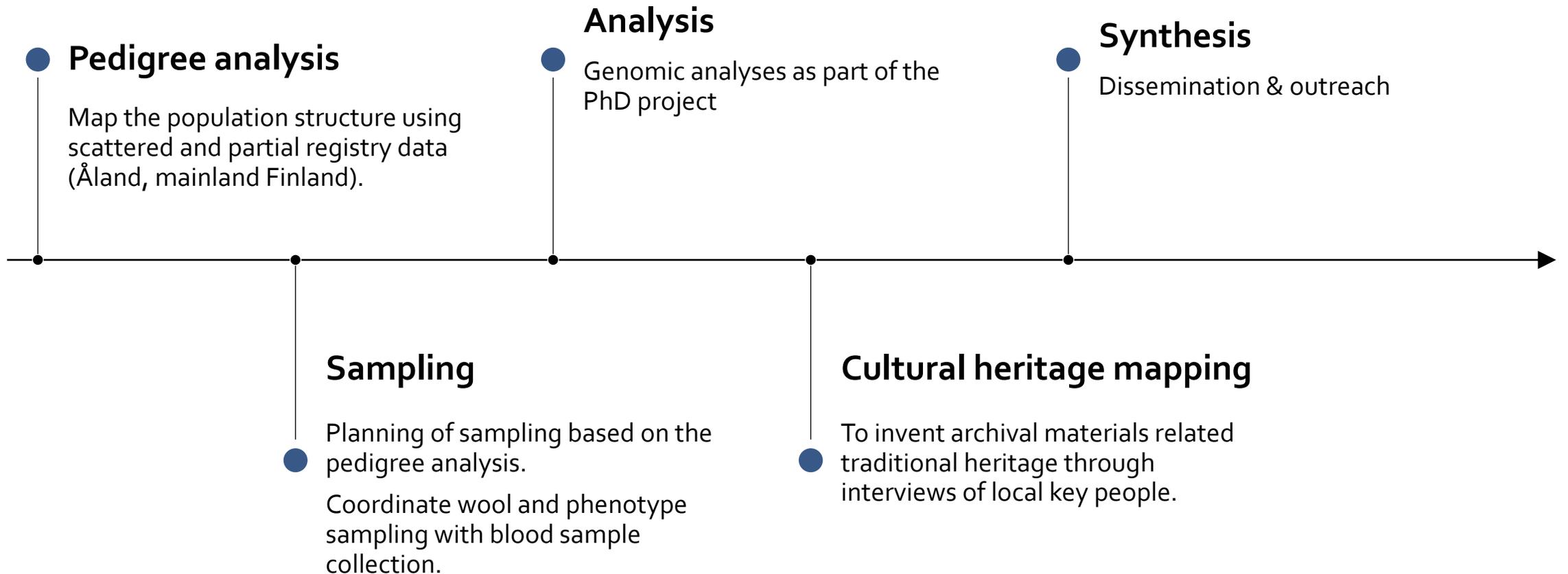

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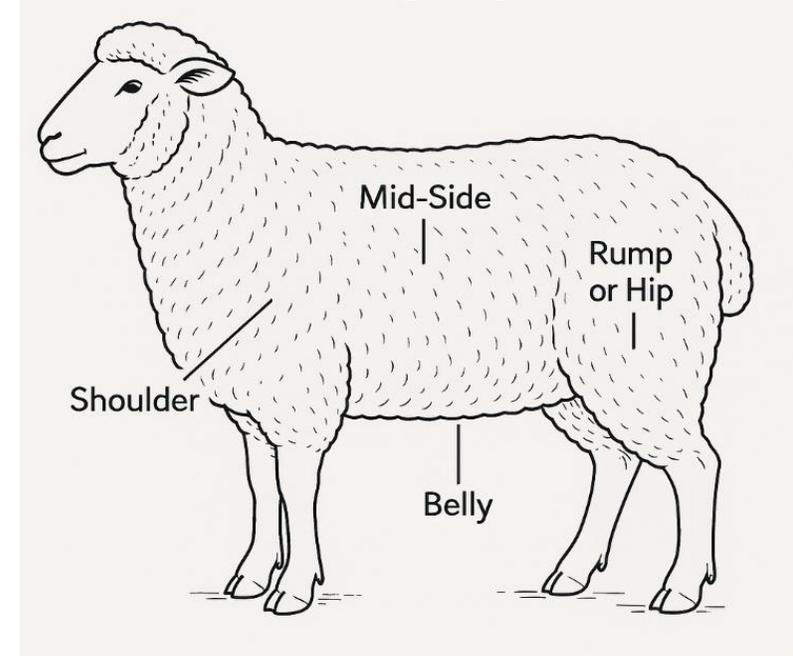
Ålandsheep (2025-2026)

Goals

— Investigate wool quality, genetic diversity, kinship relationships, and the cultural history of Åland sheep.

— Generate new knowledge and research material on Åland sheep as part of the broader NordWool project cluster.

Expected impact

— Increased visibility of the breed and enhanced value of its wool.

— New insights from pedigrees and genomic data.

— Clearer understanding of family lineages to support national-level conservation efforts.

— Placement of Åland sheep within the Nordic short-tailed sheep group, strengthening knowledge of Nordic genetic diversity.

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Roadmap

Pedigree analysis

Map the population structure using scattered and partial registry data (Åland, mainland Finland).

Analysis

Genomic analyses as part of the PhD project

Synthesis

Dissemination & outreach

Sampling

Planning of sampling based on the pedigree analysis.

Coordinate wool and phenotype sampling with blood sample collection.

Cultural heritage mapping

To invent archival materials related traditional heritage through interviews of local key people.

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Sheep Project cluster

Ongoing projects
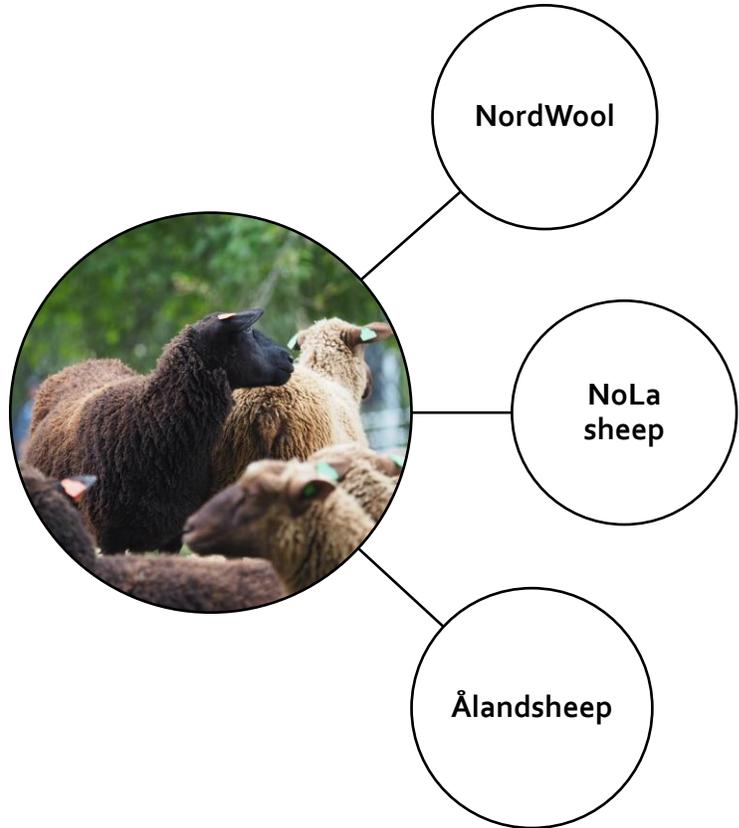
Proposals under preparation

NordWool

NoLa sheep

Ålandsheep

Research Council Faroe Islands

17.2.2026

EU Horizon Area B:
Production systems within the wool value chain

DL mid April

Nordic Arctic Co-operation Programme

DL 15.2.2026

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Looking ahead

Continue and strengthen Nordic-level sheep activities

Maintain and further develop the Nordic sheep network

Intensify Nordic research collaboration to generate new knowledge on sheep breeds and production

Increase data availability and knowledge base to support conservation and sustainable use

Initiate promote activities

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Thank you for your attention!

mervi.honkatukia@nordgen.org

Genomic characterisation of Nordic Landrace sheep breeds for sustainable management and conservation – "NoLa sheep"

Ellen-Louisa F. White

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PhD – project

- **Public PhD** funded by Forskningsrådet

- Collaboration between NMBU NordGen

Introducton

- About me: Ellen-Louisa Fagerheim White
- Born in Chertsey, UK – raised in Eidsvoll, Norway
- Bachelor's degree in Animal Science, from the University of Aberystwyth, UK
  - Thesis: Transcriptomic investigation of the canine heartworm *Dirofilaria immitis* to reveal possible target proteins.

- Master's degree from NMBU in Animal Science
  - Thesis: "Fine mapping to unravel genes for resistance to OsHV-1 in the Pacific oyster (*Crassostrea gigas*)"

NordGen   NMBU   Forskningsrådet

Introducton

- Started working at **NordGen Farm Animal Section** in August 2023
  – Work for the conservation of genetic resources in the Nordics

- PhD-candidate:
  – From September 2025
  – Main supervisor NMBU: Peer Berg
  – Main supervisor NordGen: Maria Kjetså
  – Co-supervisors: Cathrine Brekke and Mervi Honkatukia

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Background

Sheep: vital source of protein, skins and wool since their domestication

34 local sheep breed in the Nordics

Faroe Islands	Denmark	Iceland	Finland	Norway	Sweden
1	2	2	9	12	14

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Background

Overall lack of knowledge on the Nordic sheep breeds

- Genetic contribution
- Within population genetic diversity
- Knowledge on important production and sustainability traits.

→ Information about the sheep's status and uniqueness is imperative for decision-making in conservation.

Aims and objectives

- To develop informed advice for improving conservation and sustainability of the Nordic sheep genetic resources through genetic characterisation utilising genomic data

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Objectives and project structure

1. To quantify the impact of the choice of genotype method on inferences on genetic diversity within and between breeds.
2. To assess the genetic uniqueness of Nordic native breeds both from a Nordic and global perspective.
3. To characterise genotypes linked to resource allocation traits (i.e., health, growth, fertility, climate adaptation and wool quality as a resilience indicator) across several Nordic breeds.

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Paper 1

→ Objective 1: To quantify the impact of the choice of genotype method on inferences on genetic diversity within and between breeds.

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Paper 1

- Possible ascertainment bias due to pre-designed chips based on fewer and more commercial breeds.
- Introducing bias by:
  - **Missing rare variants** of the smaller breeds.
  - **Skewing allele frequencies** in favour of "common SNPs".
  - **Inflating heterozygosity** (only captures common variants that it was designed for → overestimates expected heterozygosity).
  - **Distorting evolutionary metrics** like F_{ST} and LD.
  - **High False Positive rates.**

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Paper 1

- **AIM**: to improve the accuracy of genomic characterisation through simulation.

Paper 1

Available data

	50K	60K	600K	WGS	N breeds w/ available data
Sweden	14	-	-	3	14 of 14
Norway		12	4	1	12 of 12
Finland	1	-	-	-	1 of 3
Iceland	-	-	-	1	1 of 2
Faroe Islands	1	-	-	-	1 of 1
Denmark	2	-	-	-	2 of 2

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Paper 1

How to merge data from different resolution and different SNP-chips?
Divide into different datasets:

- Merged data – overlapping genotypes
- Imputed data
- Sequence data

Software: GATK, PLINK, bcftools, imputation tool (e.g., Beagle, FImpute)

Thank you!