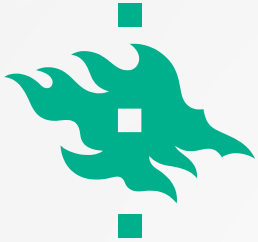




FabaNova

Climate-ready faba beans for the Nordic and Baltic Region

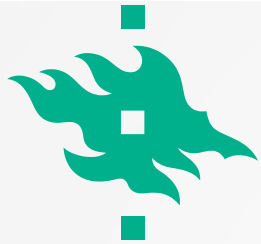
Fred Stoddard



FabaNova: Climate ready faba beans for the Nordic and Baltic region

- 01.01.2023 – 31.12.2026
- Aim: to improve one key abiotic stress response (drought), one key biotic one (chocolate spot disease) and one key adaptation trait (earliness) in faba bean for our region
- Coordinator: Fred Stoddard
 - Working on faba since 1981





Who are we?



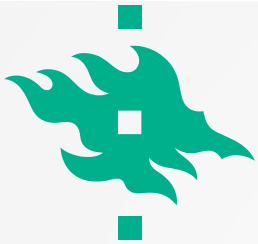
- University of Helsinki UH
 - Dept. Agricultural Sciences (Stoddard)
 - Biotechnology Institute (Schulman, Vahisalu)
- Swedish University of Agricultural Sciences SLU, Alnarp
 - Åsa Grimberg
- Norwegian Institute of Bioeconomy Research NIBIO
 - Heidi Udnes Aarnot



Norwegian University
of Life Sciences

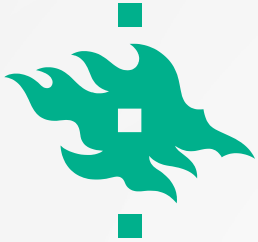
- Norwegian University of Life Sciences NMBU
 - Åshild Ergon
- Centre of Estonian Rural Research and Knowledge METK
 - Ilmar Tamm, Lea Narits





Our grand plan

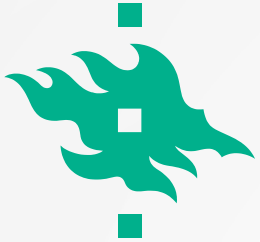
- WP1: Chocolate spot disease (NIBIO leading)
 - Prevalence of 4 causative Botrytis spp in different locations and seasons (all)
 - Genetic basis of disease resistance (UH)
 - Association between disease and weather factors: risk modelling (NIBIO)
- WP2: Earliness (SLU leading)
 - Characterization of earliness of flowering and growth cessation (all)
 - Genetic and molecular studies of flowering and growth cessation (SLU, NMBU)
- WP3: Drought (NMBU leading)
 - Characterization of drought responses in field (all) and CE (NMBU)
 - Root traits associated with drought tolerance (UH)
- WP4: Gene editing (UH leading)
 - Establishing a method
 - Creating gene-edited knock-out lines
- WP5: Central facilities
 - Project management
 - Germplasm management
 - Data management
 - Communications and dissemination



Why faba bean? (*Vicia faba* L.)

- It is a legume: fixes own N, high protein content (~29% of seed DM)
 - cf 20-25% in most food legumes, 7-15% in cereals
- It is cool-adapted: grows in Nordic and Oceanic summers and Mediterranean winters
 - Cf. warm-adapted soybean
 - We are at its northern limit
- It is suited for food or feed (40% starch)
 - Traditional food from Karelia to Khartoum
 - Novel uses include meat and dairy analogues





WP1: Chocolate spot

- At least 4 *Botrytis* species contribute
- Improve PCR test for rapid species determination
 - Map prevalence of the species in our countries
- Develop disease forecasting system based on growth stage and weather conditions
- How well do (partial) resistances to all 4 species coincide? RIL populations
 - Candidate genes at QTLs?
 - PhD student Maniruzzaman





WP2: Earliness

- Select local and exotic germplasm for screening, including:
 - Rapid-cycling landraces from South Asia
 - Terminal-inflorescence mutants
- Test time to flowering at 4 sites x 2-3 years *and* in controlled environments
 - Separates photoperiod from photosynthetically active radiation
- Test for association between flowering and maturity times
 - How to provoke plants into senescence
 - Transcript sequencing

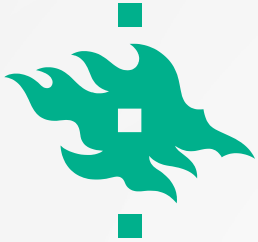




WP3: Drought

- Root traits: finding water
- Leaf traits: controlling water loss
- Deal arranged with Jülich to screen roots of diversity set and/or RIL set (200 lines) for early root growth
 - What are genes underlying differences in root system architecture?
- Rain-out shelter at NMBU to test separate responses to establishment-phase and reproductive-phase drought in ~10 lines
 - Transcriptional responses



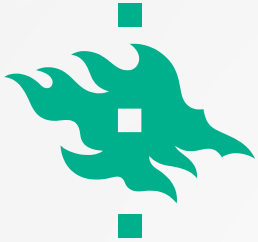


WP4: Gene editing

- Challenge: generating plants (especially roots) from tissue
 - We think we have a tool
- Protocol established by M24
- First target gene associated with disease response in *Arabidopsis*: what would it do in faba?
 - Combines novelty with applicability 🤔

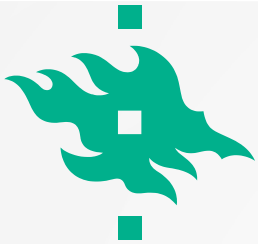


Photo © J. Hadley, Univ. Reading, UK



WP5: Management

- Kick-off meeting 22 – 23 March 2023, Helsinki
- Planned annual meetings about the same time each year
 - We're all too busy in the growing season to travel!
- Germplasm chosen, being multiplied this year
- Protocol development this year
- <Insert photo of happy faba people here>



Expected outcomes

- Improved breeding material
- Improved understanding of genes, pathways etc, → selection tools
 - For each key trait
- Improved reliability of production & protein yield / ha
 - Improved protein security in our region
- Improved world profile of regional researchers
- Improved crop rotations, enabling reduced pesticide use
- Greater regional collaboration & synergy
- Sustainability in the face of world political situation
- Potential for precision-breeding tools
- Improved predictions for CS risk
- Most productive crops > 5 t/ha. Why is average yield only 1.5 – 2 t/ha?

A black crow is standing in the middle of a dense field of green lupine plants. The plants are small and leafy, growing closely together. The crow is facing right, and its dark feathers contrast with the bright green of the vegetation.

We have promised a lot!

So now we have to get on with it!



Thank you!

Any questions?