



Master thesis on cereals, grain legumes, oil seed crops and other seed crops

General: Our research areas at IPV within seed crops are linked to sustainable production methods to achieve satisfactory yield of desired quality. Key areas are plant responses to weather parameters as well as management practises, sustainable production methods, adaptation to climate changes, quality assessment and improvements. Master thesis can be linked to on-going research projects at IPV, but we might also cooperate with other Research Industries as NIBIO, NOFIMA, and with industry companies within the agricultural sector. In our on-going projects at IPV we have specialized in quality aspects within the seed crops. A typical master thesis may include field/greenhouse or lab experiments, data recordings/chemical analyses, statistical calculations and interpretation, literature review and discussion.

We may offer master thesis within the following topics:

Cereal production

Oilseed crops and Grain legumes

Food grade/feed grade

Sustainable food production

Production potential in a changing climate

Niche crops

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Wheat quality – improvement of the Norwegian wheat to increase the utilization for food

Hvetekvalitet til mat – Norsk hvete med forbedret bakekvalitet for å kunne bruke mer norsk hvete i mel



Gluten quality can differ widely between varieties and due to environmental factors. In on-going research projects, wheat is grown in experiments in both field and climate chambers, and samples are also available from the value chain. Different analyses performed on flours, doughs and gluten exist, and can in different ways characterize the potential of baking quality in a flour. The master work can be directed to one or several of the following objectives:

- Efficient measurements of gluten quality: Analyse different flours of different protein content and gluten quality by different methods and interpret the results.
- Gluten quality in new wheat varieties: Analyse gluten quality in new varieties to investigate their potential for food uses
- Gluten quality as affected by growth environment: Analyse gluten quality in samples from field trials grown at different locations and in different seasons

Main supervisor: Anne Kjersti Uhlen anne.uhlen@nmbu.no

Co-supervisors/contacts: Shiori Koga and Ulrike Böcker, Nofima AS



Resistance to pre-harvest sprouting in wheat

Økt resistens mot aksgroing i norsk hvete

Pre-harvest sprouting (PHS) can occur in wheat prior harvest, as the germination process can start in grains subjected to frequent rain and wet conditions. PHS destroy the quality for food uses, and a substantial proportion of the Norwegian wheat are degraded to feed almost every season. The climate change predicted for Norway will cause increased problems with PHS. To cope with these challenges it is important to breed new varieties which develop a deeper dormancy at maturity. New breeding lines and market varieties are being tested yearly for dormancy in special field trials at NMBU. The master thesis will be linked to these experiments, and it will include different methods to efficiently record dormancy.

Supervisors: Anne Kjersti Uhlen, Morten Lillemo, Most Champa Begum

Resistance to preharvest sprouting in barley and oats

Værresistens i bygg og havre

Resistance to Pre-harvest sprouting are tested also in barley and oats by using the standard germination tests to assess the level of dormancy. This has been done by germination tests on samples harvested at precise development stages. The method needs improvement, and to apply the “Germination Index” method, as are commonly used in wheat, will have several advantages. The suggested Master work will imply field work during August in the coming season (2019) for harvesting of samples from a set of varieties of barley and oats, grown in field trials at Vollebekk, and to run germinations tests to compare methods, and to assess differences in dormancy between varieties. The Master work is suitable for a 30 credit Master thesis. The work will be done in cooperation with researchers at NIBIO responsible for the variety testing of cereals in Norway.

Supervisors: Anne Kjersti Uhlen, IPV-NMBU, Aina Lundon, NIBIO, Anne Marthe Lundby, NIBIO.





Nutritional quality in food legumes

Kvalitet i belgvekster til mat

The master work will be linked to the research project FoodProFuture, and can be designed to fit a 30 or 60 credit master thesis.

To utilize proteins from plants in the diet give less environmental footprint. Food legumes are high in proteins, but the amino acids are not as balanced compared to animal protein sources. Besides, legumes can contain antinutritional compounds. This master work can include 1) Updated literature review on chemical composition of food legumes with focus on protein, protein digestability and AA composition, as well as the most important antinutrients, 2) solutions to optimize/improve nutritional value of raw materials and products based on food legumes, 3) analyse nutritional quality of varieties of food legumes grown in Norway.

Supervisors: Anne Kjersti Uhlen, researchers in the FoodProFuture team





Edamame (ferske grønne soyabønner) – optimalt høstestadium for ulike sorter basert på innhold av løselig karbohydrat, farge og frøstørrelse; og vurdering av lagringsevne og lagringsbetingelser for ferskhøstede belger.

Oppgaven er knyttet til forskningsprosjektet **FoodProFuture**. Dette kan være oppgave for en eller to studenter. Sted: Ås eller Grimstad.

Edamame er soyabønner høstet ferske og umodne, spist lttkokt og evt saltet som sunn snacks



eller grønnsak. Dette er en populær grønnsak med lange tradisjoner i Kina og Japan, også populært i nyere tid i USA, og også i ferd med å bli mer kjent i Europa. I samarbeid med Bama/Gartnerhallen ønsker vi å se på muligheten for å produsere edamame for ferskmarkedet i Norge. Edamame er en belgvekst, rik på protein og mange andre sunne

bioaktive stoffer, og vil kunne bidra til økt tilgjengelighet av fristende proteinrike planteråvarer for forbrukerne. På forsknings- og utviklingsiden ser vi i første omgang på om denne kulturen i det hele tatt går an å produsere med suksess i Norge, og undersøker hvilke sorter som egner seg best under norske forhold. Det vil være feltforsøk med ulike edamamesorter hos NIBIO på Landvik i Grimstad, og muligens et felt ved NMBU på Ås.

Oppgaven(e) går ut på å:

1. se på kriterier for å bestemme optimalt høstestadium for de ferske belgene, basert på viktige parametre som innhold av løselige karbohydrater (brix?), frøfarge, frøstørrelse, om mulig koblet til ytre kjennetegn som kan være en hjelp til å bestemme beste høstetid.
2. Gjøre forsøk med best egnede lagringsforhold (temperatur, fuktighet etc), og lagringsevne etter ferskhøsting. Eventuelt i kombinasjon med tema 1.

Forsøket vil bli sådd i slutten av mai 2018, og høstet i perioden august-oktober, avhengig av klimatiske forhold og sorter.

Supervisors: Anne Kjersti Uhlen, NMBU, Ingunn Vågen, NIBiO



Mekanisk jordløsning på pakkeskadet jord – effekt på plantevekst

Oppgaven er knyttet til forskningsprosjektet OPTIKORN som er koordinert av NIBIO, og NMBU er samarbeidspartner.

I OPTIKORN prosjektet driftes det flere forsøksfelt som studerer effekter av jordløsning. Her skal kombinasjon av mekanisk jordløsning og biologisk jordløsning (div jordforbedrende vekster) vurderes. Arbeidet omfatter en detaljert kartlegging av jordegenskapene, og det er rom for utfyllende studier av planteveksten i disse forsøkene; både av kornet og de aktuelle jordforbedrende vekstene som ulike belgvekster og oljevekster. Oppgaven vil naturlig vinkles mot klimaendringer og klimatilpasninger.

Supervisors: Anne Kjersti Uhlen, NMBU, Wendy Waalen, NIBIO, Till Seehusen, NIBIO



Testing new seed crops in a Norwegian climate **Utprøving av ny vekster/nisje-vekster i Norge**

Climate changes can give opportunities for new crops to be cultivated in Norway. The master thesis will focus on testing of actual and new varieties from one or several crops, among food legumes, pseudocereals (quinoa, buckwheat), or oilseed crops. The work will involve field trials during the 2019 season including plant development assessments, as well as quality analyses of seeds in the laboratory.

Supervisors: Anne Kjersti Uhlen, NMBU