Bachelor or Master thesis BIOVIT 2022/23

**Topic/Title (Norwegian)**

Funksjonell validering av kandidatgener involvert i temperaturrespons i *Brachypodium distachyon*

**Topic/Title (English)**

Functional validation of candidate genes involved in temperature response in *Brachypodium distachyon*

**Picture**

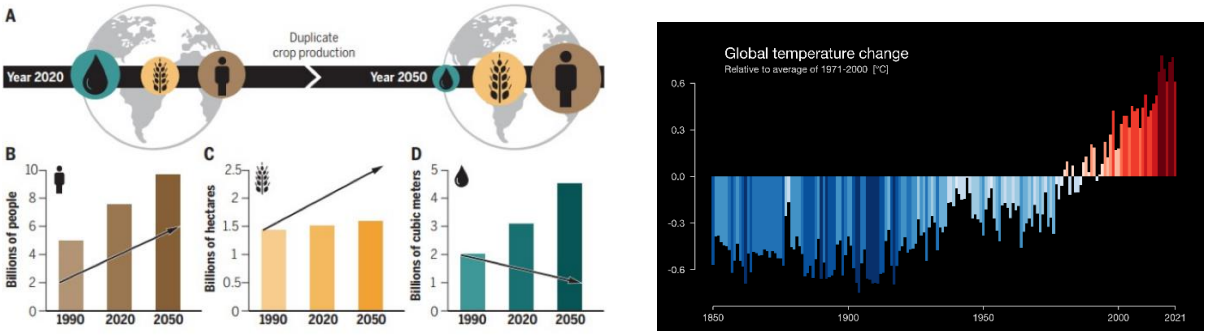


**Figure 1** - Past, present, and future of global climate, agriculture, and food security. (**A**) Most scenarios predict that water scarcity will increase in the coming years. With the world's population continuously growing, crop production must also increase to fulfill civilization's basic needs. (**B**) Estimated world population for the 1990–2050 time period. The arrow indicates the estimated number of people living in water-scarce areas. (**C**) Global arable land for agriculture for the 1990–2050 time period. The arrow indicates the predicted demand for arable land. (**D**) Global freshwater demand for agriculture for the 1990–2050 time period. The arrow indicates the predicted decline in freshwater availability. (**E**) Graphic display of global temperature change from the pre-industrial age (1850) until 2021 when compared with the temperature average of the 1971-2000 period.

**Summary**

Global warming has been causing a steady rise in ambient temperature (1,1 ºC superior to pre-industrial levels) (Fig.1e) and it is one of the major threats of the current climate crisis. Agricultural systems such as row crops are particularly susceptible to temperature fluctuations, with studies predicting that a 2.0 °C rise in average temperature can lead to a more than 10-20 % reduction in cereal grain yield. According with this scenario, by 2050, a 70–100% increase in cereal food supply will be required to feed the predicted 9.8 billion people (Fig.1a-d), a substantial pressure to an already strained food production chain. It is, therefore, urgent to understand the molecular mechanisms that plants employ to respond to elevated ambient temperature and use that knowledge to create the biotechnological tools necessary to the development of better-adapted crops and ultimately ensure the sustainable production of food. The main aim of this project is to identify ambient temperature sensors in grasses, a family that includes some of the largest food and forage crop species such as wheat, barley, or perennial ryegrass.

This project proposes to functional validate some candidate genes involved in temperature sensing in the grass model species *Brachypodium distachyon*. Technically, the project will involve the use of bioinformatic tools, RNA extraction, expression analysis by qPCR, obtaining CRISPR mutants, cloning, embryogenic callus culture and plant transformation using Agrobacterium.

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**Subject area** (keywords)

Plant science, molecular biology

**Language thesis** (Norwegian and/or English)

English

**Bachelor or Master thesis**

Master

**Credits**

60 ETC

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