

Sustainable Agriculture and Climate Change

Programme memorandum

Background

Today global agriculture is more productive and efficient than ever. As the efficiency of production has increased yield growth and falling food prices have been accompanied by increasing food waste, from the field to the consumer, and a growing burden on human health associated with poor diets and unsustainable environmental degradation (Kuylenstierna et al. 2019).

Humans have already influenced the climate system, and a global increase of 0.89 °C has been observed since 1901. The climate is expected to continue to change due to anthropogenic influences, and the temperature is predicted to increase further during the coming years (IPCC 2007, 2014¹). This is also true for the Nordic-Baltic area. In the south and west, the temperature is expected to be similar to the global average increase, while the northern and eastern areas are expected to have a higher increase in temperature (Barua et al. 2014). In addition to the increase in temperature, other changes are expected, for example, an increase in extreme weather events, changes in precipitation patterns, reduction in snow cover and rise in sea levels.

Climate change will affect agriculture and influence food and feed security in the Nordic and Baltic regions in several ways. Some consequences can be positive, such as a longer growing season or an increase in CO₂ to stimulate photosynthesis, while others, such as increased CO₂ emissions due to an increase in respiration, drought, floods, or influx of new pests and diseases, will have a negative effect (Barua et al. 2014).

The weather-wise diametrically opposed summers 2017 and 2018 have made the public aware that climate change is here and not something that only will happen in the future. The drought in 2018 demonstrated the risks with a shortage of domestic animal feed, and farmers were forced to import fodder for their

¹ *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp



animals. However, the feed shortage occurred all over Europe, which resulted in the import of animal fodder of substandard quality and with the increased risk of carrying plant and animal diseases and new weeds.

The consumer demands are expected to change, resulting in an increased demand for locally produced plant-based protein and, consequently, increased demand for crops like beans, peas, and quinoa. Climate change and the diversified market demand is a worldwide trend. To meet the consumer demands, it is also important to consider the profitability within the agricultural sector.

In addition, demands for efficient, healthy, safe and diverse food production, there is also a need to limit the environmental footprint of agriculture itself and minimise the production of greenhouse gasses, thus mitigating climate change. Carbon storage in plants and soil is a cost-effective climate action, which also can benefit biodiversity.

Also, sustainable agriculture demands living farmland and soil. There are research needs on alternative cropping systems: no-tilling systems, growing perennial crops, cover crops, intercropping, or mixtures of varieties/plant genotypes. In addition, overuse and inappropriate crop rotation may damage fertile soils. The question is how this can be done efficiently and sustainably in order to overcome rapid changes in the climate, satisfy demands for climate change mitigation, and uphold the quantity and quality of food production.

The Nordic Council of Ministers' Vision 2030

The Vision 2030 heads towards developing the Nordic region as the most sustainable and integrated region in the world in 2030. [The action plan](#) (2021-2024) describes how the Nordic Council of Ministers will work to achieve the objectives of the vision through a series of initiatives linked to the vision's three strategic priorities; a green Nordic Region, a competitive Nordic Region, and a socially sustainable Nordic Region. The most relevant area is *A green Nordic region*, where the countries will work together to promote a green transition of their societies and towards carbon neutrality and a sustainable circular and bio-based economy. This is established in the Action plan, objective 2:

-further develop nature-based solutions for biodiversity and the climate. This involves working with solutions that increase and



maintain land and sea-based carbon sinks;

-increase efforts to develop food and feed crops that are more resistant to extreme weather and climate change.

Nordic and Baltic countries are rich in various biomass sources and have a long tradition of businesses operating in the traditional sectors utilising biological resources and generating financial growth. As a vital part of the strategy the Nordic and Baltic countries will join forces to be in the forefront of the green transition and the mitigation of climate change through carbon neutrality and sustainable bioeconomy. This is established in the [Nordic Bioeconomy Panel under the Nordic Council of Ministries](#) as a driver for economic growth and green transition in rural areas.

Overarching aims and the thematic framework of the Programme

The aim of the Sustainable Agriculture and Climate Change programme is to promote cooperation between the knowledge communities in the participating countries and to enhance opportunities and address challenges relating to sustainable agriculture. The main objectives of the programme are to strengthen research collaboration between the participating countries and to fund excellent research with impact within and beyond academia. The programme seeks to develop research networks in the region to produce innovative analyses and methods and essential knowledge for successful implementation. The programme aims at interdisciplinary projects that combine disciplines, which rarely collaborate, or that pursue an original research question that demands the exact combination of competencies from different disciplines proposed in the application. Also, the programme strives to support the next generation of researchers and their mobility.

The funding institutions have identified four thematic areas of the Programme:

1. Plants adapted for future Nordic and Baltic conditions

There is a need for research on topics of relevance for food security and climate change adaptation, such as research on the effects of projected climate change on physiology, yield (productivity), and resistance of plants to multiple abiotic (e.g. extreme temperatures, drought, waterlogging) and biotic (e.g. pathogens and pests) stress factors. In addition, research on the impacts of genotype (including root system and microbiome) and environmental conditions and their interactive effects



on yields and the resistance of plants is needed to identify suitable genotypes adapted to climate change.

2. Increased local and regional protein production for food and feed

Locally grown protein would be needed for sustainable food and feed security. There is a need for suitable cultivars adapted for northern growing conditions to increase the production of protein. There is also a need for research on agronomic practices, including their environmental benefits and potential risks for pests and diseases. The success of increasing production in a sustainable way will be determined by our capacity to adapt and implement digital farming tools. Digital research that can help farmers to meet their needs can be categorised into three categories 1) Data standardisation/access, 2) Decision support tools, 3) Digital-based solutions (precision farming).

3. Plants and soil as a carbon sink

More research is needed to find out which measures are - from the point of view of climate change mitigation - the most cost- and resource-efficient ways to sequester and store carbon in plants (e.g. cover and perennial crops) and soil without increasing the harmful impact on the environment. Research on plant and soil interactions and the role of microbial biodiversity on the ecosystem carbon balance is crucial for determining the best possible agronomic practices and policy tools that ensure sustainable agriculture in the changing climate.



4. Transformation towards climate-smart and profitable local and regional agriculture

Adaptation to climate change always takes place within a wider societal, institutional and policy context, and agriculture is no exception. New, sustainable agronomic practices need to be supported by changes in this operational context. Research-based evidence for transformational change is needed. There is a need to modify agricultural policies and incentives so that the profitability and social sustainability of Nordic and Baltic agriculture, as well as security of supply, drive change towards climate-smart agriculture.

The added value of research cooperation

The cooperation and networking can lead to substantial added value for the participating countries. There are similarities across the borders regarding food culture, crops, plant diseases and pests, soils and climate-photoperiod and the small size of the Nordic and Baltic markets. The Nordic countries, Estonia and Lithuania can make much progress in sustainable agriculture by pooling scientific and financial resources and sharing infrastructures.

The cooperation will not only contribute to the regional added value but also enable Nordic, Estonian and Lithuanian researchers and users of the research to align with the international state of the art and build networks and capacities they can utilize in the European arenas as Horizon Europe and the coming mission on soil health and food, European Partnerships and the Joint Programming Initiative on Agriculture, Food Security and Climate Change (FAC-CE-JPI). This, in turn, could improve researchers' performance on the European and international levels.

International alignment

The EU has adopted ambitious targets for agriculture as a part of the European Green Deal. At the heart of the Green Deal, the Farm to Fork and the Biodiversity strategies point to a new and better balance of nature, food systems and biodiversity. The Farm to Fork Strategy aims to make food systems fair, healthy and environmentally friendly.

Programme activities

The Programme encourages the projects to recruit early career researchers and create networks where both junior and senior researchers are engaged.



Financial framework

The Programme is funded through a virtual common pot provided by the participating funding institutions. At least 2/3 of the programme budget will be provided by funding organisations from at least three participating countries. NordForsk will then co-fund the Programme with up to 1/3 of the budget allocated by the Nordic countries. The NordForsk cofunding is allocated to the Nordic research partners.

Funding will be granted for Nordic, Estonian and Lithuanian research collaborations, as specified in the proposal. National funding to partners from Nordic or other participating countries depends on national funding rules, regulations and available budget. Partner institutions from outside the participating countries participate with their own funding.

The Programme Committee sets the aims of the call for proposals, its thematic and financial framework, its timescale and rules for communication and stakeholder involvement. These and high scientific quality are the basis for the evaluation criteria of the proposals. The NordForsk administration opens the call and receives the proposals. An international peer-review panel will evaluate the proposals. The NordForsk administration will organise the evaluation panels.

The Programme Committee will recommend funding the proposals with high scientific quality, relevance to the Programme and added value for the participating countries. The NordForsk board and the national funding institutions will make the funding decisions based on the Programme Committee's recommendations. The programme committee will use a substantial amount of the total programme budget for further development of the funded projects and joint programme activities such as conferences, seminars, and workshops. The Programme Committee will communicate information about the programme and its objectives, aims, and calls for proposals to a broad range of researchers working in the area, as well as to citizens, stakeholders and policymakers. The Programme will use both NordForsk's and the funding partners' communication channels.