

Suggestions from Natural Resources Institute Finland (Luke) on the core tasks of Bionova. We encourage that this Bionova tool would have a possibility to either fund overseas partners if they have unique technologies to assist developments in Norway or include options where fully funded partners could participate with national players in Bionova projects.

A selection of ideas related to a holistic view of Bioeconomy (Agriculture, Forestry and Aquaculture).

- Diversification of income opportunities for agribusiness: income from food production, new business opportunities (biogas, carbon market) and ecosystem services. These opportunities should also be part of developing longer domestic green value chains in accordance with the intentions stated in Hurdalsplattformen
- Economic resilience of agriculture (arable and livestock production) under conditions of increased production demand and climate change. Diverse cultivation concepts and production options for increasing yield and sustainability of the renewing food system. This is critical in an environment with focus on reducing greenhouse gas emissions from the food production value chain whilst the operating environment is one of increasing input prices especially for fertilizers.
- How to enhance closed-loop system, where livestock and crop farms continually sustain and improve one other. Welfare and health-promoting production systems for livestock production.
- The potential of indoor vertical cultivation and other closed system solutions in agriculture and aquaculture should be developed in order to meet the future demand for food.
- Promoting the cultivation of protein crops to meet consumer demand. This cultivation and the selection and design of both the crops and the crop production and harvesting system must be integrated with the technology development for the processing of these crops. Here is an opportunity to operate in cooperation with a green value chain Katapult Senter.
- Improving nutrient use, recycling of nutrients and crop rotation to improve economic viability, reduce fossil fertilization and reduce environmental impact
- The functioning of the food chain and the structuring of food prices. This needs to be well understood in order to, through the use of behavioral economic and industry policy tools, increase the share of domestically produced food in the domestic food consumption in accordance with the intentions stated in Hurdalsplattformen.
- Development of contract solutions, through which the climate-friendly agriculture is made attractive and profitable for farmers and companies (both public and market based). Like carbon farming, where part of the income flow comes from increased carbon in soil. Compensation schemes could be introduced.

- Consumer survey on transition in food system as a first step to better understand consumer perspective. How to increase the consumer knowledge and affect their choices such as proof at purchase of the carbon or water footprint of a product. This has been successfully employed in stores in Finland
- Farming cooperatives and practices for regenerative farming as well as encouraging the development of organic farming will be important developments in the future to maintain biodiversity levels.
- Establishment of living labs where new solutions are tested and showcased rapidly and flexibly whilst there is dissemination towards grass-root level (farmers), e.g. in Finland we have Agrihubi ([Home - AgriHubi \(luke.fi\)](http://Home-AgriHubi.luke.fi)) and its format. These Living Labs can be developed jointly with Norsk Katapult
- Development and application of genetic tools for sustainability and profitability in primary production - incl. the socio-economic impact of the produced solutions. This covers agriculture, aquaculture and forestry. This will have to be coordinated with the Norwegian Research Council. This can also include increasing production potential by comprehensive exploitation of key genomic traits and genetic diversity in primary production
- Consumer awareness to be developed towards zero-waste production chain and consumption (e.g., minimised food waste). This should also focus on cascading use of the Watw materials in order to generate new valuable chemicals.
- Managing the nutrient cycle in fields, forests and water systems to control the nutrient cycles and to get rid of nutrient loss as well as generate recycled fertilisers
- Forest management / inventories need to be updated with latest technologies and concepts for holistic sustainability of wood production e.g. In Finland the UNITE flagship provides many ideas
- High-quality viable silvicultural material available to withstand effects of climate change. Reforestation and forest management for increased biomass and high-quality raw material for various uses
- More advanced side stream component characterization using genetic methods. New species, varieties and traits for the circular economy using genetic potential and tools
- Innovative, high-value product applications from the forest, food and aquatic system. Of these the development in the forest domain (engineered timbers, biochemicals and materials) have developed the furthest and can form a template for the thinking in the other domains.¹

¹ See e.g. Ahlqvist, T., Kettle, J., Hytönen, E., Niemelä, K., Kivimaa, A., Vanderhoek, N., Dufva, M., Mäkinen, T., Kurkela, E., & Valovirta, V. (2013). Future options for the cellulosic fibre value chain in the Green Triangle, South Australia: strategic technology roadmaps, business cases and policy recommendations. Customer Report VTT-CR-04761-13. VTT Technical Research Centre of Finland.

- Agriculture will demand alternative growing media and peat-substituting material solutions will be needed.
- Restoration of peatlands and the management and maintenance of soil processes (e.g. the role of the microbiome) for the growth potential and water management of arable and forest land in Norway

Within the Norwegian system there are already agencies that fund Research on lower TRL and MRL levels 1 to Level 4 so we assume that Bionova will be focused on higher TRL levels. This will include not only TRL levels 5 and 6 for larger companies but also TRL levels 7-9 for SME's (including individual farming, forestry and aquaculture operators) to both mitigate their lack of access to capital and to reduce their cost of capital. This is especially important when establishing capital intensive production facilities at scale.

Bionova should also aim to synergistically collaborate with the other funding and support actors and programs that exist in Norway and to avoid double work
